



WorkplaceNL



# Building a Safer Tomorrow

Occupational Health and Safety

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## Occupational Health and Safety

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WorkplaceNL strongly believes that focusing on youth will foster a culture of safety in the workplace for the next generation of workers in Newfoundland and Labrador. The intent of Occupational Health and Safety 3203 is to create awareness for youth of occupational health and safety, rights of workers, and the means to reduce some common risks and hazards at the workplace and at home, thus keeping young workers safe.

WorkplaceNL worked in partnership with the Department of Education to make Occupational Health and Safety 3203 a provincial high school course. **Building a Safer Tomorrow, Occupational Health and Safety** was completed for use in this provincial health and safety course.



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## UNIT AT A GLANCE

- CHAPTER 1** What is Occupational Health and Safety?
- CHAPTER 2** Occupational Health and Safety Legislation
- CHAPTER 3** WorkplaceNL
- CHAPTER 4** Careers in Occupational Health and Safety

## LET'S GET STARTED

What do the words “occupational health and safety” mean to you? What words or ideas come to mind when you hear that terminology?

1. Make a list of the first 10 words that come to your mind.
2. Share that list with a partner. Circle the words that were the same. Add the words that were different to your list.
3. As partners, share your lists of common words with the class. Begin an occupational health and safety word list to post in the classroom.



### My OH&S

This course is about you and your future in the workplace...whether as a worker, a supervisor, or an employer. As you complete unit one, ask yourself the following questions:

- What are the most important OH&S ideas for me to remember?
- What OH&S laws affect me?
- What OH&S resources could be useful to me now and in my future work life?
- What careers might be available in the area of OH&S?

# What is Occupational Health and Safety?

According to the Association of Workers' Compensations Boards of Canada, approximately 1 000 workers die and 250 000 workers suffer work-related injuries or diseases every year. Every year in Canada, more than 48 000 young workers under the age of 25 are injured seriously enough to require time off from work. Do these statistics surprise you?

The reality is that workplace injuries and illnesses can be prevented if we keep health and safety at the forefront every day. Occupational health and safety (OH&S) programs have been developed to protect workers, employers—all of us—from incidents and occupational diseases related to the workplace. This chapter outlines how and why OH&S programs were developed and the role we can play to keep ourselves, and each other, healthy and safe in the workplace.

## LEARNING GOALS

This chapter will enable you to:

- define terms related to OH&S
- explore general responsibilities in creating a healthy and safe work environment
- outline the benefits of implementing an OH&S program
- examine historical events that influenced the development of OH&S
- investigate specific tragedies that emphasize the need for OH&S

## SPREAD THE WORD

Every day in Newfoundland and Labrador two young workers aged 15-24 are injured on the job. Young workers are injured by slips and falls, by overexerting themselves, by exposure to hazardous chemicals and materials, and during the operation of machinery. But such injuries can be prevented. Since 2010, on average, fewer young workers are being injured in Newfoundland and Labrador. But, even one injury is too many.

With a partner, brainstorm as many answers as you can to the following questions:

1. Why might young workers be especially vulnerable to workplace incidents?
2. What workplaces or settings typically hire high school students as workers?





# Workplace Injuries and Illnesses

Consider the impacts of work-related deaths, injuries, and diseases on workers and their families. What might they be? How might employers, supervisors, and co-workers be affected? What about the community at large? The impacts of workplace injuries and illnesses can be devastating. Loss of life is immeasurable and illness recovery time and costs can be significant.

## Really!?!

Factoring in direct and indirect costs, the total costs of occupational injuries to the Canadian economy can now be estimated to be more than \$19 billion annually.

Source: Human Resources and Skills Development Canada, 2010.

## THE COST OF WORKPLACE INJURIES AND ILLNESSES

Costs of workplace injuries and illnesses can be broken into three categories—**direct costs**, **hidden costs**, and **human costs**.

Types of Costs	What They Are	Some Examples
Direct Costs	Measured in dollars and cents—those expenses immediately connected to an incident or illness	<ul style="list-style-type: none"><li>• Medical expenses</li><li>• Worker’s compensation payments</li></ul>
Hidden Costs	Measured in dollars and cents—those costs more broadly incurred as a result of a workplace incident or illness	<ul style="list-style-type: none"><li>• Training replacement workers</li><li>• Possible damage to tools and equipment</li><li>• Potential loss of business to the employer</li></ul>
Human Costs	Effects on people	<ul style="list-style-type: none"><li>• Pain, suffering, and stress suffered by workers and their families</li><li>• Negative morale in the workplace</li></ul>

**Figure 1-3** | Costs of workplace injuries and illnesses are interrelated. One impacts another. Explain, using an example, how this can be the case.

Human costs can be the most devastating: a person’s loss of connection to the workplace, the distress associated with permanent disabilities and/or loss of limbs, and the devastating loss of long-term career aspirations. These are just some life-changing examples of living with and managing the pain of workplace incidents. For some people, human costs may involve the pain and suffering of living without a loved one because he or she was killed while working. This type of pain cannot be measured.



**Figure 1-4** | The National Day of Mourning was established in Canada in 1984 by the Canadian Labour Congress. In 1991, the Canadian government passed legislation marking April 28th as a national “Day of Mourning for Persons Killed or Injured in the Workplace.” The movement has since spread to more than 80 countries around the world.

## THE BENEFITS OF OCCUPATIONAL HEALTH AND SAFETY (OH&S) PROGRAMS

**Workplace incidents** and **occupational diseases** can be prevented through the implementation of an OH&S program. An OH&S program is a process for managing health and safety issues in the workplace. Its benefits extend to employers, supervisors, and workers including:

- safer and healthier work environments
- lower medical care costs
- lower insurance costs
- increased work productivity and efficiency
- increased profits
- fewer work-related tragedies

**workplace incidents**  
events that cause harm to a person, or damage to property or the environment

**occupational disease**  
an illness or disease contracted from exposure to risk factors arising from work

## rights

a moral or legal entitlement to act in a certain way

An OH&S program also outlines the roles and responsibilities of employers, supervisors, and workers within the workplace. In addition to carrying responsibilities for workplace health and safety, we all have **rights**, including:

- the right to know about all the hazards to which we might be exposed
- the right to participate in protecting ourselves
- the right to refuse to work

You will learn more about your rights and responsibilities for OH&S as you progress through this course.

Who	What is his or her role?	What is his or her responsibility?
Employer	A person who employs one or more workers	Ensure the health and safety of workers where reasonably possible
Supervisor	A person authorized or designated by an employer to exercise direction and control over workers	Ensure the health and safety of workers where reasonably possible
Worker	A person who is engaged in an occupation	Take reasonable care and cooperate with the employer to protect themselves and others

**Figure 1-5** | Generally speaking, who is responsible for healthy and safe workplaces?

## QUICK CHECK

1. What is occupational health and safety?
2. List three reasons why OH&S is important.
3. What are the general roles and responsibilities of employers, supervisors and workers for OH&S?

# The History of Occupational Health and Safety

Many worker health and safety programs have been identified throughout history. The evolution of these programs dates back centuries.

## EARLIEST TIMES

In 2000 BC, Hammurabi, the ruler of Babylonia developed the *Code of Hammurabi* where damages were assessed against those who injured others. For example, one clause states that “a man who puts out the eye of another man, his eye shall be put out.” While we would certainly no longer agree with the punishment, the damages were indeed clearly stated.



**Figure 1-6** | The Code of Hammurabi contains an extensive list of laws written more than 4 000 years ago.

In Egypt, the slaves who built the temples and pyramids were treated very poorly and punished if their work was too slow. Around 1500 BC, Pharaoh Rameses created an industrial medical service to ensure his workers remained healthy and his temple was built. Workers were required to bathe every day in the Nile River. They were given regular medical check-ups and were isolated if sick.

The first signs of construction in the area of public health and safety were the public baths, sewerage systems, and well-ventilated houses built by the Romans in approximately 200 AD. These measures resulted in healthier citizens, including workers.



**Figure 1-7** | Emperor Caracalla discusses with his architect the expansion of the baths of Caracalla to be opened for free use to all Roman citizens.



In 16<sup>th</sup> Century Europe, a number of documents emerged that dealt with diseases of miners exposed to mercury. These documents identified the need for ventilation in mines.

### occupational medicine

the branch of medicine concerned with maintenance of health and the prevention of diseases and incidents in the workplace

### ergonomics

a science that studies how to fit the job or task to the worker rather than fitting the worker to the task

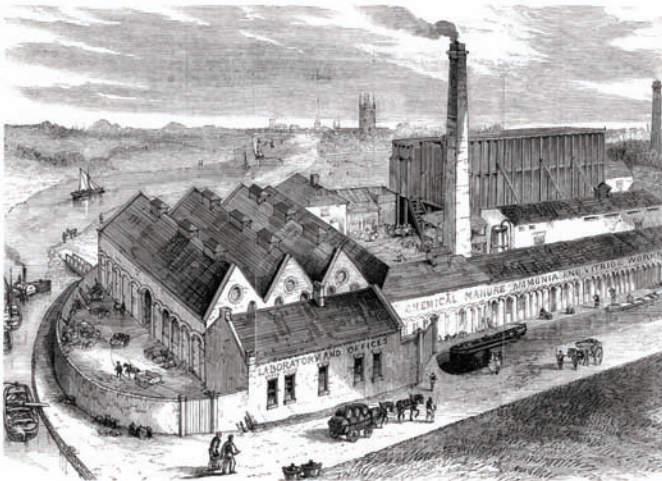
In 18<sup>th</sup> Century Europe, Bernardino Ramazzini wrote the book, *Discourse on the Diseases of Workers*. He is considered the founder of **occupational medicine**. He was the first to suggest that patients should be asked about their occupation. He also wrote about issues related to work such as unnatural body movements, repetitive motion, and sedentary (inactive) work. These elements are still studied today in workplace **ergonomics**.



**Figure 1-8** | Ramazzini's book, published in 1700 AD, outlined the health hazards of workers in 52 occupations including miners, masons, farmers, nurses, and soldiers. His work was commemorated with an Italian postage stamp more than 300 years later.

## THE INDUSTRIAL REVOLUTION

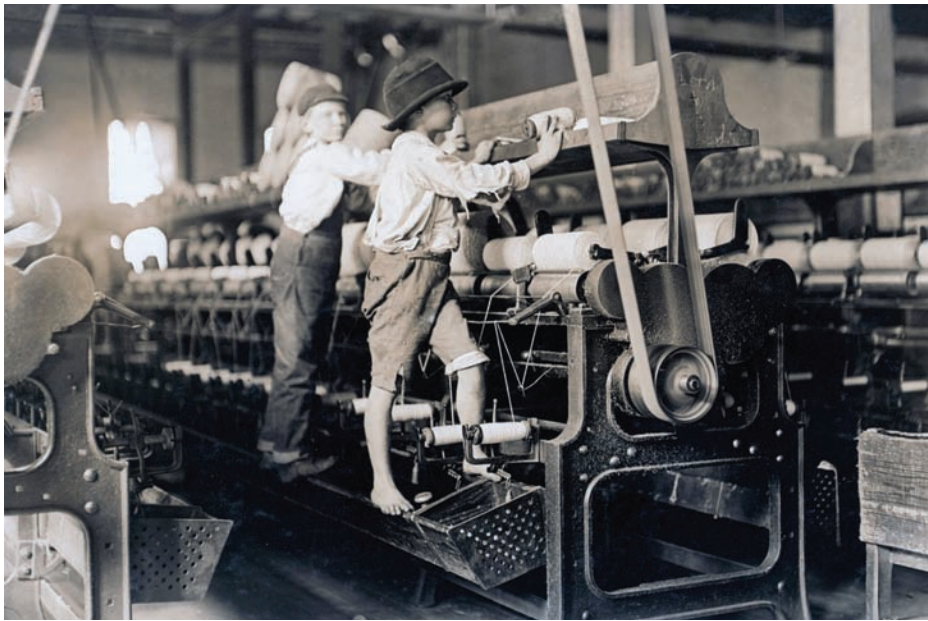
The industrial revolution in the mid-1800s changed how people worked.



**Figure 1-9** | This image depicts a chemical factory in England in 1869. What hazards might have been present?

- Steam power replaced people and animal power.
- New machines and equipment brought new methods for converting raw materials to finished goods.
- The organization and specialization of work introduced many small repetitive and tedious tasks completed over long periods of time.
- Children worked in factories for long hours; the work was hard and the conditions were unhealthy and unsafe.

These changes played a significant role in the creation of hazards never before seen in workplaces.



**Figure 1-10** | In textile mills children were made to clean machines while the machines were kept running. Why might this have been allowed to happen? Could it still happen today?

## ORGANIZED LABOUR

Organized labour, or unions, played an important role in bringing occupational health and safety (OH&S) issues to public attention. It pressured governments to create occupational health and safety legislation and incident prevention programs to protect the rights of workers.

Organized labour fought for safer working conditions and compensation for injured workers. As a result, existing anti-labour laws were overturned, including:

- Fellow Servant Rule—that employers were not liable for workplace injuries that resulted from the negligence of other workers. Those other workers would be to blame.
- Contributory Negligence—that, if the action of workers contributed to their own injuries, the employers were absolved of any liability.
- Assumption of Risk—that people who accept a job assume the risks that go with it.



## THINK ABOUT IT...

Why is the “assumption of risk” important to you as a worker on the job?



## It's the Law...

Children under 14 years of age may be employed in Newfoundland and Labrador but are restricted in the type of work they may perform. The type of work allowed is mandated by local regulation. The type of employment “may not be unwholesome, prejudice the child’s attendance at school, or the child’s capacity to benefit from instruction given at school.”

Source: Canadian Labour Congress

## IMPORTANT DATES IN OH&S HISTORY

As the impact of workplace incidents and occupational health issues became more widely known, governments enacted legislation, industry associations formed, and employers applied additional preventative measures. Figure 1-11 lists some examples.

1802	<i>Health and Morals of Apprentices Act</i> passed in England
1867	Massachusetts instituted the first government-sponsored factory inspection program
1869	Pennsylvania passed a law that requires two exits from mines
1877	Massachusetts passed a machine-guarding law
1884	<i>Ontario Factories Act</i> passed, requiring a system of inspection to ensure safety and health standards in factories
1898	Canadian Mining Institute incorporated by an Act of Parliament
1900	Frederick Taylor (an American mechanical engineer) conducted the first systematic research of efficiency in manufacturing, linking workers' lost time with employers' policies and procedures
1908	Concept of Workmen's Compensation introduced in the United States
1914	Passage of <i>Workmen's Compensation Act</i> in Ontario
1919	Association of Workers' Compensation Boards of Canada (AWCBC) founded
1929	Construction Safety Association formed in Canada
1951	Workmen's Compensation Board of Newfoundland established
1967	<i>Canada Labour Code</i> passed, organizing safety laws and regulations for federal workers
1970	<i>United States Occupational Health and Safety Act of 1970</i> ; National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) formed
1978	Newfoundland and Labrador's <i>Occupational Health and Safety Act</i> created and approved
1988	Workplace Hazardous Materials Information System (WHMIS) legislation came into effect
2001	Newfoundland and Labrador's <i>Occupational Health and Safety Act</i> and Regulations amended to include requirements for Occupational Health and Safety policy statements and Occupational Health and Safety programs
2004	<i>Bill C-45</i> was introduced—federal legislation that amended the Criminal Code of Canada; criminal liability to organizations, corporations, their representatives, and those who direct work
2009	Amendments made to the Newfoundland and Labrador OH&S Regulations
2012	The Mines Safety of Workers Regulations blended into the provincial OH&S Regulations

**Figure 1-11** Identify one provincial, one national, and one international example of a health and safety measure. Research to determine the significance of each example you selected.

## PUBLIC AWARENESS

Increasing public awareness contributed to improved working conditions and legislation. But many workers died or were seriously injured in workplace tragedies before governments began to focus on serious workplace problems. The following disasters played significant roles in the international safety movement:

- In 1930, a large tunnel was dug through mountains to bring hydroelectric power to a remote area of West Virginia. Workers had to cut through rock that contained **silica**. Exposure to silica led to numerous deaths. This led to a public outcry and a conference on silica in 1936. Tragically, miners in St. Lawrence, Newfoundland and Labrador, continued to be exposed to silica dust for many years after 1936, despite the silica-related deaths in West Virginia.
- Scientists first started considering the connection between the use of asbestos in construction and lung cancer in the late 1930s. When the **asbestos** used to insulate pipes broke down, hazardous fibres were released into the air. Workers inhaled the fibres and many suffered serious illnesses. As these connections have become widely known, there has been increasing public pressure in many countries to ban the use of asbestos. Specialized safety equipment is now required for its handling.
- Illnesses suffered by those in the hat-making industry in Europe and Britain had been connected as early as the 1800s to the use of **mercury** in their production processes. By 1934, the United States Public Health Service also made the connection—estimating that 80% of felt makers had mercurial tremors. The issue was not addressed until the 1940s when New York's hat-making industry replaced the use of mercury with hydrogen peroxide. The use of mercury in manufacturing and imported products is now highly regulated.



### **silica**

a hard chemical compound found in quartz, sandstone, and other rocks

### **asbestos**

a mineral that does not burn, used especially as a building material in the past

### **mercury**

a silver metal that is liquid at normal temperatures

**Figure 1-12** | To make the hats, fur from small animals was separated from the skin. A solution containing mercuric nitrate was used as a smoothing agent. The felt was shaped into large cones, shrunk in boiling water, and dried. In treated felts, a slow reaction released volatile free mercury. To make matters worse, hatters often worked in confined areas.



The province of Newfoundland and Labrador has felt the effects of tragedy due to poor OH&S standards and practice.

### St. Lawrence

St. Lawrence is a story of widespread occupational disease and death related to fluorspar mining. During the mining process, miners were exposed to large quantities of silica dust and radon gas. Over time workers developed lung conditions where lung capacity diminishes to the point that victims, in effect, suffocate. The number of men who died as the result of occupational disease linked to their work in the mines is estimated to be between two and three hundred. However, it is difficult to estimate the true numbers because of the lack of medical facilities and accurate record-keeping in the period before the 1950s. While the number of deaths has lessened over the years, former miners continue to grow ill and die.



**Figure 1-13** | The air quality of the underground mines posed one of the greatest threats to miners in St. Lawrence. In this image, miners are taking an air sample in the underground mine.

### Baie Verte

The open pit mining of asbestos began in 1955 in Baie Verte. A medical report published in 1977 indicated 10% of the 485 mine and mill workers had asbestos-related diseases. The workers went on strike—a strike which was significant to the safety movement in Canada because it was one of the first which was fought based almost exclusively on an OH&S



**Figure 1-14** | When asbestos fibres are inhaled, they become embedded in the lungs and other body tissue.

issue. Workers recognized the need to protect themselves from exposure to asbestos dust. Their demands included double lockers (one for their clean clothes and another to store their asbestos-covered work clothes), showers, car washes, and a clean lunchroom. The strike lasted 14 weeks but eventually their demands were met. The company also agreed to provide closer monitoring and control of dust levels along with other improved safety standards.



## The Ocean Ranger

In 1976, the Ocean Ranger was the largest self-propelled semi-submersible offshore drilling unit in the world. On February 15, 1982, the worst marine disaster in decades took place when the Ocean Ranger sank during a winter storm and the 84-person crew lost their lives on the Grand Banks of Newfoundland and Labrador. That dreadful night has had a major influence on the offshore industry. Federal and provincial legislation now requires strict safety guidelines. Funding has been made available for research. New technologies for survival and training requirements for workers have been introduced.

## Cougar Helicopter Crash, Flight 491

On March 12, 2009, Flight 491, Sikorsky S-92A, went down 11 minutes after alarms alerted the two pilots that the main gearbox was out of oil. The helicopter was carrying 16 workers to the Hibernia and Sea Rose offshore oil rigs. Of the 18 occupants, only one survived the crash.

The events of the crash were initiated by a red warning light indicating there was low oil pressure in the main gearbox. The pilots shut engines down and began an emergency power-off landing. The pilots lost control when the tail rotor failed and plunged into the North Atlantic. Once the helicopter hit the water, the emergency floating system failed and caused the sinking process to quicken.

The investigation that was completed by the Transportation Safety Board (TSB) identified 16 contributing factors to the crash. Recommendations included, but were not limited to, more training for workers, mandatory breathing devices when wearing survival suits on flights, stricter regulations for flying over rough seas, and improved regulations to prevent helicopters from being approved to standards they cannot meet.



**Figure 1-15** | The Ocean Ranger disaster forced both the federal and provincial governments to quickly reorganize the offshore oil industry and place a greater emphasis on worker safety.



**Figure 1-16** | The official dedication of the memorial commemorating victims of offshore helicopter tragedies took place in 2014.

## OCCUPATIONAL HEALTH IN POP MUSIC: “SILICOSIS IS KILLIN’ ME”



**Figure 1-17** | Josh White was a singer, songwriter, and civil rights activist. His style influenced future generations of artists including Elvis Presley and Bob Dylan.

Josh White, also known as Pinewood Tom, wielded the power of the blues to tell the story of an early 20th century miner who develops silicosis, most likely from unsafe working conditions below ground.

“Silicosis Is Killing Me” was written during a time of emerging recognition of occupational hazards, especially for miners. In 1932, lawsuits began to be filed on behalf of miners involved in the construction of a tunnel near Gauley Bridge, West Virginia. The workers, predominantly African Americans, had been exposed to lethal amounts of silica dust and many had developed silicosis and died. The disaster was later named the Hawk’s Nest Incident for the name of the tunnel that was built.

The song is sung in the voice of an afflicted tunnel digger who is lamenting his lost youth and dim future prospects. At one point, he pleads with his mother to cool his fevered head, a symptom commonly associated with the disease. Silicosis still has no cure, making White’s lyrics all the more haunting today:

*I was there digging that tunnel for six bits a day  
Didn’t know I was digging my own grave  
Silicosis eating my lungs away.*

---

Adapted from article by Arti Virkud. Published March 21, 2013. The 2x2 Project, Columbia University’s Mailman School of Public Health. [www.the2x2project.org](http://www.the2x2project.org)

## QUICK CHECK

1. Identify three historical events, prior to 1950, that influenced health and safety practices. What was the impact of each event?
2. How did the labour movement help bring attention to OH&S issues?
3. How have past workplace tragedies in Newfoundland and Labrador helped shape current OH&S legislation?



## SPREAD THE WORD

Create a text message for a youth audience to raise OH&S awareness. Using 160 characters or less, convince your audience that OH&S is important. You might want to consider a compelling slogan or statistic to capture their attention.



## WHAT WOULD YOU DO **NOW**?

Review the **What Would YOU Do?** at the beginning of the chapter (page 5), recalling your initial response. After reading this chapter, would your answer change? Why or why not?



## CHAPTER CHALLENGE

Starting with the list of words you identified at the beginning of the unit, expand your personal list of important terms related to OH&S. Use that list to create a piece of word art, word cloud, or infographic illustrating the language of OH&S. Be prepared to define the words you selected for use.



## DIG DEEPER

Select one example of an OH&S tragedy that occurred in Newfoundland and Labrador. Research further information about your topic. Share your research via a commemorative poem, song, or graphic representation of your choice. Your presentation should include the following:

- what happened
- why it happened
- what safety measures developed as a result
- your thoughts, or a survivor's statement, about the personal impact of the tragedy on those who were involved

# Occupational Health and Safety Legislation

Legislation refers to the laws or rules that govern our daily activities. For example, the *Criminal Code* is a federal law that protects citizens and maintains public order. The *Schools Act* is a provincial law that ensures that all children are provided with an education and makes it mandatory for them to attend school.

Occupational Health and Safety Acts and Regulations are laws that govern workplaces. They outline the rights and responsibilities of the employer, the worker, and the supervisor to ensure working environments are healthy and safe. In Canada, there is both federal and provincial/territorial occupational health and safety (OH&S) legislation—both designed to protect us in the workplace.

## LEARNING GOALS

This chapter will enable you to:

- examine federal and provincial OH&S legislation
- explain how OH&S legislation is enforced
- explain the importance of the Internal Responsibility System (IRS) and due diligence
- summarize the basic rights of workers
- understand key stakeholder groups within OH&S legislation and the process for establishing each role
- outline the basic duties attached to each role
- outline the five step problem-solving and decision-making process for resolving OH&S issues

## SPREAD THE WORD

**Are You At Risk?** is the title of a public education campaign developed by WorkplaceNL.

Consider Figure 2-1 and answer the following questions:

1. Who is the intended audience for this poster?
2. What is the intended message?



**Figure 2-1** | What elements of the poster are most effective to capture the viewer's attention?

## WHAT WOULD YOU DO?

Spring break is just around the corner and Gary has been looking to earn some extra money. There is some local road work happening in his community and the construction company is looking for traffic control persons on a temporary basis. He interviews and gets the job!

On the first day of work Gary completes his basic training and he is issued a hard hat, fluorescent vest, and sign pole. His supervisor works with him in the afternoon to demonstrate his responsibilities. Gary starts his first solo shift the next morning. It is a beautiful spring day. While the warmth of the sun is nice, he

finds himself challenged by the glare. At times it is hard to see the oncoming traffic. He comments later to one of the crew that he must squint to see the traffic. The crew member recognizes Gary's challenge and, in fact, tells him that there was a near miss the previous week when the traffic control person had to jump out of the way of an oncoming car. Gary laughs it off but the truth of it is that he has become nervous.

**What would YOU do?**



**Figure 2-2** | How many health and safety measures can you identify in this image? Does the safety vest meet CSA standards?

## CHAPTER CHALLENGE PREVIEW

The need to be mindful about safety exists at home and at school—not just within the workplace. What safety considerations come to mind when you think about your school?

As a class, brainstorm the answers to the following questions:

1. What health and safety considerations are important within your school? How might you become injured or sick?
2. How can you play a part in supporting a safe and healthy school?
3. How is your school a workplace?

As you read this chapter, consider how OH&S legislation applies to your school setting.



# Occupational Health and Safety Legislation

Canadian workplaces are governed under federal legislation or provincial/territorial legislation. Other organizations also assert regulations and standards (often industry specific) that workplaces must obey. The Canada-Newfoundland and Labrador Offshore Petroleum Board (CNLOPB) is one example.



**Figure 2-3** | Newfoundland and Labrador is part of the Canadian Coast Guard Atlantic Region, which has 2 100 workers engaged in diverse roles on shore and at sea. CCGS Louis S. St-Laurent is a heavy icebreaker whose home port is St. John's, NL. What unique health and safety hazards might be present in this workplace environment?



**Figure 2-4** | Air traffic controllers facilitate the safe movement of aircraft in the air by monitoring flight traffic, weather patterns, and communications with pilots. They also control moving aircraft and service vehicles on the ground at airports. What health and safety considerations might be important in their work environment?

## FEDERAL OCCUPATIONAL HEALTH AND SAFETY (OH&S) LEGISLATION

*The Canada Labour Code, Part II, and the Canada Occupational Health and Safety Regulations* provide governing legislation in federal workplaces such as federal government departments and crown agencies and corporations located across the country. About 10% of all workplaces in Canada fall under federal jurisdiction. Federal jurisdiction is applied to such agencies or locations as:

- Fisheries and Oceans Canada
- Human Resources and Skills Development Canada
- Canada Revenue Agency offices
- airports
- post offices
- banks
- interprovincial trucking, shipping, and bus companies
- telecommunication companies

## PROVINCIAL/TERRITORIAL OH&S LEGISLATION

About 90% of workplaces in Canada fall under provincial/territorial jurisdiction. Each province/territory has its own *Occupational Health and Safety Act (OH&S Act)* and Regulations.

Newfoundland and Labrador's *OH&S Act* was written in 1978. It is the statute (law) that regulates health and safety in workplaces in our province. Revisions and updates are sometimes made to existing legislation. These changes to legislation are called amendments.

OH&S Regulations, both federal and provincial, provide specific direction for workers and employers to implement the requirements of the Act. When starting a new job, always ask under whose jurisdiction does your workplace fall.

## ENFORCEMENT OF OH&S LEGISLATION

Federal and provincial OH&S legislation is enforced by OH&S officers.

Their role is to:

- ensure workplaces are safe by conducting compliance inspections (inspections that ensure employers are following legislation)
- investigate accidents and serious injuries in the workplace
- review test results such as air quality assessments
- inspect radiation controls
- issue directives and stop-work orders when necessary

When OH&S officers enter a workplace and determine an employer is not complying with the OH&S legislation, the officers may issue a directive or a stop work order.

A **directive** outlines the sections of the OH&S legislation requiring attention and the time-frame for **compliance**.

For example, if a workplace is supposed to provide OH&S committee training by a certain date and the training has not taken place, the officer may give the employer a directive. The directive would state which members of the OH&S committee must be trained. It would also state how long the employer has to ensure these workers are trained.

If officers discover that something in a workplace poses an immediate risk to the health and safety of workers or other people, they may issue a **stop-work order**. A stop-work order means that all or part of work must stop until the unsafe condition is corrected.

## ADDITIONAL LEGISLATION

In addition to the *OH&S Act* and Regulations, workplaces in Newfoundland and Labrador may have to comply with other legislation. This legislation is often specific to an industry or type of work.

Some examples include:

- *Workplace Health, Safety, and Compensation Act*
- First Aid Regulations
- Asbestos Abatement Regulations
- Workplace Hazardous Materials Information System 2015 (WHMIS) Regulations
- *Radiation Health and Safety Act*
- Radiation Health and Safety Regulations



**Figure 2-5** | This symbol indicates the presence of radiation. How is radiation harmful? What work environments are likely to deal with this issue?

### **directive**

an official instruction that must be followed to correct an issue in the workplace

### **compliance**

the act of doing what you were supposed to do

The OH&S Regulations may also refer to additional standards and guidelines. The table below outlines some organizations which set standards for different health and safety areas.

Name of Organization	Standards
Atomic Energy Control Board Regulations of Canada	Radiation
CSA Group (CSA)	Personal protective equipment (PPE), electrical, safeguarding of machinery, fall protection equipment, powder actuated devices, mobile equipment, portable ladders, etc.
Canada-Newfoundland and Labrador Offshore Petroleum Board (CNLOPB)	The CNLOPB was created in 1986 through the Atlantic Accord for the purposes of regulating the oil and gas industry offshore Newfoundland and Labrador.
American Conference of Governmental Industrial Hygienists (ACGIH®)	Noise, temperature, vibration, indoor air quality
American National Standards Institute (ANSI)	Lighting, fixed ladders

**Figure 2-6** | Why would Canadian workplaces sometimes follow American standards?

## SOURCES OF OH&S INFORMATION

Provincial government organizations provide information about OH&S and how legislation is applied within the workplace.

Organization	Role
WorkplaceNL Locations: St. John's, Grand Falls-Windsor, Corner Brook	WorkplaceNL provides services to employers, injured workers and dependents, and the public through the administration of the <i>Workplace Health, Safety and Compensation Act</i> (the Act). These services include: <ul style="list-style-type: none"> <li>the promotion of workplace health and safety in order to prevent and reduce workplace injuries and occupational disease.</li> <li>ensuring injured workers receive the best care possible, receive benefits to which they are entitled, recover from their injuries, and return to work in an early and safe manner.</li> </ul>
Service NL—Occupational Health and Safety Division Locations: St. John's, Grand Falls-Windsor, Corner Brook, Labrador City	The primary goal of an OH&S Division is accident and illness prevention. This is achieved by working with stakeholders to establish, promote, and enforce workplace practices, standards, and procedures.

**Figure 2-7** | Together, WorkplaceNL and Service NL support the application of OH&S legislation.

The following is a listing of OH&S organizations. Many have dedicated websites providing information about how legislation, regulations, and standards can be applied.

- Canadian Centre for Occupational Health and Safety
- Canadian Occupational Health Nurses Association
- CSA Group (CSA)
- Fire and Emergency Services Newfoundland and Labrador
- Emergency Preparedness Canada
- Association of Canadian Ergonomists
- National Institute for Occupational Safety and Health
- National Safety Council
- Newfoundland and Labrador Construction Safety Association
- Newfoundland and Labrador Employers' Council
- Newfoundland and Labrador Federation of Labour
- Safety Services Newfoundland and Labrador



**Figure 2-8** | The CSA Group registered certification mark shows that a product has been independently tested and certified to meet recognized standards for safety or performance. CSA Group marks are displayed on electrical products, gas-fired appliances, plumbing, personal protective equipment, and a wide variety of other products sold around the world.

## QUICK CHECK

1. List three examples of workplaces that fall under federal OH&S legislation.
2. List three examples of workplaces that fall under provincial OH&S legislation.
3. What is the role of enforcement agencies and OH&S officers?
4. Identify three different workplaces in your local community. What health and safety considerations might be unique to those workplaces?

Positive developments contributing to a safer Newfoundland and Labrador include the formation of safety sector councils. These include the construction, forestry, municipal, and fish harvesting industries and the implementation of certification training standards for high-risk areas, including confined space entry, fall protection, and traffic control persons.

These organizations are also sources of valuable information for people outside the industry engaged in tasks on a household level. As one example, the Newfoundland and Labrador Construction Safety Association (NLCSA) is a not-for-profit association that takes a leadership role in lowering risk and preventing injury within the construction industry. Its website contains resource material including safe work practices related to battery boosting, use of extension cords, hand tools, light duty vehicle operation, cleaning solvents, and flammables—topics useful outside the workplace.



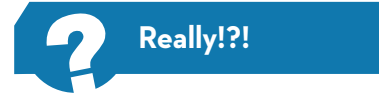
**Figure 2-9** | Don't let lack of knowledge be a reason for an incident or injury. Be informed. Seek guidance from credible sources before you begin a potentially hazardous task.



# The Internal Responsibility System

Occupational Health and Safety (OH&S) legislation sets the minimum standard that should be met to ensure workers are provided with a safe and healthy workplace. But legislation does not always give employers a step-by-step process to meet that minimum standard. It holds employers responsible for determining the steps necessary to ensure the health and safety of all workers.

In 1974, Uranium miners in Elliot Lake, Ontario, became alarmed about the high incidence of lung cancer and silicosis and they went on strike over health and safety conditions. The government appointed a Royal Commission to investigate health and safety in mines. Chaired by Dr. James Ham, it became known as the Ham Commission. The Ham Commission Report included more than 100 recommendations concerning mine health and safety. Ham was also concerned about the administration of health and safety. He developed the idea of an internal responsibility system (IRS), which would require government, employers, and workers to cooperate to improve health and safety.



The IRS originated in Canada and has now been applied internationally.

## THE PRINCIPLES OF IRS

IRS is a philosophy applied to the prevention of work-related illnesses and diseases, injuries, and incidents. It is a way of thinking about our basic duty to take “reasonable care” in protecting the health and safety of workers.

IRS involves three essential principles as illustrated in Figure 2-10.



**Figure 2-10** | The components of IRS work together to create safe and healthy workplaces.

### due diligence

the level of judgement or care that a person would reasonably be expected to take under particular circumstances

### It's the Law...



As you read through legislation, you will note that the word “**shall**” is used frequently when discussing responsibilities of employers, supervisors, and workers. Shall means that you must do it; there are no options or choices in the matter.

## DUE DILIGENCE

The IRS lays a strong foundation for a healthy and safe workplace. Employers, supervisors, and workers must follow and meet all OH&S legislation that applies to their workplace. This means that all workplace parties must take all reasonable precautions to prevent incidents, injuries, and illnesses and diseases in the workplace. If an incident were to occur, they would have to show, in a court of law, they were practicing **due diligence**.

If another worker is injured because you, as a worker, did not follow a safe work procedure, you could be charged under the *OH&S Act* and held accountable in the courts for your actions. On the other hand, if a worker was injured as the result of your actions but you had taken all precautions to follow safe work procedures, then if you are charged, you may have a due diligence defence.

Due diligence should be an everyday practice. Keep in mind the following:

- Due diligence is demonstrated before an incident occurs, not after.
- IRS provides a framework for due diligence.
- Due diligence is demonstrated by writing all OH&S activities down on paper. Document, Document, Document!

## ROLES, RESPONSIBILITIES AND DUTIES UNDER OH&S LEGISLATION

We now know that health and safety in the workplace is everyone's responsibility. OH&S legislation also emphasizes the importance of employers and workers working together to create a healthy and safe workplace.

The *OH&S Act* and Regulations outlines the roles, responsibilities, and duties of the employer, supervisor, and worker. Refer to the following sections of the OH&S legislation for further information and guidance.

### Occupational Health and Safety Act

Section 4, Employers' general duty  
Section 5, Specific duties of employers  
Section 5.1 and 5.2, General and specific duties of supervisors  
Section 6, Workers' general duty  
Section 7, Specific duties of workers  
Section 8, Imminent danger

### Occupational Health and Safety Regulations

Section 14, General duties of employer  
Section 17, General duties of workers

**Figure 2-11** | Where can you obtain copies of OH&S legislative documents?

Remember, not only should you be aware of your employer’s responsibility; you should become familiar with your own responsibility for health and safety in the workplace.

Employers must...	Supervisors must...	Workers must...
<ul style="list-style-type: none"> <li>• ensure the health and safety of workers where reasonably possible</li> <li>• provide and maintain a healthy and safe workplace</li> <li>• ensure an OH&amp;S policy statement is written that outlines the commitment, roles, and responsibilities of workplace parties</li> <li>• ensure the OH&amp;S program is developed, implemented, reviewed, and monitored on a regular basis</li> <li>• ensure safe work practices and procedures are developed and followed</li> <li>• provide education, training, and instruction to workers and supervisors</li> <li>• familiarize workers and supervisors with hazards</li> <li>• consult with the OH&amp;S Committee, Worker Health and Safety Representative, or Workplace Health and Safety Designate and respond to recommendations</li> <li>• schedule workplace inspections in consultation with OH&amp;S Committee/ Worker Health and Safety Representative/ Workplace Health and Safety Designate</li> </ul>	<ul style="list-style-type: none"> <li>• ensure the health and safety of workers where reasonably possible</li> <li>• inform workers of the health and safety hazards that may be in the workplace</li> <li>• give written and oral instructions for using personal protective equipment, devices, and clothing</li> </ul>	<ul style="list-style-type: none"> <li>• take reasonable care and cooperate with the employer to protect themselves and others</li> <li>• report hazards to the employer or supervisor</li> <li>• use protective equipment, devices, and clothing according to training and instruction received</li> <li>• cooperate with the OH&amp;S Committee/Worker Health and Safety Representative/ Workplace Health and Safety Designate</li> <li>• not work where imminent danger exists or use tools or equipment that pose a dangerous threat to others</li> <li>• follow safe work practices and procedures</li> </ul>

**Figure 2-12** | Employer, supervisor, and worker responsibilities to ensure healthy and safe workplaces. How are the responsibilities similar and different?

## WORKERS’ RIGHTS IN OH&S

Along with specific roles and responsibilities within the workplace, all workers have three basic rights:

1. The Right to Know
2. The Right to Participate
3. The Right to Refuse

## The Right to Know

Workers have the right to know about all the hazards to which they might be exposed in the workplace.

Examples:

- Workers who use chemicals have the right to know what the chemical is; what would happen if it is spilled on their skin or splashed in their eyes; what to do in case it is spilled or splashed; and, what kind of danger exists if the chemical is spilled on the floor; etc.
- Workers who are working with new equipment must be notified of associated equipment hazards, PPE to use, training required, etc.

## The Right to Participate

Workers have the right to participate in protecting themselves against injury or illness in the workplace.

Examples:

- Sitting on the OH&S committee (i.e., an advisory group of workers and management who assist employers in creating and maintaining a safe and healthy workplace)
- Taking part in developing safe work procedures
- Assisting with workplace inspections
- Reporting unsafe work situations to their supervisor

## The Right to Refuse

Under the *OH&S Act*, workers have a right to refuse unsafe work if they feel that conducting the work will cause injury or illness to themselves or someone else at the workplace. Sections 45, 46, 47 and 48 of the *OH&S Act* and section 5 of the *OH&S Regulations* outline the right to refuse process.

**Figure 2-13** | How do your rights within the workplace relate to IRS?

### It's the Law...



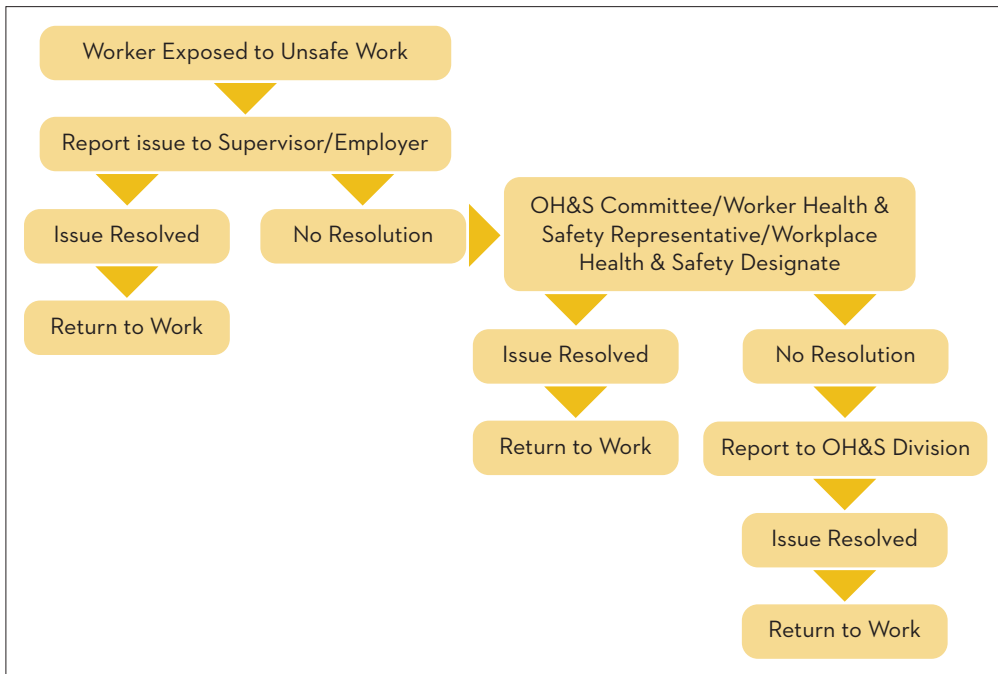
Workers cannot be disciplined if they refuse unsafe work when they have reasonable grounds to believe that the work is dangerous to their own health and safety or that of others.

Workers who are faced with unsafe working conditions are too often unsure about reporting them. But workers who refuse unsafe work are not alone in their work refusals. Legislation provides workers with support throughout the process. An OH&S committee, worker health and safety representative, or workplace health and safety designate can intervene after the work refusal has been reported to the supervisor and has not been resolved.

What happens when a worker feels he or she must refuse work? There are a number of steps to be taken. Refer to Figure 2-14 on page 29.

## QUICK CHECK

1. What are the three principles of the IRS?
2. When and why is it important to demonstrate due diligence?
3. Explain what you think are the most important roles of employers, supervisors, and workers within OH&S legislation.
4. What are the three rights of workers under OH&S legislation?
5. What is the first step you would take if you were faced with what you thought was an unsafe work situation?



**Figure 2-14** Why is it important to have a clear process for the resolution of unsafe working conditions?

## The Occupational Health and Safety Policy Statement and the Occupational Health and Safety Program

An **Occupational Health and Safety (OH&S) policy statement** is a written statement of the employer’s commitment to workplace health and safety. It states the health and safety goals of the organization and outlines the roles and responsibilities of workplace parties. An **OH&S program** is the plan developed and implemented by the employer for preventing incidents and occupational disease in the workplace.

### THE OH&S POLICY STATEMENT

The key principle of the OH&S policy statement is the employer’s responsibility for creating a healthy and safe workplace. It outlines the employer’s leadership and administration of OH&S within the particular workplace.





**Figure 2-15** | Why is posting the OH&S policy an important part of the process?

All federal and provincial workplaces must have an OH&S policy statement. The OH&S policy is signed, dated, and posted by the employer or the person responsible for the management of the employer's operations. It is then reviewed, signed, and dated on an annual basis.

The OH&S policy statement must include:

1. A statement of the employer's commitment to work with the worker health and safety representative, workplace health and safety designate, or the OH&S committee in carrying out the shared responsibility of occupational health and safety.
2. A statement of the responsibilities of the employer, supervisors, workers, and the worker health and safety representative, workplace health and safety designate, or OH&S committee in carrying out the shared responsibility of occupational health and safety.

## THE OH&S PROGRAM

An OH&S program is the employer's action plan in creating a healthy and safe workplace. All federal workplaces must have an OH&S program. All provincial workplaces with 10 or more workers must have one as well.

The OH&S program is signed and dated by the employer or the person responsible for the management of the employer's operations. The OH&S program is then reviewed, signed, and dated at least every three years.

The OH&S program must include the following:

1. The OH&S policy statement
2. Procedures to identify the need for written safe work procedures to implement health and safety practices as required by the *OH&S Act* or OH&S officers
3. Written safe work procedures appropriate to the hazards and workplace activities
4. A plan for orientating and training workers in workplace and job-specific safe work practices, plans, policies, and procedures
5. Requirements for the OH&S committee with respect to the committee's activities

6. A hazard recognition, evaluation, and control system, which includes procedures for workplace inspections, incidents, and investigation of hazardous occurrences at the workplace
7. A plan for the control of biological and chemical hazards
8. Contractor safety requirements and guidelines
9. Emergency preparedness/response program
10. Maintenance of OH&S records and statistics

WorkplaceNL recommends 10 elements for an OH&S program:

1. Leadership and Administration
2. OH&S Committees
3. Education and Training
4. Communication
5. Safe Work Practices and Procedures
6. Hazard Recognition, Evaluation, and Control
7. Workplace Inspections
8. Incident Investigations
9. Emergency Preparedness and Response
10. Disability Management

Ergonomics should be incorporated into each element of an OH&S program so that musculoskeletal injuries can be prevented.



**Figure 2-16** | Where would you locate a copy of the OH&S program pertaining to your school?

## QUICK CHECK

1. What is the difference between an OH&S policy statement and an OH&S program?
2. Identify three local workplaces. Which of them must post an OH&S policy statement? Which of them must have an OH&S program in place?
3. Obtain a copy of the OH&S policy statement that applies to your school. How does it reflect the criteria on page 30–31.



**Figure 2-17** | How do employers benefit from developing policies and programs in partnership with workers?

## The Occupational Health and Safety Team in the Workplace

The internal responsibility system (IRS) requires employers, supervisors, and workers to take seriously their roles in occupational health and safety (OH&S). Employers are required to create and maintain healthy and safe workplaces. Supervisors are required to monitor the health and safety of those under their supervision. Workers are required to take reasonable care to protect their own health and safety and others in the workplace.

Another very important activity is for workers, supervisors, and employers to join forces and engage in joint consultation. In some workplaces, you are required to have an OH&S committee. In others you are required to have a worker health and safety representative, or a workplace health and safety designate. Legislative requirements for each of these roles are related to the number of workers present in the workplace.

### THE OH&S COMMITTEE

In workplaces employing 10 or more workers, the employer is required to establish an **OH&S committee** to monitor the health, safety, and welfare of workers. OH&S committees are made up of representatives from the workers and representatives from the employer. Committee members must be trained according to WorkplaceNL's certification training standard. Co-chairs must be trained in workplaces where there 10-49 workers are employed. For workplaces with 50 or more workers, the entire OH&S Committee is required to be trained.

### THE WORKER HEALTH AND SAFETY REPRESENTATIVE

In workplaces where there are more than one but less than 10 workers employed, the employer must ensure that a worker not connected with management is designated as the **worker health and safety representative** to monitor the health, safety, and welfare of workers.

### THE WORKPLACE HEALTH AND SAFETY DESIGNATE

Where less than six persons are engaged at a workplace and the designation of a workplace health and safety representative is impractical (e.g., high turnover in staff, all part-time positions), employers may appoint a **workplace health and safety designate** to monitor the health, safety, and welfare of workers engaged at the workplace. The worker health and safety representative and workplace health and safety designate must be trained according to the WorkplaceNL certification training standard.

#### It's the Law...



The *OH&S Act* requires that the worker health and safety representative must be a person **not** connected with management. When determining whether a person is "connected with management," consider whether the person has the authority to act or make decisions on behalf of the owner or operators. If such an authority exists, the person would not be considered a worker.

The difference between a worker health and safety representative and a workplace health and safety designate is that the workplace health and safety designate could be connected with management or be the owner, operator, or partner of the company and is appointed by the employers whereas the workplace health and safety representative cannot.

## DUTIES OF THE OH&S COMMITTEE AND WORKER HEALTH AND SAFETY REPRESENTATIVE/WORKPLACE HEALTH AND SAFETY DESIGNATE

The primary function of an OH&S committee, worker health and safety representative, and workplace health and safety designate is to monitor the health, safety, and welfare of workers employed at the workplace. They operate in consultation with the employer.

Where it is reasonably practicable, worker health and safety representatives and workplace health and safety designates have the same duties as those required of an OH&S committee.

## ESTABLISHING THE OH&S COMMITTEE

There are legislative requirements regarding how an OH&S committee is established, its size, and how it functions.

### Size of the Committee

The OH&S committee must comply with the following elements:

- There must be no less than two and no more than 12 persons on the committee.
- At least half of the members of the committee must represent workers not connected with management.
- The persons representing the workers are elected by workers.
- Sufficient employer representatives must be appointed so as to ensure the committee may function.

If there is a problem agreeing on the size of the committee, the Occupational Health and Safety Division of Service NL may be contacted for assistance. Section 38 of the *OH&S Act* provides full details.



It's the Law...

Workers cannot suffer loss of pay or other benefits while engaged in a meeting of the OH&S committee.



**Figure 2-18** | Why would there be restrictions placed on the size of the OH&S committee?

## Committee Leadership

Once the OH&S committee members have been identified, co-chairs will be selected to lead the team. The employer members elect a co-chair from their members. The worker members elect a co-chair from their members.

The names of the OH&S committee members must be posted in a prominent place in the workplace.

## Terms of Reference

One of the first activities of an OH&S committee should be to develop a written **terms of reference** or “the rules of the game” as to how members will work together. It provides guidance for committee members in fulfilling their roles and responsibilities.

The terms of reference is specific to each OH&S committee and workplace. The terms of reference:

- defines the purpose of the OH&S committee
- identifies the committee members
- outlines how members and co-chairs are selected
- explains how long members can be on the committee and the procedure for electing or appointing other members
- states how often the committee will meet
- states when meetings should take place (during regular work hours)
- establishes the **quorum** for meetings
- identifies training needs for OH&S committee members
- identifies the OH&S committee’s role in work refusals
- outlines standing agenda items
- defines items not to be discussed in meetings (e.g., labour-management issues)
- outlines the process for making health and safety recommendations to the employer
- states the requirement to submit OH&S committee minutes of meetings to WorkplaceNL on the required form and post the minutes in the workplace

### quorum

one half of the membership of the committee provided that both employer and worker members are equally represented



## THE FIVE STEP PROBLEM-SOLVING AND DECISION-MAKING PROCESS

Working with the employer to monitor the health and safety of workers and making recommendations that are reasonable requires a clear step-by-step process. The goal of the process is to identify the OH&S issue and resolve it to improve the health and safety of the workplace.

The following five step process serves as a guide when faced with an OH&S issue:

1. Recognize the OH&S issue
2. Gather information
3. Review information for possible solutions
4. Make written recommendations to the employer
5. Follow up and monitor that the issue has been resolved

Figure 2-19 (below and on the next page) outlines each step in the process in more detail. It is, however, important to remember that the very first step in resolving health and safety issues in the workplace is to bring the issue to the supervisor or the manager. These people are the first line of defence against injury and illness at work. Only if the issue is not addressed at this level does it need to go to the OH&S committee or the worker health and safety representative/workplace health and safety designate.

<p>1. Recognize the OH&amp;S issue</p>	<ul style="list-style-type: none"> <li>• Determine whether or not the issue actually relates to occupational health and safety and not something else (e.g., a labour relations issue)</li> <li>• Look beyond the obvious to identify the root cause of the issue, not just the symptom</li> <li>• Utilize additional internal and external resources as required</li> </ul>
<p>2. Gather information</p>	<ul style="list-style-type: none"> <li>• Refer to the <i>OH&amp;S Act</i> and Regulations to identify a minimum standard</li> <li>• Refer to any existing industry-specific standards (NOTE: these may or may not be law)</li> <li>• Refer to manufacturer’s specifications or technical manuals when incidents involve machinery</li> <li>• Refer to workplace records to determine if the issue or incident has happened before (look for workplace statistics, staff/supervisor comments, workplace inspection reports, incident reports, etc.)</li> </ul>

*continued*

continued from previous page

3. Review information for possible solutions	<ul style="list-style-type: none"><li>• Consider that there is often more than one solution</li><li>• Evaluate solutions to ensure they do not create additional hazards</li><li>• Prioritize the hazard and address how urgently the issue needs to be resolved</li><li>• Short-term recommendations are acceptable until longer term solutions are implemented</li><li>• Attain OH&amp;S committee consensus regarding solutions</li><li>• Set target dates for implementation</li></ul>
4. Make written recommendations to the employer	<ul style="list-style-type: none"><li>• State the date the hazard complaint was received by the OH&amp;S committee, worker health and safety representative, or workplace health and safety designate</li><li>• Identify the process by which the hazard was recognized (e.g., a workplace inspection)</li><li>• Provide any supporting information</li><li>• Set a target date for short and long-term recommendations, if needed</li><li>• Set time frames and responsibilities for follow-up</li><li>• Date, sign, and send recommendations to persons who have the authority to make changes</li></ul>
5. Follow-up and monitor that the issue has been resolved	<ul style="list-style-type: none"><li>• Delegate a person responsible for follow-up</li><li>• Ensure legislative requirements are met</li><li>• Provide progress reports to the OH&amp;S committee/worker health and safety representative/workplace health and safety designate</li><li>• Monitor the impact of temporary recommendations</li><li>• Document progress of the issue's resolution</li></ul>

**Figure 2-19** | The five step problem solving and decision-making process guides us in resolving occupational health and safety issues in a thorough and effective manner.

## QUICK CHECK

1. Create an organizer to capture the roles and duties of the OH&S committee, the worker health and safety representative, and the workplace health and safety designate?
2. Why is it important to have co-chairs on an OH&S committee?
3. Why is the terms of reference important?
4. What are five steps in the problem-solving and decision-making process to resolve OH&S issues?
5. Why is written documentation critical when it comes to OH&S?

 **SPREAD THE WORD**

Working in small groups, create a public awareness campaign to spread the word that health and safety in the school is everyone's responsibility. Your campaign should consist of three related messages.

1. Identify the media you will use. You might consider an audio campaign that can be played over the school's public address system, a poster series to be displayed throughout the school, or another social media strategy.
2. Determine your key messages and storyboard your campaign.
3. Present your plan to your teacher/administration for approval.
4. Complete your campaign.

 **WHAT WOULD YOU DO NOW?**

Review **What Would YOU Do?** at the beginning of the chapter (page 19). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

How does OH&S legislation apply within your school? What factors would be the same in other workplaces? What factors would be unique?

Work on your own or in small groups to complete the following task:

1. a) Obtain copies of the OH&S policy statement and OH&S program that applies to your school.  
b) Identify a local business or workplace of interest that is willing to share its OH&S policy and OH&S program. Obtain copies of the documents.  
c) Review the OH&S policy and OH&S program developed by the business or workplace.
2. Prepare a graphic organizer that outlines the similarities and differences between your school and the business or workplace you have identified. Explain why these similarities and differences might exist.

 **DIG DEEPER**

Identify a health and safety organization related to an industry of interest to you. Research to create a profile of the organization including:

- its purpose or mandate
- how and why it got started
- three key strategies it uses to promote or support OH&S

# WorkplaceNL

Unless they have experienced a work-related injury, most people know very little about what happens if a person is injured at work. Did you know that the Workplace Health, Safety and Compensation Commission (WorkplaceNL) provides benefits to workers who are injured as the result of a work-related injury?

This chapter provides a general overview of the workers' compensation system, the responsibilities of employers and injured workers, and the services and benefits provided to employers and injured workers.

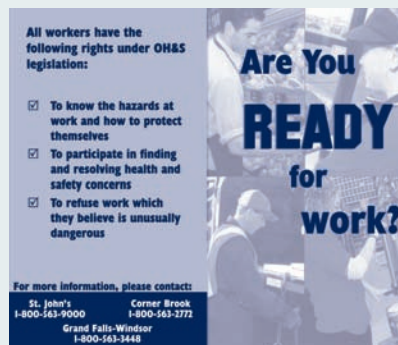
## LEARNING GOALS

This chapter will enable you to:

- describe the role of WorkplaceNL
- explain the responsibilities of employers and workers if an injury occurs
- explain the importance of the early and safe return-to-work (ESRTW) process

## SPREAD THE WORD

WorkplaceNL provides valuable resources to students. One such resource includes the “Are You READY for Work?” checklist that helps students and young workers become well-informed about occupational health and safety in their workplace. Visit the WorkplaceNL website to browse additional materials relevant to young workers.



**Figure 3-1** Where on the WorkplaceNL website can you locate a copy of the “Are You READY for Work?” card?

## WHAT WOULD YOU DO?

Jason is a lifeguard and enjoys his work at the local pool. Every week he teaches classes, supervises public swims, and takes his turn in the lifeguards' office.

Yesterday his supervisor called him at home to say that the water quality technician, who does all the testing and mixing of chemicals for the pool, would be off sick for two weeks. She tells Jason that the lifeguards will have to help out with this, or the pool will be closed. Jason doesn't want this to happen and the next day he finds himself in the tiny chemical shed with an instruction binder that he doesn't understand.

Jason calls another lifeguard who, over the phone, talks him through how to mix the chemicals. While completing the process, Jason spills a small amount of one chemical on his arm. It stings a little and turns red but doesn't seem too bad. He covers it with a bandage and continues with his shift.

**What would YOU do?**



**Figure 3-2** | What health and safety hazards might be associated with work as a lifeguard?

## CHAPTER CHALLENGE PREVIEW

The role of WorkplaceNL is not limited to workers who have finished school and entered the workplace on a permanent basis. As you read this chapter, make particular note of how the role of WorkplaceNL can assist you as a student preparing for a full-time or part-time job.

Consider the following questions as you read:

1. Are you covered, as a student, under workplace health and safety legislation?
2. What WorkplaceNL benefits exist for students?
3. What are your obligations as a student worker in regard to workplace health and safety?



## What is WorkplaceNL?

WorkplaceNL administers the *Workplace Health, Safety and Compensation Act (WHSC Act)* and Regulations. It serves over 19 000 employers and approximately 13 000 injured workers annually.



**Figure 3-3** | WorkplaceNL develops and promotes social marketing campaigns designed to educate Newfoundlanders and Labradorians about workplace health and safety and focus on how to avoid injuries. View these campaigns on the WorkplaceNL website.

### WHAT IS THE ROLE OF WORKPLACENL?

WorkplaceNL provides services and benefits to employers, injured workers, and their dependents. It supports workers in their medical recovery and return to work. It also promotes occupational health and safety (OH&S) in order to prevent and reduce workplace injuries and occupational disease. WorkplaceNL's Prevention Services Department works to foster commitment to workplace health and safety among employers and workers at the workplace.

The workers' compensation system is a '**no fault**' system. This means that workers injured in the course of their employment get compensation benefits whether or not they are at fault, or whether or not their employer is at fault. It is fully funded by the employers of the province. In return for these benefits and services, workers are unable to sue employers for work-related injuries.

### WHO IS COVERED UNDER THE WHSC ACT?

All incorporated and limited companies must register with WorkplaceNL. Coverage is mandatory for all workers, including the owner, directors, or managers of an incorporated company—even if the owner or director is the only worker.

Some companies are set up as proprietorships or partnerships. This is where one or more people operate a company in their own personal names. In these situations, the workers (employees) of the companies have coverage but the owners (proprietors or partners) are not automatically covered under the *WHSC Act*. Proprietors and partners can purchase Optional Personal Coverage if they want to be covered under the *WHSC Act*.

All other employers who perform work in the province and have one or more workers must register with WorkplaceNL. In all cases workers, whether full-time, part-time, or casual work, are covered under the *WHSC Act*. This means most employers and injured workers in this province are covered under the *WHSC Act*.

There are three groups of workers not covered under the *WHSC Act*:

- persons employed in construction or renovation of a private residence, where the residence is or shall be used as a private residence of that person
- persons employed in a function in a private residence
- professional sports competitors

The *WHSC Act* has provisions for covering students; however, not all students are covered. Students are covered under the *WHSC Act*:

- if an employer is directly paying them to work
- if students are not being paid but are on a work-term from Memorial University, or any of the regional government colleges (e.g., College of the North Atlantic, Centre for Nursing Studies; Eastern Health, or Western Health)
- if students are not being paid but are part of a high school work-term program authorized by the school
- if employers are hiring students and the funding is coming from a federal or provincial program in the list of programs under “blanket” coverage

Students are not covered by the *WHSC Act* if they are on an unpaid work-term from a private educational institution within the province or an out-of-province educational institution. In this case, a civil action through the courts may be possible in the event of a workplace injury.



**Figure 3-4** | If you hold a full- or part-time job, how can you find out more about your coverage under the *WHSC Act*? Identify at least two sources of information.

## BENEFITS AND SERVICES AVAILABLE TO INJURED WORKERS

There are benefits and services available to injured workers to aid in their recovery, and support their safe and early return to work.

1. Health care	WorkplaceNL pays reasonable health care expenses related to a workplace injury. These include physician fees, chiropractic fees, hospital costs, prescription drugs, physiotherapy, and occupational therapy. Also included are health care supplies and adaptive aids such as crutches and heating pads.
2. Wage-loss benefits	<p>If WorkplaceNL accepts a claim for wage-loss benefits, compensation usually starts the day after the injury. The employer is required to pay full wages for the day of the injury.</p> <p>WorkplaceNL pays wage-loss benefits while a worker is off work for the compensable (work-related) injury and receiving medical treatment and/or participating in a return-to-work or labour market re-entry program. Wage-loss benefits are equal to 80% of the worker's net earnings. (Gross less probable Employment Insurance, Canada Pension Plan, and federal and provincial tax credits.)</p> <p>If the worker refuses treatment recommended by the doctor, delays treatment, or fails to participate in a return-to-work or labour market re-entry program without good reason, WorkplaceNL may interrupt or stop benefits.</p>
3. Early and Safe Return to Work (ESRTW)	<p>All employers and workers are obligated under the <i>WHSC Act</i> to co-operate in the worker's early and safe return to suitable and available employment with the injured worker's employer.</p> <p>The employer must pay the worker for work performed during these programs and WorkplaceNL pays the difference, up to the compensation rate.</p> <p>The programs assist workplace parties during return-to-work planning. Such planning may include one or more of the following:</p> <ul style="list-style-type: none"><li>• <b>Accommodation</b> is any change or adaptation to the work, hours of work, work duties, or workplace, and includes the provision of equipment or assistive devices.</li><li>• <b>Alternate duties</b> are non pre-injury duties within the worker's functional abilities.</li><li>• <b>Alternative work</b> is a different job or bundle of duties (not the pre-injury job or duties) that is suitable and provided to accommodate a worker who has temporary or permanent functional restrictions as a result of the injury.</li><li>• <b>Assistive devices</b> include aids and attachments specifically designed for the worker and/or required by the worker to perform job-related activities.</li><li>• <b>Ease back</b> is a gradual return to pre-injury hours of work achieved by increasing the number of hours worked over a defined time-frame agreed upon by the workplace parties based on the functional abilities information relating to the worker. While the pre-injury hours of work vary, the pre-injury duties are the same.</li><li>• <b>Modifications</b> are changes to job schedule, equipment, organization of work, and/or facilities.</li><li>• <b>Modified work</b> occurs when the duties of the pre-injury job are changed to accommodate the worker's functional restrictions as a result of the injury. Modified work includes altering or removing some duties while the worker is still primarily in his or her pre-injury position.</li></ul>

4. Labour market re-entry (LMR)	<ul style="list-style-type: none"> <li>In cases where the employer is unable to accommodate an injured worker or has been found to be non-cooperative in the early and safe return-to-work process, or where the nature of the injury limits the worker's return to suitable employment with the pre-injury employer, WorkplaceNL will consider a labour market re-entry assessment and plan. If a labour market re-entry plan is required, it may include academic upgrading, formal training, on the job training, or employment readiness.</li> </ul>
5. Dependency benefits	<ul style="list-style-type: none"> <li>If a worker dies as a result of a work-related injury or disease, there are benefits for the surviving spouse and children. These benefits may include a lump-sum award and monthly benefits. The amount, type, and length of time when benefits are paid varies.</li> </ul>

**Figure 3-5** Benefits available through WorkplaceNL. Why are both financial and non-financial benefits important to employers and workers?

## QUICK CHECK

1. What is the purpose of the workers' compensation system?
2. Who funds the workers' compensation system in Newfoundland and Labrador?
3. Who is not covered by the *WHSC Act*? Why might this be the case?

## What Happens if You Are Injured While Working?

A **work-related injury** is one that happens while you are on the job or is related to the job that you do. If you are injured, it is important that you follow the process in Figure 3-6 and report your injury as soon as possible.



**Figure 3-6** Why is it important to report your injury as soon as possible after it occurs?

## CEO Safety Charter—Leaders in Safety

In 2007, WorkplaceNL introduced the CEO Safety Charter to support the continuous improvement of healthy and safe workplaces throughout our province. As ambassadors for safer workplaces, CEO Safety Charter signatories have demonstrated their commitment to the prevention of incidents and promotion of health and safety in the workplace.

CEO Safety Charter members subscribe to the principles of workplace health and safety by:

- integrating health and safety principles into their business strategies
- controlling workplace health and safety risks
- continuing to improve health and safety practices and disability management within their organization
- encouraging full health and safety participation of all workers
- fostering a province-wide health and safety culture through community involvement such as mentoring other organizations as they implement health and safety workplace practices, seeking opportunities for public speaking engagements to promote healthy and safe workplaces, developing best practice standards, and participating in leadership forums

CEO Safety Charter signatories represent businesses and organizations, including education, across the province. In the inaugural year, representatives from the Newfoundland and Labrador Department of Education and Holy Spirit High School became signatories.



**Figure 3-7** | Research to identify three recent signatories to the CEO Safety Charter.



## REPORTING AN INJURY—WORKERS

Injured workers must report an injury to WorkplaceNL using a “Worker’s Report of Injury” also known as Form 6. This form is available from the employer or union office, or from any WorkplaceNL office or website. It is important to complete the Form 6 completely and accurately, including the injured worker’s:

- full name
- complete mailing address
- date of birth
- MCP number
- social insurance number

If all information is not completed or is incorrect, it may cause delays in the processing of a claim.

The injured worker must complete the Form 6. If the worker cannot complete the form, a parent, spouse, relative or friend can help; or, contact WorkplaceNL for assistance. The completed Form 6 should be mailed or faxed to WorkplaceNL as soon as possible. If the Form 6 is not sent within three months of the injury, WorkplaceNL may not accept the claim.

If workers have questions regarding reporting a work-related injury, they can contact WorkplaceNL.



Your employer is responsible for paying reasonable travel costs for your initial visit and/or medical care.

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<b>Workplace Health, Safety &amp; Compensation Commission</b> Phone: (709) 778-1000   146 - 148 Forest Rd. Toll free: 1-800-563-9000   P.O. Box 9000 Fax: (709) 778-1302   St. John's, NL Toll free fax: 1-800-276-5257   A1A 3B8		<b>Worker's Report of Injury</b>	<span style="font-size: 2em; font-weight: bold; margin-left: 10px;">6</span>										
This information is collected under the authority of the <i>Workplace Health, Safety and Compensation Act</i> to determine entitlement to benefits and manage your claim.													
<b>SECTION A - GENERAL INFORMATION</b>													
WORKER	1 Last name		First name	Initial	Date of birth	yyyy/mm/dd	Gender	<input type="checkbox"/> M	<input type="checkbox"/> F				
	Mailing address						City / Town	Province	Postal code				
	Home telephone		Work telephone		Social Insurance Number		MCP						
EMPLOYER	2 Occupation		Are you the owner / operator of this business?		<input type="checkbox"/> Yes	<input type="checkbox"/> No	Were you employed as part of a HRSDC program?		<input type="checkbox"/> Yes	<input type="checkbox"/> No			
	3 Employer		Mailing address				City / Town	Street address / if different		City / Town			
	Province	Postal code	Supervisor's name			Supervisor's telephone							
<b>SECTION B - INJURY / INCIDENT INFORMATION</b>													
4 Date / time of injury / incident				yyyy/mm/dd	hh:mm	<input type="checkbox"/> AM	<input type="checkbox"/> PM	Did this injury develop over time without a specific injury / incident?		<input type="checkbox"/> Yes	<input type="checkbox"/> No		
								Date / time injury / incident was reported to employer:		yyyy/mm/dd	hh:mm	<input type="checkbox"/> AM	<input type="checkbox"/> PM
5 Did this injury / incident occur outside Newfoundland and Labrador? <input type="checkbox"/> Yes <input type="checkbox"/> No													
6 To whom was the injury / incident first reported?		Last name		First name		Occupation		Telephone					
7 What part(s) of your body was affected? Indicate right, centre or left, if applicable.													
8 How did the injury / incident occur or the condition develop?													
9 Did the injury / incident happen on the employer's property or worksite? <input type="checkbox"/> Yes <input type="checkbox"/> No Specify where:													
10 Were there any witnesses to this injury / incident? <input type="checkbox"/> Yes If yes, please specify name and contact information, if available. <input type="checkbox"/> No													
		Last name		First name		Address		Work telephone		Home telephone			
1.													
2.													
11 Was the injury / incident caused by anything listed at right? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, tick applicable: <input type="checkbox"/> Motor vehicle accident (e.g., forklift, car, truck, ATV) <input type="checkbox"/> Malfunction of product / equipment <input type="checkbox"/> Other: <input type="checkbox"/> Person(s) not employed by your employer <input type="checkbox"/> Slip and fall													
If yes to Question 11, was someone else involved? <input type="checkbox"/> Yes If yes, please specify name and contact information, if available. <input type="checkbox"/> No													
		Last name		First name		Address		Work telephone		Home telephone			
1.													
2.													
<b>SECTION C - MEDICAL INFORMATION</b>													
12 Did you seek medical attention? <input type="checkbox"/> Yes <input type="checkbox"/> No		Date of visit		yyyy/mm/dd		Were you seen in emergency? <input type="checkbox"/> Yes <input type="checkbox"/> No		Did you require hospitalization for more than two days? <input type="checkbox"/> Yes <input type="checkbox"/> No					
13 Name the health care person you saw during this first visit:		Last name		First name		Address if known							
14 Name your family physician:		Last name		First name		Address if known							
15 Have you experienced similar problems in the past? <input type="checkbox"/> Yes If yes, explain in chart below. If related to a previous claim, record the number. <input type="checkbox"/> No													
Similar problems		Year		Part of body		Location if applicable			WHSCC claim number				
1.						<input type="checkbox"/> Right <input type="checkbox"/> Centre <input type="checkbox"/> Left							
2.						<input type="checkbox"/> Right <input type="checkbox"/> Centre <input type="checkbox"/> Left							
3.						<input type="checkbox"/> Right <input type="checkbox"/> Centre <input type="checkbox"/> Left							

**Figure 3-8** Research the complete version of the Form 6, available on the WorkplaceNL website, to determine the additional information that must be included in a worker’s injury report.



A worker cannot be fired for reporting a work-related injury. In fact, if workers require medical care or time off work due to a work-related injury, they are required to report this to WorkplaceNL.

## REPORTING AN INJURY—EMPLOYERS

Employers have their own process for reporting an injury to WorkplaceNL. It is important for employers to report a worker's injury quickly. Employers must notify WorkplaceNL within three days of every injury disabling a worker or requiring medical, surgical, or dental aid.

The Employer's Report of Injury—the Form 7 must be completed and mailed, faxed or submitted via the Internet to WorkplaceNL. If the employer does not notify WorkplaceNL within three days of the injury,

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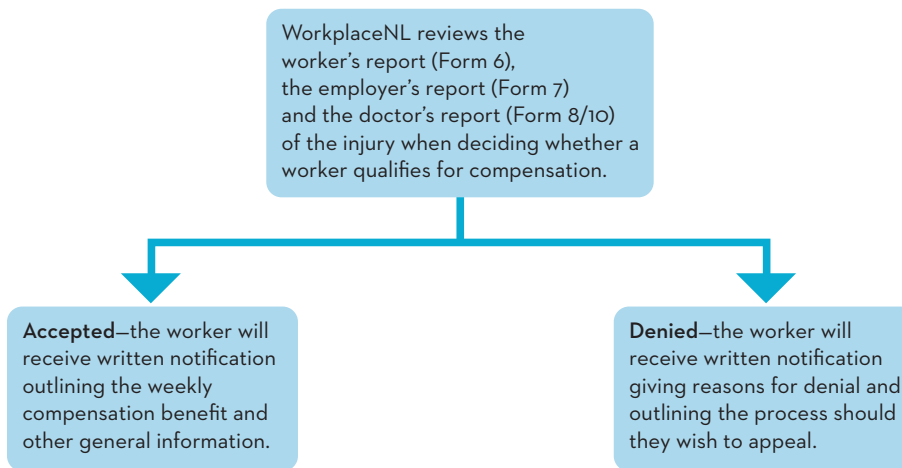
Workplace Health, Safety & Compensation Commission Phone: (709) 778-1000   146 - 148 Forest Rd. Toll free: 1-800-563-9000   P.O. Box 9000 Fax: (709) 778-1302   St. John's, NL Toll free fax: 1-800-276-5257   A1A 3B8		<b>Employer's Report of Injury</b>		7
This information is collected under the authority of the Workplace Health, Safety and Compensation Act to determine entitlement to benefits and manage your claim. <span style="float: right;">This form must be filed within three days of injury / incident.</span>				
<b>SECTION A - GENERAL INFORMATION</b> <span style="float: right;">WHSCC firm # _____</span>				
EMPLOYER	1 Trade name _____ Legal name <i>if different from trade name</i> _____		Mailing address _____ City / Town _____ Province _____ Postal code _____	
	Street address <i>if different</i> _____ City / Town _____		Site name _____ Site # _____ Site location _____	
	2 Contacts _____ Name _____ Telephone _____ Fax _____ E-mail _____		For wage information _____ For details of injury _____ For disability, return to work _____	
WORKER	3 Worker's last name _____ First name _____ Initial _____ Date of birth <i>yyyy/mm/dd</i> _____		Gender <input type="checkbox"/> M <input type="checkbox"/> F	
	Mailing address _____ City / Town _____ Province _____ Postal code _____		Home telephone _____ Work telephone _____ Social Insurance Number _____	
	4 Do you regularly employ 20 or more workers? <input type="checkbox"/> Yes <input type="checkbox"/> No		Is the worker an owner / operator of this business? <input type="checkbox"/> Yes <input type="checkbox"/> No	
How long has this worker been in your employ? <input type="checkbox"/> less than 12 months <input type="checkbox"/> more than 12 months		What date was the worker initially hired? <i>yyyy/mm/dd</i> _____		
Is the worker employed as part of a HRSDC Program? <input type="checkbox"/> Yes <input type="checkbox"/> No		Employment status: <input type="checkbox"/> Full-time <input type="checkbox"/> Part-time <input type="checkbox"/> Contractual <input type="checkbox"/> Seasonal <input type="checkbox"/> Casual		What are the lifting requirements of this occupation? <input type="checkbox"/> < 11 lbs <input type="checkbox"/> 11-21 lbs <input type="checkbox"/> 22-44 lbs <input type="checkbox"/> > 44 lbs
5 What occupation was the worker performing at the time of the injury / incident? _____				
<b>SECTION B - INJURY / INCIDENT INFORMATION</b>				
6 Date / time of injury / incident <i>yyyy/mm/dd</i> _____ <i>hh:mm</i> _____ <input type="checkbox"/> AM <input type="checkbox"/> PM		Did this injury develop over time without a specific injury / incident? <input type="checkbox"/> Yes <input type="checkbox"/> No		Date/time injury/incident was reported to employer: <i>yyyy/mm/dd</i> _____ <i>hh:mm</i> _____ <input type="checkbox"/> AM <input type="checkbox"/> PM
7 Did this injury / incident occur outside Newfoundland and Labrador? <input type="checkbox"/> Yes <input type="checkbox"/> No				
8 To whom was the injury / incident first reported? Last name _____ First name _____ Occupation _____ Telephone _____		9 What part(s) of the worker's body was affected? _____ Did the worker seek medical attention? <input type="checkbox"/> Yes <input type="checkbox"/> No Did the worker require hospitalization for more than two days? <input type="checkbox"/> Yes <input type="checkbox"/> No		
10 Was the work / activity being done for the purpose of the employer's business? <input type="checkbox"/> Yes <input type="checkbox"/> No If no, what was the purpose? _____		Did the injury / incident happen on the employer's property or worksite? <input type="checkbox"/> Yes <input type="checkbox"/> No Specify where: _____		
11 Describe your understanding of how the injury / incident occurred or condition developed: _____				
12 Was the injury / incident caused by anything listed at right? <input type="checkbox"/> Yes <input type="checkbox"/> No <i>If yes, tick applicable:</i> <input type="checkbox"/> Motor vehicle accident (e.g., forklift, car, truck, ATV) <input type="checkbox"/> Malfunction of product / equipment <input type="checkbox"/> Other: _____ <input type="checkbox"/> Person(s) not employed by the employer <input type="checkbox"/> Slip and fall				
If yes to Question 12, was someone else involved? <input type="checkbox"/> Yes <i>If yes, please specify name and contact information, if available.</i> <input type="checkbox"/> No				
Last name _____ First name _____ Address _____ Work telephone _____ Home telephone _____		_____		
<b>SECTION C - INJURY / INCIDENT NOTIFICATION</b>				
13 Has your occupational health and safety committee and / or representative / designate been notified of the incident / condition? <input type="checkbox"/> Yes <input type="checkbox"/> No				
14 Do you have any objections to this claim? <input type="checkbox"/> Yes <input type="checkbox"/> No <i>If yes, please use an additional sheet to explain your objections. Further to Section 63 of the WHSC Act, you must provide a copy of your objections to the Commission within 10 days of the claim being reported to you. Also, you must provide the worker with a copy of your objections.</i>				

**Figure 3-9** Why do you think the worker and employer must both submit a form?

there is a “late reporting” financial penalty. If the employer fails to notify WorkplaceNL at all, there is another financial penalty.

## WHAT HAPPENS WHEN A REPORT REACHES WORKPLACENL?

Once a report is filed, WorkplaceNL reviews the information and determines if the injury is work-related and whether a worker qualifies for compensation (See Figure 3-10.) Once claims have been accepted, employers and workers have obligations under the Early and Safe Return-to-Work (ESRTW) Process (See Figure 3-11).



**Figure 3-10** | WorkplaceNL decides whether a worker is entitled to compensation for his or her injuries.

## QUICK CHECK

1. How do you report an injury to your employer?
2. Why would employers face financial penalties for not reporting injuries?
3. What is the purpose of WorkplaceNL evaluating a claim?

## Early and Safe Return-to-Work

WorkplaceNL provides return-to-work services and programs to injured workers. The goal of the early and safe return-to-work process (ESRTW) is to safely return workers to employment, or employability that is comparable to their pre-injury level, as soon as possible. With effective return-to-work planning, the human and financial costs associated with workplace injuries are significantly reduced.

### THE ESRTW PROCESS

Injured workers are expected to actively participate in their own recovery. They may be assigned a case manager who is the main contact at WorkplaceNL. The case manager will help direct appropriate medical treatment and assist in the ESRTW process. Workers should ask questions of the case manager to ensure they understand the process and programs involved.

<b>Workers' Obligation in the ESRTW Process</b>	<b>Employers' Obligation in the ESRTW Process</b>
<ul style="list-style-type: none"><li>• Contact the employer as soon as possible after the injury occurs</li><li>• Maintain effective communication throughout the period of recovery or impairment</li><li>• Assist the employer, as may be required, to identify suitable and available employment</li><li>• Accept suitable employment when identified</li><li>• Give WorkplaceNL any information requested concerning the return-to-work</li></ul> <p>Note: If a worker fails to demonstrate co-operation and does not have a legitimate reason for not co-operating, the worker's benefits may be reduced, suspended, or terminated, as determined appropriate by WorkplaceNL.</p>	<ul style="list-style-type: none"><li>• Contact the worker as soon as possible after the injury occurs</li><li>• Maintain communication throughout the period of the worker's recovery or impairment</li><li>• Provide suitable and available employment</li><li>• Provide WorkplaceNL with any information requested concerning the worker's return-to-work</li><li>• Provide WorkplaceNL with an ESRTW plan</li></ul> <p>Note: Employers who do not meet their co-operation obligations in the ESRTW process will be subject to direct financial penalties.</p>

**Figure 3-11** Why do you think it is important for both employers and workers to have obligations within the early and safe return-to-work process?

## ADDITIONAL SUPPORTS FOR WORKERS AND EMPLOYERS

### Workers' Advisors

**Workers' advisors** are funded by WorkplaceNL to assist, free of charge, any workers on any matters related to workers' compensation. The workers' advisors provide general information about the workers' compensation system and help workers interpret the legislation and prepare for appeals. They can also coordinate between the injured worker and WorkplaceNL and between the injured worker and the Workplace Health, Safety and Compensation Review Division (WHSCRD).

Workers' advisors may be contacted through the Newfoundland and Labrador Federation of Labour. Offices are located in St. John's and Grand Falls-Windsor.

### Employers' Advisors

Two **employers' advisors** operate out of the office of the Newfoundland and Labrador Employers' Council and are available to provide independent assistance and advice, free of charge, to employers on appropriate legislation, policies, prevention, and related matters.

## WorkplaceNL Frequently Asked Questions (FAQs)

### 1. Can an injured worker have a decision reviewed?

Staff at WorkplaceNL make decisions every day to determine workers' entitlement to benefits and services. Workers dissatisfied with a decision may request a review of the decision to the Internal Review Division of WorkplaceNL. This request must be filed, in writing, within 30 days from the date they receive the decision. Workers must clearly state the decision they are appealing and the reasons they disagree. If the reason for the appeal is unclear, it may cause delays in the review.

This final decision is always in writing and will be provided within 45 days from the date the request is received by WorkplaceNL.

### 2. Can a decision be reviewed after WorkplaceNL has made its final decision?

The internal review decision is the final decision of WorkplaceNL. However, a decision can be reviewed by the Workplace Health, Safety and Compensation Review Division (WHSCRD), which is an external body independent of WorkplaceNL. The request for external review must be filed within 30 days from the date of receipt of WorkplaceNL's final decision.



## WorkplaceNL Frequently Asked Questions (FAQs)... continued

### **3. Will an injured worker receive compensation benefits if the injury was his/her fault?**

Workers' compensation is a no fault insurance system. This means that workers are eligible for benefits for work-related injuries regardless of who is at fault. However, if an injury is caused by a worker's deliberate and improper behaviour, benefits may not be payable.

### **4. What if an injured worker is cleared to go back to their job but the employer will not take them back?**

The employer is required to offer the injured worker re-employment if the following conditions are met: the employer regularly employs 20 or more workers; the worker has worked with that employer for one year prior to the injury; the worker is medically able to perform the essential duties of the pre-injury employment, or to perform suitable work (if available).

If it is determined that the employer is not complying with his/her re-employment obligation, WorkplaceNL may levy a penalty to the employer.

### **5. What if an injured worker has difficulty or a disagreement with his or her employer about early and safe return-to-work?**

ESRTW facilitators are available at WorkplaceNL to assist with any ESRTW issues if there is any difficulty or disagreement regarding ESRTW.

## QUICK CHECK

1. Explain the importance of an ESRTW process?
2. What are the obligations of employers and workers regarding ESRTW?
3. What are the penalties for non-cooperation regarding ESRTW for employers and workers?

 **SPREAD THE WORD**

After browsing the WorkplaceNL website, create a list of resources that would be of particular interest to student workers. Select an item of particular interest and share it with a partner including:

- what it is
- what you learned
- why you think it is useful or interesting

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** at the beginning of the chapter (page 39). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Create your own “Student Guide to WorkplaceNL” brochure or program. It can take the form of a print document or audio/video message but must be targeted toward a high school audience. Your brochure or program should include:

- how students are covered under WorkplaceNL
- what they should know about their rights and responsibilities in the workplace
- what they should do if injuries or health issues arise in the workplace
- sources of further information

 **DIG DEEPER**

Every year, WorkplaceNL sponsors a contest that enables you, as students, to make a radio ad or a safety video sharing your thoughts on workplace health and safety and injury prevention.

Locate the “Student Safety Video/Radio Ad Contest” on the WorkplaceNL website to learn more about it.

- Download the contest rules
- Review the samples of previous submissions

Individually, or as a team, complete YOUR entry!

# Careers in Occupational Health and Safety

A range of employment opportunities exist in the field of occupational health and safety (OH&S). Some careers involve working with people or processes. Others involve working with technology, communication, and design.

This chapter investigates where OH&S professionals may be employed. It explores their roles in different workplace environments and how they support workers in all professions. As you study the remaining units in this course, you will discover additional opportunities for careers in OH&S.

## LEARNING GOALS

This chapter will enable you to:

- explore specific OH&S professions including preparation necessary for entry into the profession
- investigate places where OH&S professionals may be employed
- understand how OH&S professionals can be of benefit to you as a workplace member

## SPREAD THE WORD

“Wanted—Occupational Health and Safety Professionals!”

OH&S is a growing profession with opportunities expanding as workplaces, workflows, and technologies evolve.

Use the Internet to locate three current job advertisements related to OH&S. Record the following information:

- job title
- job description
- job location
- training/  
prerequisites

Share your findings with the class.



## WHAT WOULD YOU DO?

Aryn works part-time for her uncle Dean who owns a rapidly expanding graphic design company. He has leased studio space in an old warehouse to accommodate eight additional graphic artists.

Her uncle selected a great, open concept space with large windows on all sides. It is bright and cheerful with light flowing in all directions. The hardwood floors have been recently painted. The work stations were left behind from the previous occupants—wooden tables with matching wooden chairs.

After only a few months working in the new space, Dean notices his staff requiring sick time, complaining of sore backs and headaches. He is concerned that the new office space is to blame and figures that he will likely have to move the business once again. Aryn isn't so sure.

**What would YOU do?**



**Figure 4-1** | How can too much light sometimes be a problem in an office environment?

## CHAPTER CHALLENGE PREVIEW

This chapter explores a sampling of careers in occupational health and safety and related fields.

1. With a partner, brainstorm a list of such careers.
2. Share your list with the rest of the class.
3. Group the class list into categories whether they involve working primarily with
  - people
  - processes
  - technology
  - communication
  - design



**Figure 4-2** | Some occupations you may discover in the future might not exist today! What hazards exist today that would not have been an issue even 20 years ago?

# Occupational Health and Safety Professionals

There is a growing need for trained occupational health and safety (OH&S) professionals in a wide range of work environments. Their presence is required to control exposure to hazards in occupational settings and to comply with and enforce government OH&S regulations.

These opportunities exist in:

- Manufacturing Plants
- Health Care Facilities
- Insurance Companies
- Transportation Industry
- Construction Firms
- Consulting Firms
- Educational Institutions
- Engineering and Design Firms
- Agricultural Operations
- Waste Management Facilities
- Government Agencies
- Utility Companies



## THINK ABOUT IT...

**What roles might OH&S professionals play in the environments listed above?**

### OH&S OFFICERS

OH&S officers employed by federal and provincial governments inspect a wide variety of workplaces (e.g., construction sites, offices, and mines). They may specialize in inspecting a particular type of workplace but, in general, officers:

- inspect workplaces to ensure equipment, materials, and production processes do not present a safety and health hazard
- investigate health and safety complaints
- enforce health and safety laws and regulations
- review and make decisions regarding situations where a worker has refused to work on the grounds that danger exists, or the work will cause danger to the worker
- provide advice regarding the development of safe and healthy practices
- encourage managers, supervisors and workers to participate in OH&S programs
- investigate workplace fatalities, serious injuries, and near misses

These duties require OH&S officers to have a thorough understanding of legislation relating to safety standards and the ability to advise corrective action and facilitate change to improve the health and safety culture of workplaces. Officers also must keep informed about changes in technology.

## Working Conditions

OH&S officers usually are responsible for a territory or specific industry. Considerable travel may be required. Working hours depend on the types of workplaces they inspect. Overtime may be required, particularly after an incident or a hazardous situation has been identified.

OH&S officers spend most of their time in the field where they may be exposed to potentially dangerous situations. Officers routinely are required to climb ladders, and work in dusty conditions. The rest of their time is spent in offices located at central or regional headquarters.

## Personal Characteristics

OH&S officers need the following characteristics:

- good communication skills, both in writing and in person
- mediation and conflict resolution skills
- the ability to manage multiple projects
- the ability to remain open-minded and objective
- good health and physical fitness
- good interpersonal skills



**Figure 4-3** Why are good interpersonal skills an asset in the role of an OH&S officer?

They should enjoy having clear rules and organized methods for their work, analyzing information, and acting as an advocate for workers.

## Educational Requirements

OH&S officers must have several years of related work experience. They also must have a bachelor's degree in science, engineering, or a related discipline, or a related post-secondary diploma.

The Board of Canadian Registered Safety Professionals offers the designation Canadian Registered Safety Professional (CRSP) to applicants who have been employed as safety professionals for at least three years and have successfully completed an evaluation, interview, and examination process.



## OH&S ADVISORS

OH&S advisors promote the health, safety, and well-being of workers and sustainability of workplaces by considering the following:

- health and safety concerns in the physical work environment
- health, safety, and well-being concerns related to the organization of work and the workplace culture
- personal health resources in the workplace
- ways to participate in the community to improve the health of workers, their families, and other community members

Specific duties vary considerably from one position to another. Depending on where they work, health and safety advisors may be managers or primarily responsible for implementing OH&S programs. However, in general, they:

- assess and evaluate work procedures and environments to identify potential hazards and eliminate them or ensure that adequate controls are in place
- advise managers, supervisors, and workers about safe work practices and OH&S standards and regulations
- recommend appropriate procedures and equipment for safety and compliance with relevant laws and regulations
- develop health and safety policies and programs
- instruct OH&S courses
- facilitate OH&S committees and programs
- promote safe work practices and injury and fatality prevention activities

- participate in incident investigations
- work with others on emergency response planning

These responsibilities may require that OH&S advisors:

- inspect machines to identify potential hazards, recommend risk reduction measures and supervise the installation of safety features or the introduction of safer procedures
- regularly inspect premises for fire hazards and adequate fire protection, and inspect fire fighting equipment
- investigate the causes of incidents and develop procedures, methods or devices to prevent similar occurrences in the future



**Figure 4-4** | Safety is the responsibility of the truck driver, his or her employer, and the dock workers where drivers load and unload their shipments.

OH&S advisors also may hire specialized consultants to:

- conduct noise level surveys
- conduct air quality sampling or water sampling
- complete ergonomic assessments
- identify harmful or hazardous dusts, vapours or gases, and advise management about corrective measures

In trucking companies, advisors inform truck and trailer drivers about traffic and safety regulations, loading and unloading policies, and proper care of equipment. They also investigate collisions and recommend measures to improve safety records and conserve equipment.

In mines, advisors ensure compliance with health and safety laws and regulations. They check supports, electrical and mechanical equipment, explosives storage, and air quality. They also instruct OH&S and first-aid courses and lead rescue activities.

In electrical utility companies, advisors instruct workers about safety measures, check equipment and tools, observe crews at work, examine tunnels and ditches, investigate incidents, and recommend preventative measures.

In some organizations, OH&S advisors have additional responsibilities related to workers compensation, environmental protection, risk management, or workers' security.

### Working Conditions

OH&S advisors work in offices and at production sites. In companies with many field work sites, considerable travel may be required to assist with implementing OH&S programs and monitoring compliance with company, industry, and government OH&S standards.

In addition to their regular work hours, OH&S advisors may be required to respond whenever safety-related incidents occur. OH&S precautions must be observed to reduce the risk of exposure to hazardous materials.

Physical requirements may include lifting, climbing to heights, or working in confined spaces.



**Figure 4-5** | How could an OH&S advisor assist a demolition company in dismantling an old chemical factory? What particular expertise might the company seek for this job?



**Figure 4-6** Why would a cruise line hire OH&S advisors? What might be the focus of their job onboard a ship?

### Personal Characteristics

OH&S advisors need the following characteristics:

- excellent oral and written communication skills
- excellent interpersonal skills
- the ability to lead and motivate workers and executives
- a willingness to do the reading required to keep up with new developments (e.g., in personal protective equipment, laws and regulations, research into links between worker illnesses and diseases and the materials to which they are exposed)

They should enjoy having clear rules and organized methods for their work, analyzing information, and advocating for workers.

### Educational Requirements

Employers generally prefer to hire people who have computer skills and a combination of relevant education and experience. Some positions require post-secondary education in OH&S or a related field (e.g., chemistry, engineering, medicine, microbiology, nursing, or physics). Other positions require journeyman certification or extensive work experience related to the employer's business (e.g., trucking, mining, electrical utilities).

Once hired, OH&S advisors may obtain additional training on the job or take related continuing education courses offered by post-secondary institutions and professional associations. Continuing education programs may be taken on an as needed basis.

## QUICK CHECK

1. Create a graphic organizer that demonstrates
  - a) how the roles of OH&S officers and OH&S advisors are similar
  - b) how the roles of OH&S officers and OH&S advisors are different
2. Would you consider yourself suited to either role? Why or why not?
3. Research the requirements necessary to obtain a CRSP® designation.

# Related Roles in Occupational Health and Safety

There is a wide range of specialty careers within, or that relate to, occupational health and safety (OH&S). Professionals in this area provide services related to the design of safe systems, processes, and equipment in the workplace as well as incident and disease prevention, and incident or disease treatment and management.

## INDUSTRIAL HYGIENIST

**Industrial hygienists** study and apply ways to protect the health of workers. These special studies enable them to:

- anticipate and recognize occupational health hazards
- understand their effect on humans and their well-being
- evaluate health hazards in terms of their ability to impair human health and cause occupational illnesses and diseases
- prescribe methods to eliminate, control, or reduce these hazards

Industrial hygienists often have a college or university degree in engineering, chemistry, physics, medicine, or related physical and biological science. These qualifications are then supplemented by special studies and training in industrial hygiene.

Topics covered in an industrial hygiene program might include:

- **epidemiology** (the study of how often and why diseases occur in different groups of people)
- industrial ventilation
- noise control
- air quality / indoor air quality
- environmental health
- radiation measurements and control / health physics
- laboratory safety
- hazardous waste management
- structured industrial hygiene internship

## SAFETY ENGINEER

**Safety engineering** utilizes a combination of engineering, physical, and behavioural sciences to reduce and eliminate losses due to workplace incidents and occupational disease.

The safety engineer's responsibility is to develop a system to prevent incidents and other harmful exposures and the personal injury, disease,



**Figure 4-7** Industrial hygienists sometimes require personal protective equipment to carry out their jobs. These workers are monitoring soil quality. What safety equipment can you identify in the image?



or property damage that may result. The safety engineer directs and/or develops the following initiatives:

- incident prevention activities
- workplace health and safety programs
- policies and procedures that comply with legislative codes and standards
- equipment purchasing
- health and safety inspections
- incident and occupational illness investigations
- record keeping and reporting of work related incidents, injuries, illnesses, and diseases
- worker education and training in health and safety issues
- job safety analysis

Safety engineers generally combine an undergraduate degree or diploma in science or engineering with advanced professional OH&S studies. Safety engineers also must work on a team that includes other specialists in quality assurance, regulatory compliance, and the law.

## OCCUPATIONAL PHYSICIAN

Occupational medicine is a subspecialty of preventive medicine. An **occupational physician** is concerned with:

- the assessment, maintenance, restoration, and improvement of workers' health through preventive medicine, emergency medical care, rehabilitation, and environmental medicine
- the promotion of social, economic, and administrative needs and responsibilities of the worker
- a team approach to health and safety involving interaction between the physician, industrial hygienist, occupational health nurse, safety engineer, and other specialists

The occupational physician may be involved in:

- treating occupational injuries, illnesses, and diseases
- establishing worker health services
- planning for emergency care in the occupational setting
- providing health education and counselling
- performing pre-placement medical examinations (to determine individual's physical and emotional capacity to perform a particular job, to assess the individual's health, and to establish a baseline record of physical condition of the worker)

## “John Martin Introduces Occupational Health to Newfoundland and Labrador”

As a physician, John Martin didn't just treat a disease, but pursued its origins. This took him inside patients' bodies, and up and down their family trees. He entered their homes and their work environments. The latter might have been a fluorspar mine or a deep-ocean oil drilling rig.

“He really invented occupational health in the province,” said Edward Roberts, former Newfoundland and Labrador lieutenant-governor. In the late 1960s and early 70s Dr. Martin first took notice of the clusters of illnesses affecting the St. Lawrence miners, where silica dust was causing silicosis.

Mr. Roberts's own chief concern were the asbestos miners of Baie Verte, in his electoral district. But he and Dr. Martin could see they were dealing with similar cases. “Men were getting sick in St. Lawrence, but nobody would draw the conclusion between the [work] and the illness.”

The Baie Verte miners faced the same ignorance. They were told to stop smoking. “Industrial health was largely ignored here. It was in its infancy across the country. Dr. Martin got people to pay attention. He took on these vested interests.

But the mining companies—the St. Lawrence Corporation of Newfoundland when the mines first opened in 1933, later the Newfoundland Fluorspar Co. and, in the 1960s, Alcan—would not or could not see the connection between the work and the sickness. Dr. Martin helped track and validate those links.



**Figure 4-8** | Dr. Martin received the Occupational and Environmental Medical Association of Canada's Meritorious Service Award in 1996. During his career he wrote two books related to occupational health and safety issues.

Adapted from an article by Joan Sullivan, Special to the *Globe and Mail*, May 22, 2013.



## OCCUPATIONAL HEALTH NURSE

**Occupational health nurses** provide care to workers with the goal of preventing work-related injury and illness, preventing disability, and helping workers achieve the highest level of wellness throughout their lives. By focusing on the work site, an occupational health nurse delivers high quality care from a prevention-based perspective.

The occupational health nurse is generally the primary health care provider on-site in an occupational setting and is a key stakeholder in a comprehensive OH&S program. The occupational health nurse uses a team approach to prevent work-related injury and illness through knowledge of the work processes and potential hazards in the workplace.



**Figure 4-9** | The Association of Occupational Health Nurses of NL (AOHNNL) was founded in 1981 by a group of 12 nurses interested in Occupational Health. The AOHNNL now has active members and associates from all over Newfoundland and Labrador.

Certification in Occupational Health Nursing is available through the Canadian Nurses Association. It usually involves a nursing degree or diploma combined with practical experience in the field.

## OCCUPATIONAL THERAPIST

An **occupational therapist** is a health professional who works with people of all ages and conditions to help them develop, restore, or maintain skills and abilities. Occupational therapists help individuals to adapt to environments and they also adapt environments to individuals.

The work of an occupational therapist focuses on decreasing the impact of disability and enhancing quality of life.

Occupational therapists perform a variety of functions related to health and safety in the workplace, including:

- ergonomic assessments of occupational settings and processes
- recommendations for modification of work sites
- functional capacity evaluations to determine an individual's physical capabilities for a job
- job site analysis to determine the physical demands of different jobs in a workplace
- pre-placement job screening

Occupational therapists require a university degree and must complete a minimum of 1 000 hours of supervised fieldwork experience (on-the-job training).

## KINESIOLOGIST

**Kinesiology** is the multi-disciplinary approach to the study of human movement. A **kinesiologist** understands how the body functions as a complex living system and how it interacts with its environment. Kinesiology students would study such topics as ergonomics, fitness and wellness, or coaching sciences.

Kinesiologists work with a variety of workers, including office and industrial workers, outdoor workers, and elite athletes. They have a role in the prevention, management, and treatment of injuries.

Kinesiologists perform a variety of functions similar to other health professionals including the following:

- ergonomic assessments of workplaces/workstations
- functional capacity evaluations to determine a person's physical ability to perform a job
- job site and physical demands analysis to determine the specific tasks required to perform a job
- rehabilitation programs to assist persons in strengthening themselves so they are able to return to a job

To become a certified kinesiologist in Newfoundland and Labrador requires a Bachelor of Science degree in Kinesiology or Human Kinetics.



**Figure 4-10** | Why do you think the therapist is considering this particular piece of equipment as part of a therapy program for an injured transport driver?

## Not Your Typical Kinesiology Experience

Kinesiology may not be the first thing that comes to mind when you think about oceans, but they are more connected than they seem.

What about working conditions for offshore workers—do the accommodations work for offshore workers who are at sea for weeks? What about health and safety procedures? Is the safety equipment in good working order? Kinesiology masters students, Nicole Bishop and Katie Aylward, interned with the American Bureau of Shipping (ABS) in Houston, Texas for several months answering these questions.

ABS is an international classification society devoted to promoting the security of life, property, and the marine environment through the development and verification of standards for the design, construction, and operational maintenance of marine-related facilities.

“Many people assume that pursuing a degree in kinesiology means continuing on to work in health care, however, that’s not the case anymore,” says Ms. Bishop. “The Memorial kinesiology program is rapidly expanding and the opportunities are endless if you just do a little searching to see what’s out there.”

Ms. Bishop worked with the Safety and Human Factors Department on projects looking at the accommodations area criteria for sea-going vessels to determine the appropriate criteria for lighting, vibration, noise, and air quality. Ms. Aylward worked on guides and guidance notes that provide rules and regulations to owners and operators of ABS classed vessels as well as calculating statistics on the number of incidents, accidents and fatalities that have occurred within the company worldwide (more than 5 000 employees working from over 70 countries).

“I personally like how the industry is always evolving,” notes Ms. Bishop. “Research is consistently being performed to improve safety for employees, to protect the environment, and to refine and develop state-of-the-art technology and equipment.”

Sept 18th, 2014  
School of Human Kinetics and Recreation  
Memorial University



**Figure 4-11** | Among their internship responsibilities, Nicole Bishop and Katie Aylward worked together to test the latest safety equipment for ABS surveyors such as cooling vests, ear and eye protection, and other personal protective equipment.

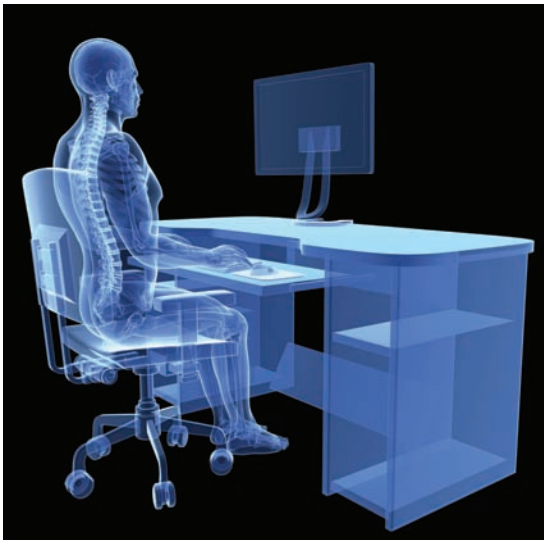
## ERGONOMIST

Ergonomics is a science dedicated to fitting the job to the worker rather than fitting the worker to the task. The goal of ergonomics is to optimize or improve the interaction between people and their work.

An **ergonomist** uses information about people, for example, their size, their ability to handle information and make decisions, their ability to see and hear, and their ability to work in extremes of temperature.

An ergonomist studies the way that these things vary in a group of people. With this information, the ergonomist works with designers and engineers to ensure that a product or service will be able to be used comfortably, efficiently, and safely.

An ergonomist can also assess existing products, services, and workplace designs, showing where they fail to ‘fit’ the user and suggest how this fit may be improved.



**Figure 4-12** | Where do you sit when you are doing your homework? Are you creating potential injury to your body by how and where you sit?

## QUICK CHECK

1. Create an organizer to record how each of the occupations in this section help prevent workplace injuries or occupational diseases.
2. Why must OH&S professionals be team players?
3. Identify three personal characteristics that are important for OH&S professionals.



## SPREAD THE WORD

Certification in areas related to health and safety has shown to be of benefit when young people are seeking employment, regardless of the job at hand. Why might this be the case?

First aid training and drivers' education programs are examples of training/certifications. Identify training/certification opportunities in your area.

- What are they?
- Who provides them?
- What is involved?



## WHAT WOULD YOU DO **NOW**?

Review the **What Would YOU Do?** at the beginning of the chapter (page 53). After reading this chapter, would your answer change? Why or why not?



## CHAPTER CHALLENGE

You have now explored a number of career possibilities available in the field of occupational health and safety. What additional careers from your brainstormed list may be of interest to you?

Select one career from within the chapter or from your list. Research to find out more about it. Contribute your findings to a class bulletin board (wall board or electronic) featuring OH&S careers.

Your individual presentation should include:

- the name of the occupation
- a brief description of the work
- at least one interesting fact related to the occupation
- the training or education required and where it can be completed



## DIG DEEPER

Research or interview a local person who is currently working in a field related to OH&S. Find out:

- what that person does
- how he/she got into that career
- what education is required
- what that person likes about his/her career and its challenges
- what personal characteristics would make someone suited for that career



## MY OH&S

It is time to start building your course portfolio. Remember, you are creating a personal OH&S resource to have available throughout your working life. It is up to you to identify, and keep at hand, the information to keep you healthy and safe throughout your career.

Your portfolio may take a number of forms. Examples might include:

- a print or electronic journal
- a video blog
- a series of pamphlets, brochures, or posters
- another format of your choice
- a web page

Whatever format you choose, your portfolio should reflect the following four elements:

### THE BIG IDEAS...

Select a minimum of five critical ideas that you have learned from the unit. To complete your list, consider the following: Why is it important? Why is it relevant to me?

### LEGALLY SPEAKING

Identify any significant information related to the law, your rights and your responsibilities that you might expect to encounter as a worker, supervisor, or employer.

### USEFUL RESOURCES

Create an annotated list of resources for future reference. Your list should include the name of the resource, why it was included, and where it can be located.

Remember, resources may include documents, brochures, videos, web pages, organizations, and people.

### CAREER POSSIBILITIES

Identify at least one potential career that might be of interest to you in the future. Record the following information:

- a brief description of that career
- any qualifications required
- what it is you find interesting about that career
- programs of study and their locations

Your career option may be selected from within the unit or from external sources.



# Occupational Health and Safety Systems and Processes

In Newfoundland and Labrador, we adhere to systems and processes that enable us to live and work together as community members. Examples include how we obtain a driver's license and drive following the rules of the road. Similarly there are systems and processes in place to keep us healthy and safe in our work environments.



What do you think is the intended message of this cartoon?

## UNIT AT A GLANCE

- CHAPTER 5** Hazard Recognition, Evaluation, and Control
- CHAPTER 6** Workplace Inspections
- CHAPTER 7** Incident Investigation
- CHAPTER 8** Emergency Preparedness and Response
- CHAPTER 9** Personal Protective Equipment

## LET'S GET STARTED

You are likely already familiar with occupational health and safety systems. Does your school conduct fire drills? How and where are chemicals stored in the science lab? How is waste managed in the school cafeteria?

1. As a class, brainstorm additional examples of occupational health and safety systems and processes within your school.
2. In your notebook or electronic journal, create a chart to capture five systems or processes, identify who/what each is meant to protect, and evaluate its effectiveness.
3. Create a cartoon or comic strip to illustrate the impact or effectiveness of one system or process.



Richard Duszczak is the cartoonist who created the unit opener cartoons used in this resource. How can humour be used as an effective tool to spread the message of occupational health and safety?

### My OH&S

This course is about you and your future in the workplace. As you complete unit two, keep in mind the following questions:

- What are the most important OH&S ideas for me to remember?
- What OH&S laws affect me?
- What OH&S resources could be useful to me now and in my future work life?
- What careers might be available in the area of OH&S?

# Hazard Recognition, Evaluation, and Control

The goal of an occupational health and safety (OH&S) program is to prevent incidents and occupational diseases. This means that health and safety is considered in all aspects of day-to-day operations.

People, equipment, materials, and the environment all play a role in the prevention of incidents, illnesses, and diseases. They can also be direct or indirect contributors to workplace incidents, illnesses, and diseases. The identification of hazards in the workplace, evaluating them for risk, and eliminating or controlling them are important first steps in the incident, illness, and disease prevention process.

## LEARNING GOALS

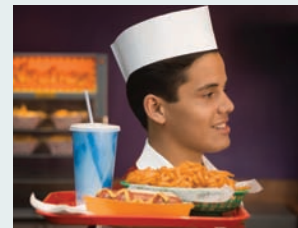
This chapter will enable you to:

- discuss why hazard recognition, evaluation, and control is a critical component of an OH&S program
- identify workplace roles and responsibilities in hazard recognition, evaluation, and control
- identify categories of hazards and provide examples within each category
- identify how people, equipment, materials, and the environment (PEME) contribute to hazards
- describe the process of hazard recognition and risk evaluation
- outline three categories of controls for workplace health and safety hazards

## SPREAD THE WORD

Every job presents hazards. Hazards related to the use of heavy machinery and chemicals are obvious. Other hazards such as uncomfortable workstations, unfavourable weather conditions, and repetitive movement may not be so obvious.

What jobs are commonly filled by young workers? With a partner, identify five youth-oriented jobs. Now brainstorm the hazards that might relate to those jobs.



**Figure 5-1** | What job-related hazards might be present for these workers?

## WHAT WOULD YOU DO?

Caleb recently started a work placement program in a small local shipyard. He takes pride in how his wood cuts fit into the restoration of old wooden boats. His coworkers also take pride in the results of their labour and he sees them as mentors in a trade he hopes to someday pursue.

On his first day, Caleb's supervisor showed him how to properly use an electrical mitre saw. A few days later, one of his co-workers watches him work. He says, "You know, you really don't need to bother using the safety guard. I don't and I've never had an issue." This guy seems to know what he's doing. He has worked there a long time and Caleb doesn't want to hurt his feelings.

**What would YOU do?**



**Figure 5-2** | What safety precautions is Caleb demonstrating in this image?

## CHAPTER CHALLENGE PREVIEW



Your school is a workplace as well as a learning environment. OH&S policies must consider not only workers (including teachers, administrative staff, and custodians) but students and community members.

In small groups, brainstorm the possible hazards at your school. Share with other groups to create a "top 10" list.

**Figure 5-3** | As you brainstorm, consider all areas of your school building.

## hazard

any condition, substance, practice, or behavior that has the potential to cause loss due to injury, illness, disease, or property damage

## risk assessment

evaluating the potential of something happening to workers, property, or the environment as the result of a workplace hazard

## hazard control

a process or action taken to remove hazards or minimize risk

# Hazard Recognition, Evaluation, and Control

**Hazard** recognition, evaluation, and control (REC) is the foundation for an effective OH&S program. In order to eliminate workplace hazards and minimize risk, there must be a process for recognizing them, evaluating the risk they pose, and selecting the best method to control them. A workplace hazard that has not been identified and controlled increases the potential for an incident.

## ROLES IN HAZARD RECOGNITION, EVALUATION, AND CONTROL

In keeping with the internal responsibility system all workplace parties have a role in hazard recognition, evaluation, and control. Hazard recognition and **risk assessment** should be a team effort. Members of this team should include:

- supervisors
- members of the OH&S committee/WH&S representatives/WH&S designates
- workers from the physical work area
- workers performing the task being assessed
- maintenance personnel
- human resources personnel

In some circumstances, people from external agencies may be consulted including governmental agencies responsible for occupational health and safety, suppliers, and manufacturers.

## THE FIVE STEP PROCESS IN HAZARD RECOGNITION, EVALUATION, AND CONTROL

The five step process outlines a series of steps to properly recognize, evaluate, and control hazards. The five steps are as follows:

Step 1—Hazard recognition

Step 2—Risk assessment

Step 3—**Hazard control** selection

Step 4—Implementation of controls

Step 5—Monitoring and evaluation

Everyone has a role to play in hazard REC. See Figure 5-4.

Employers	All Workers Including Managers and Supervisors	OH&S Committees
<p>Employers must ensure the health, safety, and welfare of workers.</p> <p>They must:</p> <ul style="list-style-type: none"> <li>• provide a system for hazard REC</li> <li>• provide the resources to carry out risk assessments</li> <li>• ensure hazard REC procedures are developed and followed</li> <li>• ensure all workers are provided with training to understand their roles</li> <li>• review hazard REC reports</li> <li>• ensure corrective action is implemented, monitored, evaluated, and communicated</li> <li>• review hazard REC procedures at least every three years</li> </ul>	<p>All workers must participate in risk assessments when requested.</p> <p>They must:</p> <ul style="list-style-type: none"> <li>• make suggestions for corrective actions to those conducting risk assessments</li> <li>• take part in training or the development of safe work practices and procedures required as the result of the risk assessments</li> </ul>	<p>OH&amp;S committees must co-operate with the employer in risk assessments.</p> <p>They must:</p> <ul style="list-style-type: none"> <li>• actively participate in risk assessments</li> <li>• review all risk assessment reports</li> <li>• make recommendations for corrective action to the employer</li> <li>• monitor implementation, follow-up, and evaluation of corrective actions</li> <li>• regularly monitor the effectiveness of risk assessments and make recommendations for improvement when appropriate</li> <li>• review hazard REC procedures</li> <li>• ensure ergonomic considerations are included in all risk assessments</li> </ul>

**Figure 5-4** | How are the roles of employers, workers, and OH&S Committees similar?

## QUICK CHECK

1. Why is a team approach critical to hazard REC?
2. Mnemonics are tricks to help us remember things. WorkplaceNL has used the word **SAFE** to remind us of our OH&S responsibilities:
  - S**pot the hazard
  - A**ssess the risk
  - F**ind a safer way
  - E**very day

Create a mnemonic to help you remember the five steps of the hazard REC process.
3. Why is it critical to complete all steps of the hazard REC process?



# Hazard Recognition

Hazards occur in the course of our daily life, both at home and in the workplace. Successful control of health and safety hazards in the workplace begins with identification of potentially harmful hazards that may result in injury or illness and/or property damage.



## THINK ABOUT IT...

What hazards might exist within your home environment?

### TYPES OF HAZARDS

Hazards are divided into two categories: health and safety. **Health hazards** may result in the development of disease or illness. **Safety hazards** may result in physical injury to workers.



**Figure 5-5** | Consider whether the six workplace situations above represents either a health hazard or a safety hazard. Explain your answer.

Type	Health Hazards	Safety Hazards
Definition	Exposures to chemical, biological, physical, and ergonomic hazards which may result in the development of disease or illness if uncontrolled	Workplace hazards that physically injure workers through the release of energy
Specific Examples	<ol style="list-style-type: none"> <li>1. Chemical <ul style="list-style-type: none"> <li>• solvents, gases, vapours, dusts, fumes, mists</li> </ul> </li> <li>2. Biological <ul style="list-style-type: none"> <li>• living organisms that can cause adverse health effects</li> <li>• viruses, blood borne pathogens, contaminated blood and other fluids, bacteria, fungi, mould, and parasites</li> </ul> </li> <li>3. Physical <ul style="list-style-type: none"> <li>• noise, temperature, ionizing/non-ionizing radiation, vibration, and pressure</li> </ul> </li> <li>4. Ergonomic <ul style="list-style-type: none"> <li>• fixed or awkward postures for prolonged periods, repetition</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>1. Energy hazards are introduced to workplaces through tools, equipment, and machinery that provide power for doing the work. Rotating or moving equipment that operate or move using one or more types of the following energy: <ul style="list-style-type: none"> <li>• electrical—energy is stored in electrical circuits</li> <li>• hydraulic—energy is stored within a pressurized liquid (e.g., power presses, braking systems)</li> <li>• chemical—energy is produced during chemical reactions</li> <li>• pneumatic—energy stored within pressurized air (e.g., power washers/sprayers, nail guns)</li> <li>• radiation—energy comes from electromagnetic sources (e.g., lasers, microwaves, X-rays, Ultraviolet (UV) rays)</li> <li>• gravitational—the weight of the object and the distance from the ground determines the amount of stored energy</li> <li>• mechanical—energy found in items that are under tension (e.g., coil or spring-loaded tools, equipment, and machinery)</li> </ul> </li> <li>2. Materials handling—related to the storage, movement, protection, and control of materials and products in an organization. Types can be manual or mechanical (e.g., hand carts, trolleys, powered pallet jacks, forklifts).</li> <li>3. Housekeeping—everything has a place and it is to be returned to that place to promote organization and proper storage. This helps to avoid incidents (e.g., slips, trips and falls).</li> <li>4. Work practice hazards—failing to develop or follow safe work procedures</li> </ol>

**Figure 5-6** | How might worker fatigue become a workplace hazard?

## WAYS TO IDENTIFY HAZARDS

A proper hazard recognition and risk evaluation process looks at the **People, Equipment, Materials, and the Environment (PEME)** in a workplace.

1. **People (P)**—employers, workers, supervisors, managers, contractors, visitors, suppliers, and the general public. Anyone may

introduce hazards to the workplace. People involved in the design of tools, equipment, and machinery can also be contributors to workplace hazards.

2. **Equipment (E)**—tools, equipment, machinery, vehicles, materials handling devices, and personal protective equipment.
3. **Materials (M)**—raw materials such as wood, steel, plastics, glass, and chemicals used in production processes.
4. **Environment (E)**—the physical and non-physical aspects of the workplace such as buildings; chemical, physical, biological and ergonomic hazards, the organizational culture, marketplace factors, and leadership/management systems.

There are many processes and sources of information that can be used to recognize workplace hazards.

1. **Risk Assessments**—a formalized method used by employers. This process uses a standardized form to assess an occupation, a particular job, or a specific area in the workplace.
2. **Hazard Reports**—reports of hazards made to employers by workers, supervisors, contractors, and the public. Hazard reports should always be documented even if they are presented verbally so they can be kept as an accurate record for future reference.
3. **Workplace Inspections**—regular walk-through examinations of the workplace to recognize and evaluate existing and potential hazards and recommend ways to fix them. Examples of hazards identified in this manner may include leaks, spills, unsafe work habits, excessive noise levels, and strange odours.
4. **Incident Investigations**—investigations to gather information about what caused the incident. These investigations may reveal occupational hazards in the workplace.
5. **Job Safety Analysis (JSA)**—allows for identification of steps in a particular task that expose people to occupational hazards. JSA involves selecting a specific job task and breaking it down into a series of steps that are required to perform the task.
6. **Professional Assistance**—industrial hygienists, ergonomists, medical personnel, may provide information and guidance. Through their specialized training and education, they are able to provide technical services such as sound level measurements, air quality monitoring, radiation level readings, and ergonomic assessments.
7. **Safety Data Sheets (SDS)**—legislation in Canada requires that all hazardous substances (such as chemicals) that are



**Figure 5-7** | How many health and safety hazards can you identify in this image? Consider each element of PEME in your answer.

Dangers to Young Workers	# of Young Workers Injured	Types of Jobs
1. Lifting objects—overexertion causing sprains, strains, tears	258	Retail and grocery clerks, labourers, material handlers, shippers and receivers
2. Working with knives—cuts and lacerations	116	Cooks, food service workers, retail clerks and shelf stockers
3. Working with hot substances/objects—burns	95	Jobs in the hospitality and service industries
4. Using mobile equipment or motor vehicles—sprains, strains, tears and fractures	92	Any job requiring driving, riding, operating, or operating near mobile equipment
5. Working in proximity to running equipment or machinery—cuts, lacerations and fractures	69	Labourers in manufacturing or construction, machine operators, material handlers, bakers and cooks

**Figure 5-8** | This chart identifies the “Top Five” dangers to young workers in Newfoundland and Labrador based on the number of reported injuries for the five year period 2009-2013.

handled in a workplace must be accompanied by a SDS. SDSs identify hazards such as the potential for fire, explosion and reactivity, as well as primary routes of entry into the human system such as inhalation, ingestion, or skin absorption.

- 8. First Aid and Medical Records**—reviews of first aid and medical records may reveal symptoms that can be traced to hazards in the workplace. For example, reports of:
- back problems—could reveal handling or lifting hazards
  - numbness—could reveal a repetitive motion hazard
  - ringing in the ears—could reveal noise hazard
  - skin irritation—could reveal a chemical hazard

## QUICK CHECK

1. Using PEME, reconsider your list of potential hazards in your home. Create a chart to capture the hazards you have identified within each category.
2. Review the list of hazard recognition sources and processes on page 76-77. Create an organizer to classify which are pro-active (i.e., before an incident takes place) and which are reactive (i.e., after an illness, disease, or incident takes place). Why are both groups important?
3. Apply the PEME factors to hazard recognition within your school. Identify any potential health and safety hazards that might exist.

## Risk Assessment

Once workplace hazards have been identified, they are evaluated to determine the chance of loss to people, equipment, materials, or the environment. Hazards that have the highest risk to workers must be dealt with first. Evaluation of risk takes into account the severity of the potential consequences and the probability of an incident occurring as a result of the hazard.

Risk evaluation is performed by trained individuals. Determining the degree of risk associated with a hazard is based on a number of factors such as:

1. Level of Exposure
2. Chemical Properties
  - Is the substance a solid, liquid or gas?
  - At what concentration will the substance be used?
3. Route of Entry (into the body)
  - inhalation
  - ingestion
  - absorption
  - injection
4. Length of Exposure
  - How long will the worker be exposed to the hazard during the work shift?
5. Frequency of Exposure
  - Will exposure occur during each shift or occasionally?
6. Individual Characteristics
  - The age or health of the exposed individual may influence the degree of risk.
7. Environmental Variables
  - Temperature, humidity levels, etc. may influence the degree of exposure.
8. Controls in Use
  - The effectiveness of controls in place to reduce the degree of hazard should be evaluated.

Really!?! 

21 000 germs per square inch exist on your mouse, keyboard, and chair.

Source: OHS Insider

### RISK ASSESSMENT RATING SCALES

Hazard recognition and risk assessment teams may use rating scales as a tool within their risk assessment process. Teams will define, for their workplace, the severity and probability, how they are rated in the risk assessment, and how the risk assessment itself is evaluated.



## Severity

Severity refers to the loss most likely to occur when a particular task is performed. Severity is ranked on a scale from one through four:

1. No injury or lost time—injury or illness can be treated with first aid, insignificant property damage
2. Minor injury—medical aid treatment for minor injury or illness, minor property damage
3. Lost time injury—serious injury or illness, no permanent disability, significant property damage
4. Permanent disability—permanent disability, fatality, loss of structure

Any hazard that has a rating of four is automatically a number one priority.

## Probability

Probability considers how likely it is that a loss will occur when a particular task is performed. Probability is ranked on a scale from one through three:

1. Low—probability of loss occurring (improbable)
2. Moderate—probability of loss occurring (possible)
3. High—probability of loss occurring (likely)

## Risk Calculation

Risk can then be evaluated using the following equation:

$$\text{Probability} \times \text{Severity} = \text{Hazard Priority Rating}$$

The higher the priority rating the higher the risk. The risk assessment team may use this as a guide to evaluating the impact of hazards, the priority in establishing controls, and the type of controls established.

## QUICK CHECK

1. How does the degree of severity determine how we respond to a potential hazard in the workplace? Why is probability an important factor?
2. Why do we consider severity and probability together when prioritizing responses to health and safety hazards?
3. Return to your list of potential home hazards. Use the risk calculation formula to evaluate each potential hazard. Which one would become your top priority to address?



## Smith Snacks Is Health And Safety Vigilant— There Is No Compromise

If you sometimes feel you will never realize your dreams because you don't have money, the right connections, or skills—"don't give up," says entrepreneur and workplace safety champion Jason Smith. In 1971, Jason's father, Howard, had \$50 in his pocket and a burning desire to start a catering business.

Howard's first investment was a toaster. Each night he would toast bread to assemble and package sandwiches. Every morning he would drive from Norman's Cove to St. John's and sell his wares from his truck. On average, Howard would burn out a toaster per week, and go back to the store he purchased it from to get it replaced under warranty.

By the mid-1980s, Howard's sandwich business had expanded to 22 catering trucks and a wholesale division. Despite this growth, he stayed close to home in picturesque Norman's Cove, where today Smith Snacks operates a state-of-the-art wholesale manufacturing facility and bakery.

From Bidgood's Supermarket in the Goulds, to Jackie's Convenience in Nain, Smith's Snacks markets two million sandwiches per year, 300 000 pastries, and 70 000 packages of deli meat to convenience stores, gas stations, and supermarkets throughout Newfoundland and Labrador.

"With an operation of this size involving so many people, we are always vigilant when it comes to health and safety," says Jason, the company's CEO. "We have staff to protect, but we also have to ensure the health and safety of the general public."

It has long been recognized that a company's safety performance is only as good as the CEO's willingness to recognize its importance and to invest accordingly.

Jason is a hands-on CEO. "Unless you're in touch with what's happening on the shop floor, then you're not going to be a leader," Jason says. As such, it is not unusual to see Jason donning his waterproof footwear, hair net, beard net, and lab coat, to go and chat with staff, and try his hand at doing their jobs. "This is always fun, especially when I screw up and the whole shop goes into a fit of laughter."

All fun aside, the work carried out at Smith Snacks is serious business that involves skill, and health and safety preparedness and awareness. "We've had some close calls that could have resulted in serious injuries," says Jason. "Then there have been the injuries that have been incurred as a result of repetitive strain."

One of Jason's longest serving employees developed a shoulder injury because of repetitive motion. "By the time we realized what was going on, it was too late. We tried our best to help her, she was off for a long period of time and is now permanently disabled," he explains. This worker's injury was a wake-up call for Jason. "I feel terrible knowing that she is at home too uncomfortable sometimes to face the day."

Repetitive strain injuries are common in the manufacturing industry. Over the years, Smith Snacks has made numerous occupational health and safety changes, two of which were rotating repetitious jobs and cross training employees to reduce and eliminate strain injuries. As Jason explains, "even something as simple as cheese versus ham—you handle these ingredients differently, and that slight change can significantly help reduce and eliminate injury."

One of the advantages for staff at Smith Snacks is that Jason makes them a major part of the company's decision-making process. In order to improve operations, prevent waste, and operate in a healthy and safe environment, employees are actively encouraged to make suggestions and take action. This level of employee involvement helps improve morale and overall performance.

These initiatives, along with the hiring of a full-time food safety quality assurance manager, have contributed greatly to the prosperity and success of Smith Snacks. There are fewer workers' compensation claims, lower assessment fees, and a happier workforce—as a result of a well-thought out safety incentive program.



**Figure 5-9** | Jason Smith is CEO of Smith Snacks in Norman's Cove, NL.

## Selection of Hazard Controls

Once hazards have been recognized and evaluated for risk, it is time to identify the best controls to eliminate the hazards or minimize the risk. The selection of controls is based on the method that provides the most protection to workers. Controls are also based on what is reasonable and practical for workers and the workplace.

Controls may be directed at the source of the hazard, the pathway of transmission, and/or at the receiver. Controls exist on three levels. This is known as the **hierarchy of controls**:

1. Engineering Controls
2. Administrative Controls
3. Personal Protective Equipment (PPE)

Refer to Figure 5-11.



**Figure 5-10** | In addition to hearing protection, what other safety measures do you observe in this automotive workplace?

## NOISE IN THE AUTOMOTIVE INDUSTRY

Noise is a common occupational health hazard found in many workplaces. Due to the nature of the work tasks in the automotive industry, auto body repair shops, garages, and service stations often produce noise levels high enough to cause negative health effects in workers. Controls must be put in place to ensure the health of workers in this industry.

### Health Effects

Hearing loss is the most common effect of exposure to excessive noise levels. Such hearing loss is irreversible, and will continue to worsen if the worker remains exposed. Other non-auditory health effects include potential stresses on the cardiovascular systems and safety concerns. For example, workers with hearing loss may be at an increased risk for safety related incidents since they may not be able to hear warning alarms.

### Legislative Requirements

When noise hazards are suspected, the first course of action is to measure the noise levels to identify the risk to worker's health. Where levels exceed the criteria for permissible noise exposures, controls must be implemented to decrease the noise to acceptable levels. Where it is not practicable (e.g., when using air tools) other control measures such as personal protective equipment (e.g., hearing protection) must be used. Where noise levels cannot be decreased and continue to exceed the permissible levels, a hearing conservation program must be developed and implemented.

Type	Engineering Controls	Administrative Controls	PPE
Definition	<ul style="list-style-type: none"> <li>the first line of defence</li> <li>removing the hazard completely from the workplace</li> </ul>	<ul style="list-style-type: none"> <li>second line of defence</li> <li>changing safe work practices or procedures</li> </ul>	<ul style="list-style-type: none"> <li>last line of defence:</li> <li>placing a barrier between the worker and the hazard</li> </ul>
Examples	May involve: <ul style="list-style-type: none"> <li>elimination of the hazard by initial design change</li> <li>substitution of a less hazardous process</li> <li>isolation or enclosure of the source of the hazard</li> <li>mechanical ventilation</li> </ul>	May involve: <ul style="list-style-type: none"> <li>worker education and training</li> <li>good housekeeping</li> <li>worker rotation</li> <li>scheduling workers to minimize hazardous exposures</li> <li>medical surveillance</li> </ul>	May involve: <ul style="list-style-type: none"> <li>reduced exposure by eye and face protection, hearing protection, protective clothing, respiratory protective devices, and protective creams and lotions</li> <li>can be used as a temporary control while waiting for the permanent one to be put in place</li> </ul>
In some cases, when an engineering and/or administrative control is not enough protection, PPE must be used in combination to minimize risk to workers.			

**Figure 5-11** | The Hierarchy of Controls. How might a combination of controls be used in a welding shop?

## Recommendations for Automotive Workplaces

- Develop and implement a written, site-specific hearing conservation program in accordance with CSA Z107.56 “Procedures for the Measurement of Occupational Noise Exposure.”
- When preparing to measure the noise levels in the workplace consider both instantaneous noise mapping as well as full-shift noise dosimetry sampling.
- Before implementing the use of hearing protection consider
  - installing barriers or isolating machinery
  - installing sound absorption devices and/or using sound dampening materials
  - purchasing tools and machinery that generate lower noise levels.
- Administrative controls such as shift scheduling should also be considered.
- In places where it is not possible to reduce the noise levels, workers overexposed to noise must wear hearing protection.
- When personal protective equipment is used by workers, hearing tests must be conducted on an annual basis or as recommended by an audiologist or occupational physician.
- Ensure workers receive education and training regarding the hazards of noise exposure and regarding the proper use of controls.
- Post adequate warning signs at entrances to areas where noise levels exceed permissible levels to indicate the hearing protection that is required.

Source: Service NL

## QUICK CHECK

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1. Explain what is meant by a hierarchy of controls?
2. When is the use of PPE appropriate as a control measure?
3. Review the article “Noise in the Automotive Industry.” Create a chart to identify the recommendations made to protect workers’ hearing and classify each within the hierarchy of controls.

## Implementation of Controls, Monitoring, and Evaluation

Once controls have been selected, a plan is developed for their implementation. Targets are set, timelines are established, and workers are involved in completing the necessary tasks. Assigning specific dates helps to ensure the controls are implemented in a timely manner.

There may be some instances where it is necessary to put a temporary control (e.g., PPE) in place before the permanent one can be fully implemented. If this is the case, it is important to document and monitor temporary controls before full implementation is put in place.

Controls are monitored and evaluated on a regular basis to ensure they are providing adequate protection to the workers and to ensure they are not introducing another hazard to the workplace.

## QUICK CHECK

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1. Identify two essential elements in the implementation of controls.
2. Why is ongoing monitoring and evaluation of controls important?
3. Revisit your list of home hazards. How might you implement the controls you selected?

 **SPREAD THE WORD**

As a class, create a series of print or electronic “hazard alerts” that apply to jobs commonly held by youth workers. Decide, as a class, whether you will create a series of brochures, posters, or video blogs.

After breaking into small teams, each group will select a job and identify at least five potential hazards that might be associated with that job. Your hazard alert should contain the following:

- The Job Title
- Potential Hazards of the Job
- Brief Description of the Job
- Tips for Safe Work Practices

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 71). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Return to your list of 10 potential OH&S hazards that might exist in your school. Working with your partner:

- Evaluate the potential risk of each hazard.
- Rank each potential hazard in a priority list based on your evaluation.
- For each item, identify any controls already in place within your school.
- For each item, recommend any further controls that might be added.
- Report your findings in a table.
- Share your findings with another set of partners. How were your findings similar or different?

 **DIG DEEPER**

Select an occupation of interest to you. Make a list of potential hazards that might be associated with that occupation. Research to determine any additional occupational hazards that might accompany that career. What efforts have been taken by industry associations or governments to protect workers in that field?



# Workplace Inspections

Workplace inspections are an important part of an occupational health and safety (OH&S) program. They involve a process for monitoring workplace health and safety and are an effective way to recognize, evaluate, and control hazards in the workplace.

Employers have a responsibility to outline a step-by-step process for carrying out inspections in their workplaces. Including workplace inspections in the OH&S program strengthens the internal responsibility system; which is essential for building a positive health and safety culture.

## LEARNING GOALS

This chapter will enable you to:

- discuss how workplace inspections are an important part of the hazard recognition, evaluation, and control process
- identify workplace roles and responsibilities in workplace inspections
- describe the types of workplace inspections
- explain the four steps involved in workplace inspections

## SPREAD THE WORD

Workplace inspections can be seen as either positive or negative events. They are sometimes seen as “problem finding” rather than “problem solving.” With a partner, discuss possible answers to the following questions:

1. Why might this be the case?
2. What could you do, if you were conducting an inspection, to change this perception?



## WHAT WOULD YOU DO?

Tim has started an internship at a local warehousing facility. This week his supervisor has been assigned to a workplace inspection team. Tim has been invited to join the training session and participate as part of the inspection team. Tim, his supervisor, and another colleague have been assigned to inspect three storage areas as well as the loading docks to identify potential health or safety hazards.

Moving through the three storage areas takes longer than expected but they are happy to find no issues to report. Now they're running out of time before the next shift change. Tim's supervisor proposes that they just skip the section and file their report. After all, everything else is in good shape. Tim is uncertain whether this is a good idea.

**What would YOU do?**



**Figure 6-1** | Why would hard hats and safety vests be necessary equipment for inspections in a warehouse facility?

## CHAPTER CHALLENGE PREVIEW



**Figure 6-2** | How might different subject area classrooms present different hazards?

Your school is a workplace for many people as well as a gathering place for students and community members. How would you approach the task of completing a workplace inspection to ensure a healthy and safe environment for all?

- What would you look for?
- Who might be involved?
- When would you do it?
- How would you report your findings?
- How would you ensure that any issues were addressed?

These are all questions to consider as you explore the chapter.

## The Role of Workplace Inspections

The primary purpose of workplace inspections is to detect potential hazards so they can be corrected before an incident occurs. The second purpose is to improve operations to increase efficiency, effectiveness, and profitability. For workplace inspections to be effective, they must be scheduled and conducted on a regular basis.

Inspections help to:

- identify and record actual and potential health and safety hazards associated with buildings, equipment, the environment, and workplace processes and practices
- identify unsafe conditions or unsafe acts that require immediate attention
- ensure that existing health and safety hazard controls are functioning adequately
- if appropriate, recommend corrective actions

### TYPES OF WORKPLACE INSPECTIONS

There are two main types of workplace inspections—formal and informal.

**Formal workplace inspections** are regularly scheduled examinations carried out as a means of preventing injury, illness, and property damage and of ensuring a safe and healthy workplace. They are formally documented with the use of a checklist and a report that includes recommendations for corrective actions.

**Informal workplace inspections** are daily routines that are also used as a means of preventing injury, illness, and property damage and of ensuring a safe and healthy workplace. Examples include a supervisor's walk-through or a worker's routine equipment check. Informal inspections are usually not scheduled and do not require a formal checklist.

Additional inspections may take place according to the specific needs of the workplace.

#### It's the Law...



The Canada Labour Code and the Newfoundland and Labrador Occupational Health and Safety Regulations state that every employer has the duty to protect the health and safety of every worker while at work as well as others who are present in the workplace.

Spot Inspections	May be undertaken on a random basis by anyone at the workplace as part of general OH&S responsibilities
Pre-use Inspections	Inspections of tools and equipment that, under legislation and manufacturer's specifications, require regular inspections
Critical Parts Inspections	Regularly planned inspections of machine parts, pieces of equipment, or systems, which have high potential for serious loss and/or incidents
New Tool and Equipment Inspections	Conducted before operations begin

**Figure 6-3** | These additional forms of inspection play an important role in workplace health and safety.

## ROLES IN WORKPLACE INSPECTIONS

In keeping with the internal responsibility system, all workplace parties have a role in conducting workplace inspections. Employers should ensure workplace inspection procedures outline these roles.

Employers must...	Workers, Managers, and Supervisors must...	OH&S Committees must...
<ul style="list-style-type: none"><li>• provide the resources (human and financial) to carry out regular workplace inspections</li><li>• ensure workplace inspection procedures are developed</li><li>• ensure workers are provided with the education and training needed to understand their responsibility and to co-operate with those conducting workplace inspections</li><li>• consult with OH&amp;S committees about scheduling workplace inspections</li><li>• ensure OH&amp;S committees take an active role in workplace inspections</li><li>• review workplace inspection reports</li><li>• ensure recommendations for corrective action are implemented, monitored, evaluated, and communicated</li><li>• review workplace inspection procedures at least once every three years</li></ul>	<ul style="list-style-type: none"><li>• participate in workplace inspections when requested</li><li>• make suggestions for corrective actions to those conducting workplace inspections</li><li>• take part in training or the development of safe work practices identified through workplace inspections</li></ul>	<ul style="list-style-type: none"><li>• co-operate with the employer in scheduling workplace inspections</li><li>• actively participate in workplace inspections</li><li>• review all workplace inspection reports</li><li>• make recommendations for corrective action to the employer</li><li>• monitor implementation, follow-up, and evaluation of corrective actions</li><li>• regularly monitor the effectiveness of workplace inspections and make recommendations for improvement when appropriate</li><li>• review workplace inspection procedures</li><li>• ensure ergonomic considerations are included in workplace inspections</li></ul>

**Figure 6-4** | How are the roles of each group similar and different?

### QUICK CHECK

1. What is the difference between formal and informal inspections?
2. How do workplace inspections relate to the hazard recognition, evaluation, and control process?
3. Where could you locate copies of legislation related to workplace inspections in Newfoundland and Labrador?

## Steps in the Workplace Inspection Process

Workplace inspection procedures developed by the employer follow a step-by-step process.

The four steps include:

1. Planning the Inspection
2. Conducting the Inspection
3. Completing the Report
4. Monitoring Corrective Actions

### PLANNING THE INSPECTION

A workplace inspection program is based on a completed risk assessment of the workplace or facility.

The employer divides the facility into areas of responsibility with larger areas, or zones, divided into smaller and more manageable areas. An effective tool to use is a colour-coded floor plan of the facility indicating specific areas of responsibility.

The employer should also develop a checklist for inspection. The checklist should never be considered a permanent document. It should be reviewed regularly and revised when there are changes to equipment, tools, or work processes, and when hazards are identified either by staff or as the result of an incident investigation, or a previous workplace inspection. Figure 6-6 outlines a list of items that might be included in an inspection checklist.



**Figure 6-5** | How do checklists help during workplace inspections?

Items for Inspection Check Lists	Examples
Environmental factors	Illumination, lighting, dust, fumes, gases, mists, vapours, noise, vibration, heat, radiation sources
Hazardous supplies and materials and other controlled products	Flammables, acids, caustics, toxic or nuclear materials or by-products
Equipment	Mills, shapers, presses, borers, lathes
Power source equipment	Steam and gas engines, electrical motors, pneumatic and hydraulic machine processes
Electrical equipment	Switches, fuses, breakers, outlets, cables, extension and fixture cords, ground, connectors, connections
Hand tools	Wrenches, screwdrivers, hammers, power tools
Personal protective equipment	Hard hats, safety glasses, foot protection, respirators, hearing protection, gloves
Hygiene and first aid facilities	Drinking fountains, wash basins, soap dispensers, safety showers, eyewash fountains, first aid supplies, first aid rooms, stretchers
Fire protection and emergency response equipment	Alarms, water tanks, sprinklers, standpipes, extinguishers, hydrants, hoses, self-contained breathing apparatus, automatic valves, horns, phones, radios
Walkways and roadways	Ramps, docks, sidewalks, walkways, aisles, vehicle ways, escape routes
Elevators, electric stairways, and lifts	Control wire ropes, safety devices
Working surfaces	Ladders, scaffolds, catwalks, platforms
Materials handling equipment	Cranes, dollies, conveyors, hoists, forklifts, chains, ropes, slings
Transportation equipment	Automobiles, railroads, cars, trucks, front-end loaders, helicopters, motorized carts
Warning and signalling devices	Sirens, crossing and blinker lights, warning signs, exit signs
Containers	Scrap bins, disposal receptacles, barrels, drums, gas cylinders, solvent cans
Storage facilities and area both indoor and outdoor	Bins, racks, lockers, cabinets, shelves, tanks, closets
Structural openings	Windows, doors, stairways, sumps, shafts, pits, floor openings
Buildings and structures	Floor, roofs, walls, fencing

**Figure 6-6** | Which items might apply to an inspection within your school?





Inspectors must pay particular attention to tools, machinery, and equipment most likely to become a hazard because of stress, wear, impact, vibration, heat, corrosion, chemical reaction, and misuse. Examples include:

- safety devices
- guards
- controls
- wear points of components
- electrical and mechanical parts
- fire hazards

**Figure 6-7** | How might you divide your school into zones for the purpose of conducting a workplace inspection?

## CONDUCTING THE INSPECTION

It is the employer’s responsibility to ensure inspections are scheduled and conducted in consultation with the OH&S committee, worker health and safety representative, or workplace health and safety designate.

The frequency of inspections is determined by four factors:

1. Loss severity potential
2. Potential for injury to workers
3. How quickly the item can become unsafe
4. History of equipment failures

<p><b>1. Loss severity potential</b> The more severe the possibility of loss, the more often the item should be inspected.</p>	<p>↑ Severity = ↑ Inspections</p>
<p><b>2. Potential for injury to workers</b> The greater the probability for injury to workers, the more often the item should be inspected.</p>	<p>↑ Probability = ↑ Inspections</p>
<p><b>3. How quickly the item can become unsafe</b> The faster an item can become unsafe, the more frequently it should be inspected. This will depend on the nature of the part and conditions to which it is subjected.</p>	<p>↑ Likelihood = ↑ Inspections</p>
<p><b>4. History of failures</b> The more often an item has failed in the past, the greater the consequences, the more it needs to be inspected.</p>	<p>↑ Failures = ↑ Inspections</p>

**Figure 6-8** | Factors related to inspection frequency. How often do you think workplace inspections should take place in your school? Why?

It is important to remember that one individual or group should not have exclusive responsibility for all inspections. Normal procedure is to assemble a team of employer representatives, workers, and OH&S committee/worker health and safety representatives or workplace health and safety designates. The team responsible for each inspection should have training in hazard recognition.

Five characteristics of a good inspection team are:

1. Knowledge of a company's incident experience
2. Familiarity with hazards and applicable standards
3. The ability to decide upon corrective action
4. Diplomacy in dealing with personnel and situations
5. Knowledge of company's operations

The workplace inspection team may put together an inspection kit to assist in their task. Common elements within an inspection kit include:

- inspection forms
- clipboards
- pens/pencils
- lock out/tag out supplies
- flashlight
- camera
- measuring tape/ruler
- any required personal protective equipment
- sample container
- stopwatch
- sampling devices (air, noise, light, temperature)
- testing equipment (if qualified)

Inspections should be scheduled at a time when inspectors can see workers and work practices without much interruption. The route should be planned in advance.



**Figure 6-9** | Why is it important for members of an inspection team to see work practices in action?



**Figure 6-10** | This greenhouse worker is spraying pesticide on a row of bedding plants. This image from WorkSafeBC has been deliberately staged to display several dangerous work habits and safety hazards. How many can you spot?

## COMPLETING THE REPORT

An inspection can only be effective if results are promptly reported and corrective action is taken. Reports should be given to the:

- plant manager
- department manager
- supervisor
- OH&S committee, worker health and safety representative or workplace health and safety designate as applicable
- OH&S co-ordinator
- maintenance manager

Good reports should be concise and factual. Any recommendations should be based on sound problem-solving processes.

## MONITORING CORRECTIVE ACTIONS

Successful workplace inspection programs include a monitoring process. Monitoring requires a clear definition of who has the ultimate responsibility for making decisions on actions to be taken, timely feedback to those involved in the inspection, and the identification of corrective action needed.

## QUICK CHECK

1. What are the four steps in the workplace inspection process?
2. What would you include in an inspection checklist for your school?
3. Why is it important to monitor the corrective items identified in an inspection report?

 **SPREAD THE WORD**

How can we create awareness of the benefits of workplace inspections? One way is to create a series of slogans to communicate the message.

Revisit your ideas from the beginning of the chapter. Use them to create a slogan to send a positive message about workplace inspections.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 87). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

As a class, decide how you would divide your school into inspection zones. Now divide yourselves into inspection teams—each team will complete a mock formal workplace inspection for one of the zones. Each team will:

1. Plan the Inspection
  - Decide when it will be conducted.
  - Decide who should be aware of your plans and notify them in advance.
  - Create an inspection checklist for your area.
  - Identify any PPE required, if applicable
2. Conduct the Inspection
  - Identify and gather any equipment you might need.
  - Make notes of your findings along the way.
3. Complete a Report
  - Create your final report, including your findings and any recommended actions.
  - Present your findings to your classmates.
4. Identify how you would monitor any correction actions
  - Create a plan to monitor any corrective actions you have identified.

 **DIG DEEPER**

Use the Service NL website to research statistics related to OH&S Inspections in Newfoundland and Labrador. Using this data and information available from additional sources, what observations can you make about the frequency and impact of inspections in the province?

# Incident Investigation

Every day Canadians die from occupational diseases and injuries. Many others become ill, injured, or have the potential to be injured as a result of workplace incidents. The human and financial costs of workplace incidents in Canada are significant. As such, all incidents should be investigated.

Incident investigation provides a mechanism for the recognition, evaluation, and control of workplace hazards. It determines why the incident occurred and identifies corrective action to prevent reoccurrence.

## LEARNING GOALS

This chapter will enable you to:

- differentiate between incidents and near-misses
- discuss how incident investigation is an important part of the hazard recognition, evaluation, and control process
- identify workplace roles and responsibilities in incident investigations
- identify how people, equipment, materials, and the environment (PEME) contribute to incidents
- describe the steps involved in an incident investigation

## SPREAD THE WORD

Asking questions is an important component of occupational health and safety. Sometimes being able to determine the right questions to ask is also important.

Consider the case of a young worker hired by a laboratory to wash test tubes and other utensils as part of his job. His work area was small and unventilated and he was instructed to rinse the items with a chemical called methylene chloride. No other information was given to him. Not wanting to appear unqualified, he didn't ask any questions other than where was it kept. Some hours later, the worker collapsed as a result of a heart attack.

What questions might the young worker have asked prior to starting the task? What questions would the employer ask to find out how this incident happened and prevent it from happening again?



## WHAT WOULD YOU DO?

Mallory and Christine are walking down the school corridor and talking about the movie they plan to see on the weekend. Not really paying attention to where she's walking, Christine slips and falls. Looking back Mallory sees water on the floor beside a nearby drinking fountain.

Christine is lying on the floor. Mallory tells her to stay where she is in case something is broken and that she'll get some help. But Christine gets up and laughs off the incident. "I'm fine," she says. "The only thing bruised is my pride. Let's get going. We'll be late for class. And don't say anything to anyone. It's embarrassing."

Christine does seem fine to Mallory. And, after all, they are running late for class and their teacher is a stickler for punctuality.

**What would YOU do?**



**Figure 7-1** | How could you ensure Christine's incident didn't happen to someone else?

## CHAPTER CHALLENGE PREVIEW



**Figure 7-2** | How might working with animals pose unique health and safety risks?

Incident investigations are sometimes straightforward. Sometimes those involved have to employ the investigative skills of a highly skilled detective to determine what went wrong. Knowing how to handle these situations when they occur can prevent incidents in the future.

What if your friend got a job in a pet store and developed a strange skin rash about a week after she started? Or, someone you know started work in a local bakery and badly bruised his arm reaching into the dough mixer before it had stopped? How might these things have happened? As you read the chapter, consider how such incidents might be avoided in the future.



## Why Do Incidents Happen?

For years, health and safety professionals have asked the question “why do incidents happen?” The answers are varied and often times complex. But they are important to all of us. Identifying the causes of incidents helps us to ensure they do not happen again.

In the world of occupational health and safety (OH&S) you often see references to incidents and near misses. **Incidents** are unplanned and undesired events that result in harm to a person, damage to property or the environment. **Near misses** are undesired and unplanned events that have the potential to cause harm to a person or cause damage to property.

### CONTRIBUTING FACTORS TO INCIDENTS

When conducting incident investigations, investigators must look at the people, equipment, materials, and environment (PEME) that were directly and indirectly involved with the incident. It is important that all aspects of PEME are thoroughly investigated.



There are many factors that may contribute to incidents:

- failing to recognize hazards in hazard recognition, evaluation, and control activities
- inadequate hazard controls
- untrained supervisors and workers
- failing to follow safe work practices and procedures
- inadequate safe work practices and procedures
- inadequate supervision
- inadequate maintenance of tools and equipment
- inadequate OH&S program
- poor work planning
- shift work

**Figure 7-3** | How many occupations or workplaces can you identify that involve shift work? Why might shift work be a factor in incident investigations?

- lack of planning
- lack of communication
- worker's age
- worker's experience
- worker's home/social life
- poor morale in the workplace
- stress



## THINK ABOUT IT...

**How might stress or outside factors in a worker's home life contribute to workplace incidents?**

## COSTS OF INCIDENTS

As described in Chapter 1, occupational disease and incidents cost employers and workers both directly and indirectly.

Direct costs connected to the incident, illness, or disease include medical costs, costs of repairs to equipment, and increased worker's compensation premiums.

Indirectly, incidents reduce worker morale, increase absenteeism, and may attract negative attention to the organization in terms of reputation and social responsibility.

When incidents occur or occupational disease has been diagnosed, it is important to have incident reporting and investigation processes to ensure the conditions and environment that led to the incidents are resolved and do not happen again.

## REPORTING INCIDENTS

Workers are required to report all incidents to their employer. The best way to report an incident is to complete an incident report form that has been developed by the employer for this purpose. This internal document serves to officially notify the employer of an incident and initiates the incident investigation. An incident investigation is used to identify the root cause of incidents with the primary purpose of preventing reoccurrence.



**Really!?!**

Total injury costs for NL for the period 2009-2013 were more than \$650 million.

## LUCKY ESCAPES

Ignoring a close call means you could be paving the way for a serious injury to happen. You must report all close calls so they can be investigated and the hazard eliminated before someone gets hurt. For every reported first-aid or minor injury, there are on average hundreds of close calls that have gone unreported.

Close calls (also known as near misses) are situations in which a worker has a narrow escape from getting hurt. The worker probably feels lucky about getting away uninjured. If we pay attention, these incidents can be lucky in another way. They preview an injury that could happen so measures can be taken now to prevent it.

Here's an example:

A carpenter's assistant picks up a power drill and gets a slight electric shock. He quickly drops the tool, suffering no injury. At this point he has an important choice to make. If he just forgets the incident, the next person to pick up the tool may have damp hands or may be standing in a puddle of water. That person is bound to get a severe shock. However, if the incident is reported, the tool will be temporarily removed from service, checked over, and either repaired by qualified personnel or permanently removed from service. There will also be an opportunity to find out why this tool became defective. Was it poorly designed or manufactured? Has the insulation been allowed to get wet or is the cord frayed? How can problems be avoided in the future—perhaps by purchasing better tools, taking good care of them and inspecting them regularly?

If you have a near miss, consider yourself lucky on two counts. You didn't get hurt, and have the chance to prevent a future incident for yourself or someone else.



**Figure 7-4** | On average, about 500 Canadian workers suffer serious electrical injuries each year.

Source: Newfoundland Power

### It's the Law...



Where an incident at a workplace results in serious injury or death, or had, or continues to have, the reasonable potential of causing serious injury or death, the *OH&S Act* (s.54) requires the employer or principal contractor to immediately notify the assistant deputy minister of the Newfoundland and Labrador government's OH&S Division via a 24-hour a day reporting line.

## QUICK CHECK

1. What is the difference between an incident and a near miss? Describe one example of each.
2. Create an organizer to group the contributing factors of incidents listed on page 98–99 according to PEME.
3. How do incident investigations relate to the hazard recognition, evaluation, and control process?

## Conducting an Incident Investigation

The purpose of an incident investigation is to:

1. Identify and record facts about each incident or injury
2. Determine corrective action to prevent reoccurrence

Incident investigations may be adapted to meet the specific needs of a workplace. There are, however, common roles, responsibilities, and steps involved in their completion.

### ROLES AND RESPONSIBILITIES IN INCIDENT INVESTIGATION

All workplace parties have a role in incident investigations. Employers should ensure incident investigation procedures clearly outline these roles.

Managers and supervisors are often the people that carry out incident investigations. However, it is a good practice, when possible, to include other workers and members of the OH&S committee/WH&S representatives or WH&S designates on investigation teams. This practice promotes the internal responsibility system in the workplace.



**Figure 7-5** | Why should incident investigations be conducted by a team rather than one individual?

### Important

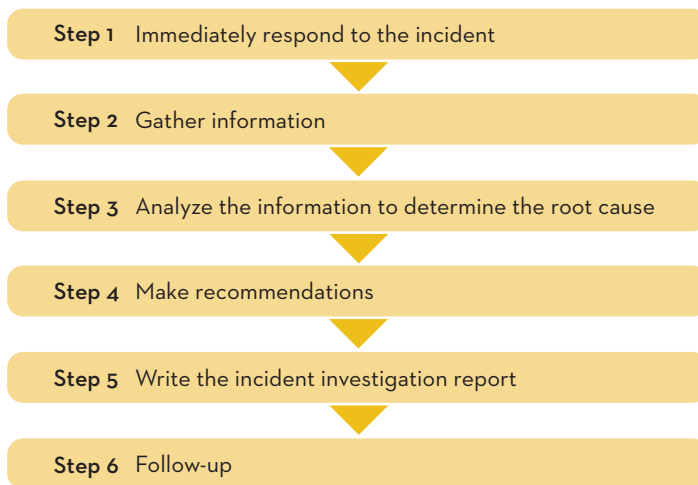
Incident investigations are fact-finding, not fault-finding. This is not to say that persons responsible should not be held accountable. They should be. But the investigation itself should only be concerned with the facts. Fairness and balance are essential in an investigation.

## Roles and Responsibilities in Incident Investigations

Employers	<ul style="list-style-type: none"> <li>• immediately report incidents resulting in serious injury or death or the potential for serious injury or death to the assistant deputy minister and the OH&amp;S committee</li> <li>• report an injury of a worker for which the worker is disabled from earning full wages or the worker is entitled to medical aid to WorkplaceNL</li> <li>• provide the resources—human and financial—to carry out incident investigations</li> <li>• ensure incident investigation procedures are developed and followed</li> <li>• ensure all workers are provided with the education and training needed to understand their responsibility to report incidents and to cooperate with those conducting investigations</li> <li>• review incident investigation reports</li> <li>• ensure corrective action is implemented, monitored, evaluated, and communicated</li> <li>• review incident investigation procedures at least every three years</li> </ul>
The Investigation Team	<ul style="list-style-type: none"> <li>• conducts the investigation as soon as possible after the incident</li> <li>• follows incident investigation procedures</li> <li>• puts emphasis on finding the root cause not on finding fault or placing blame</li> <li>• considers multiple causes to find all factors contributing to the event; do not jump to the obvious answer—keep looking</li> <li>• ensures the results of the investigation are communicated to workplace parties</li> </ul>
Workers including Managers and Supervisors	<ul style="list-style-type: none"> <li>• report incidents to their supervisors immediately and co-operate with the incident investigation team</li> <li>• participate as members of the investigation team when requested</li> <li>• make suggestions for corrective actions to the investigation team</li> <li>• take part in training required as the result of the investigation</li> </ul>
Occupational Health and Safety Committee or Worker Health and Safety Representative or Workplace Health and Safety Designate	<ul style="list-style-type: none"> <li>• acts as a resource if not participating as members of the incident investigation team</li> <li>• reviews all incident investigation reports to identify trends in injury, illness and property damage</li> <li>• monitors implementation, follow-up, and evaluation of corrective actions</li> <li>• reviews training required as the result of the incident investigation</li> <li>• regularly evaluates this element of the occupational health and safety program</li> </ul>

**Figure 7-6** Roles and responsibilities for incident investigations are based on legislative requirements and industry best practices.

## STEPS IN CONDUCTING AN INVESTIGATION



**Figure 7-7** Steps in Conducting an Incident Investigation

It is important that incident investigations are conducted carefully and thoroughly. Following a step-by-step process helps to ensure that all elements have been well-covered and that critical information is not overlooked.

### 1. Immediately respond to the incident

It is important to isolate the incident scene as soon as any emergency procedures have been activated and any injured workers are removed from the site. The incident investigation team should then:

- a) Record all evidence as quickly as possible  
Evidence can be recorded by written notes, photography, sketches, video recording, diagrams and dictated observations. To demonstrate the relative size of an object in a photograph place a ruler or coin next to the object when taking a close-up photo.
- b) Identify witnesses  
The investigation team should seek to identify all witnesses at the scene or anyone who may be able to provide evidence related to what happened.

**Primary witnesses** are those who were eyewitness to the incident. They were present at the time the incident occurred.

**Secondary witnesses** are those who may not have seen the incident but were in the vicinity when it occurred.

**Tertiary witnesses** are those who were not actually present at the time of the incident, nor afterwards, but who may provide relevant evidence.



## 2. Gather information

An incident investigation report form is used to guide investigators in gathering information. The form should be available in the workplace as part of the OH&S program. Supplementary information such as photographs or sketches should be attached to the report. In a multiple injury incident, investigators should complete a separate investigation form for each worker.

The primary method of gathering information is to interview the witnesses. Interviews should begin as soon as the witness list is compiled for the following reasons:

- a witness's best recollection is right after the incident
- to avoid the possibility of witnesses comparing notes and changing their stories

The best place to interview a witness is at the incident site. If this is not possible, select a private location where witnesses are not intimidated or interrupted. To ensure the information received from witnesses is objective and accurate, we need to understand the techniques used in interviewing incident witnesses.



**Figure 7-8** | Why might a witness feel uncomfortable talking about an incident. What techniques could you use to help someone feel more at ease?

### *Interview Techniques*

- Put the witness at ease and listen carefully to what they have to say.
- Ask open-ended questions where possible. This provides more information than questions requiring simple yes or no answers.
- Do not lead a witness or interrupt his/her story unless you require clarification about something he/she has said.
- If possible, take mental notes of critical information; note taking is distracting and sometimes worrisome to a witness.

- At the end of the interview, summarize what you have heard, have the witness verify your summary and thank the witness for his/her help.
- Develop written notes immediately after the witness leaves.

## INVESTIGATION KITS

Pre-organized investigation kits are helpful to have on-hand if an incident occurs. Kits might include:

- incident investigation forms
- 'Do Not Enter' tape
- a clip board
- a tape measure and ruler
- a camera (or video camera) and batteries
- a flashlight and batteries
- plastic bags and containers for samples
- labels and permanent markers for labelling samples
- pens/pencils
- an eraser
- a notebook and graph paper
- gloves and other personal protective equipment
- an audio recorder

### *Asking Good Questions*

It is important to be thorough in incident investigations. Asking detailed questions helps to better understand not only what happened but how to prevent it from happening again. Questions that may be helpful when conducting an investigation include:

1. What type of work was the injured person doing?
2. What exactly was the injured person doing or trying to do at the time of the incident?
3. Was the person proficient in the task being performed? Had the worker received proper training?
4. Was the injured person authorized to use the equipment or perform the process at the time of the incident?
5. Were other workers present at the time of the incident? Who are they and what were they doing?
6. Was the task being performed according to approved procedures?

7. Was the proper equipment being used?
8. Was personal protective equipment being used?
9. Was the injured worker new to the job?
10. Was the process, equipment, and/or system involved new?
11. Was the injured worker being supervised at the time of the incident?
12. Were there any established OH&S rules or procedures that were clearly not being followed?
13. Where did the incident take place?
14. What was the condition of the site at the time of the incident?
15. Has a similar incident occurred before? If so, were corrective measures recommended? Were they implemented?
16. Are there obvious solutions that would have prevented the incident?

### 3. Analyze the information to determine the root cause(s)

Incidents usually occur as a result of a chain or series of events. Causes are usually identified as the immediate (direct) cause and the root (basic) causes.

**Immediate causes** are described as those events, conditions, or acts that immediately precede the incident. They are described as being the symptoms of the root cause, not the root cause itself.

The **root causes** are the ‘real’ or underlying causes of incidents. They are not immediately obvious and will be uncovered through a thorough and well-planned incident investigation.

Think back to the “What Would YOU Do?” scenario on page 97. You might have assumed that someone had just splashed some water when taking a drink. However, after a more thorough investigation, the custodian discovered the root cause—a leak in the water pipe under the fountain was causing it to constantly drip water onto the floor.

If the root cause of an incident is not identified, chances are high that another incident will occur again in the future.

### 4. Make recommendations

Once the root cause has been identified, recommendations will be made to the employer to prevent reoccurrence.

Recommendations should:

- be clearly written
- be as specific as possible—what, when and where
- be constructive—identify contributing factors and possible solutions

Really!?!?



In 2014, 92.2% of NL employers were free of incidents.

- identify target dates for implementation and follow-up
- identify the resources required to implement your recommendations

## 5. Write the incident investigation report

The purpose of the incident investigation report is to communicate the results of the investigation and document recommendations for corrective action. The incident investigation report must be well organized, clear and to the point. It should:

- describe what happened, the sequence of events and timelines
- include a short description of the investigation methods used
- provide an analysis of the immediate and root cause
- include supporting documentation and other evidence such as interview summaries and pictures
- recommend corrective actions
- outline a follow-up procedure
- include signatures of the investigation team
- identify the date the report is being submitted to the employer

## 6. Follow-up

If recommendations outlined in an incident report are not implemented, the same contributing factors could resurface in another incident. Furthermore, the incident investigation would have been a waste of time. Incident investigation procedures should identify those responsible for:

- implementing the recommended action
- meeting timelines for implementation
- adding corrective actions to the workplace inspection checklist
- evaluating corrective actions to ensure they are effective
- posting and publicizing investigation results
- communicating the effectiveness of the corrective actions to the employer, OH&S committee, worker health and safety representative, workplace health and safety designate, and workers

## QUICK CHECK

1. What is the purpose of an incident investigation?
2. Why is it important to have an incident investigation process in place?
3. What are the six steps in an incident investigation process?

## Overloading a Central Cause of 2013 Water Bomber Incident on Moosehead Lake, Newfoundland and Labrador

On 3 July 2013, at about 2:15 p.m. Atlantic Daylight Time, the Bombardier CL-415 amphibious aircraft operating as Tanker 286, departed Wabush, Newfoundland and Labrador, to fight a nearby forest fire. Shortly after departure, Tanker 286 touched down on Moosehead Lake to scoop a load of water. About 40 seconds later, the captain initiated a left hand turn and almost immediately lost control. The aircraft came to rest upright, but partially submerged. The crew exited the aircraft and remained on the top of the wing until rescued by boat.

The Transportation Safety Board (TSB) incident investigation found that the PROBES AUTO/MANUAL switch position check was not included on the checklist, and it is likely that the PROBES AUTO/MANUAL switch was inadvertently moved from the AUTO to MANUAL selection. The switch controls the probes, which is the equipment used to scoop water from a lake. The report warns that, if a checklist does not include a critical item, and flight crews are expected to rely on their memory, then there is a risk that the item will be missed and safety could be jeopardized.

The investigation also found that the flight crew was occupied with other flight activities during the scooping run and did not notice that the water quantity exceeded the predetermined limit until after the tanks had filled to capacity. The flight crew then decided to continue the take-off with the aircraft in an overweight condition.

Some safety action has been taken by the Government of Newfoundland and Labrador Air Services Division. Changes have been made to the storage and securement of safety gear and the installation of a portable satellite telephone in their aircraft. Water bomber pilots and maintenance personnel will be subject to new training and an increased training flight schedule. Finally, the checklist has been amended to include PROBES AUTO/MANUAL switch verification.

The Transportation Safety Board is an independent agency that investigates marine, pipeline, railway, and aviation transportation occurrences. Its sole aim is the advancement of transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

 **SPREAD THE WORD**

Workers, supervisors, and employers all play a strong role in OH&S including asking good questions to ensure the safety of all workers. In small groups, take the position of a worker, supervisor, or employer. Create a short poem or rap lyric to underscore the importance of asking good questions. Perform your work for the rest of the class.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 97). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Review the chapter challenge scenarios on page 97. What questions would you ask to determine what happened to each of your friends?

In small groups, you will create a role play to showcase effective incident investigation—using one of the scenarios at the beginning of the chapter or another of your choosing.

1. Divide your group into workers, witnesses, and incident investigation team members.
2. Create a short script that identifies:
  - the incident or health issue
  - how each team member participates in the investigation to determine the immediate and root causes
  - the findings and recommendations of the incident investigation team
3. Perform your role play for the class.

 **DIG DEEPER**

Research an example of a workplace incident or health issue from within the province. Present your findings including:

- what happened
- the findings of the investigation
- follow-up recommendations that were implemented to prevent future events from taking place



# Emergency Preparedness and Response

An emergency is a potentially life threatening situation that usually occurs suddenly and unexpectedly. Emergencies may be the result of natural and/or human causes, and no one is immune to such disasters.

Speed counts in emergency response. It is essential to have emergency plans in place so they can be implemented right away. A quick and proper response can help contain the emergency, reduce panic, and decrease potential loss of life and property.

Emergency preparedness and the emergency response plan are two activities of an emergency preparedness and response program. The emergency preparedness and response program is part of the overall occupational health and safety (OH&S) program and gives employers the tools to effectively prevent, prepare, and respond to an emergency.

## LEARNING GOALS

This chapter will enable you to:

- explore the employer's responsibilities regarding emergencies in the workplace
- research several types of emergencies caused by hazards in the workplace and by external sources
- differentiate between emergency preparedness and emergency response
- discuss the key elements of emergency preparedness
- explain the main components of an emergency response plan

## SPREAD THE WORD

We often take our safety and security for granted yet we live in a province faced with emergencies of all kinds including tragic accidents and natural disasters. Some emergencies do, from time to time, fall close to home.

What would you do in the event of a fire at your home? If a family member suddenly collapsed? Do you have an emergency response plan in place at home? Do you know the emergency phone number?

With a partner, create a list of emergencies that could arise within your home. Identify what you would do in each case.

## WHAT WOULD YOU DO?

Cameron has been engaged in a co-op program work term that involves preparing a research report for the local municipal council. He's been asked to analyze youth employment rates in his town and ideas for summer work programs. In fact, he is hoping that if his supervisor is pleased with the work, she might hire him for a summer job. It's the end of his last day and Cameron is just printing the final report when the fire alarm goes off.

There has been no warning about a fire drill, but the alarm has gone off twice in the past two weeks. Both instances were false alarms. He wants very badly to complete his project and leave for the day.

**What would YOU do?**



**Figure 8-1** | Do you know the closest fire exit to your classroom? Do you know where the closest fire alarm is located?

## CHAPTER CHALLENGE PREVIEW



Fire and Emergency Services–Newfoundland and Labrador (FES-NL) is tasked with the implementation of an emergency management strategy for the province, in collaboration with agency partners and stakeholders. This government agency is responsible for planning, preparing for, responding to, and recovering from emergencies.

As a group, brainstorm the types of emergencies likely to occur in this province. Decide which of these emergencies are likely to impact your community.

**Figure 8-2** | Did you know, that since 2012, working smoke alarms are required in every bedroom of a home or dwelling?



**Figure 8-3** | Did you know that an overloaded power bar can get hot enough to burn?

## Types of Emergencies

**Emergency preparedness** means anticipating and preparing for possible emergency situations that could happen in the workplace. An **emergency response plan (ERP)** outlines how employers and workers will respond in the event that an emergency does occur. Having such plans in place, and workers properly trained to implement them, will save lives and limit damage.

Workplace emergencies can arise from hazards present within the workplace. Examples include fires, explosions, and chemical spills. External factors such as severe storms, floods, or power failures may lead to workplace emergencies. Medical emergencies may relate to the health of individual workers or result from widespread pandemics. Emergencies may also include instances of violence against individuals within the workplace and/or against the workplace itself.

### FIRE AND EXPLOSIONS

Fires can start anytime and anywhere if safe work practices and procedures are not followed. Effective prevention strategies can be employed to minimize the risk of fires happening in the workplace through hazard recognition, evaluation, and control procedures.

#### *Fire Prevention Tips*

- Keep the workplace clean and clutter-free. Remove materials that are not being used as they can provide fuel to fires and block emergency exits.
- Keep oily rags in a separate and covered metal container. Do not mix them with regular garbage. Throw oily rags away on a regular basis, following safe disposal guidelines.
- Service machinery and equipment on a regular basis. Overheating and friction sparks can provide the spark to start a fire.
- Immediately report electrical hazards. Fires can start in faulty wiring and faulty electrical equipment.
- Use and store chemicals safely according to Safety Data Sheets (SDSs). SDSs provide important information on flammability and other fire hazards. Ventilation must be provided when using and storing these substances.
- Use **intrinsically-safe** tools, non-sparking tools, and control static electricity as required.
- Ensure outside garbage bins are regularly cleaned to avoid the possibility of a fire outside the building.
- Smoke only in designated areas and extinguish smoking materials in provided ashtrays only. Never smoke in unauthorized areas such as storerooms or chemical storage areas.

**intrinsically-safe**

won't ignite gases or fuel

- Never block sprinklers, firefighting equipment, or emergency exits as this can interfere with quickly extinguishing a fire.
- Post emergency telephone numbers and the company address by the telephone in designated areas of the workplace.
- Train workers to properly use fire extinguishers.

#### In Case of Fire:

- Sound the alarm so the building occupants can escape.
- Follow shut-down procedures of machinery and equipment according to the emergency response plan.
- Go to your designated **muster area** outside the building.
- Do not re-enter the building unless told to do so by the emergency response team or the fire department.

#### **muster area**

prearranged gathering place to which you must report after evacuating the building

## CHEMICAL SPILLS

Chemical spills can pose a significant risk to workers and the workplace. Spilled chemicals can cause irritation or burns if they come into contact with skin. Chemical vapours can cause serious illness if they are inhaled. Chemical spills may also pose a fire hazard to the premises. If you detect a chemical spill in the workplace, it is important to:

1. Report the spill immediately
2. Warn others of danger
3. Evacuate the area

Never go near a chemical spill, unless authorized to do so. Do not attempt to clean up a spill unless you have been trained. If handled improperly, chemicals can cause serious injury or death. If you are exposed to chemicals, get medical attention immediately, even if you feel okay. There could be delayed effects.

**Figure 8-4** | What chemicals may commonly be found in household environments? Where might you find information about their dangers and safe use?





Environment Canada succeeded in its bid to have the World Meteorological Organization Hurricane Committee officially retire the name Igor from its rotating list of hurricane names for the Atlantic.

(Source: Environment Canada)

## SEVERE STORMS

In Newfoundland and Labrador, adverse weather can be a major concern. Hurricanes, thunderstorms, hail, blizzards, ice storms, high winds, and heavy rain can develop quickly and threaten life and property. The following safety considerations apply to both homes and workplaces.

If a storm threatens, secure everything that might be blown around or torn loose—indoors and outdoors. Flying objects can injure people and damage property. Trim dead branches and cut down dead trees to reduce the danger of these falling during a storm. Stock up on heating fuel and ready-to-eat food, as well as battery-powered or wind-up flashlights and radios—and extra batteries.

In the event of a severe storm, always take shelter inside an enclosed building or a hard-topped vehicle.

If you are already indoors:

- Stay away from windows, doors and fireplaces.
- Go to the sheltered area identified in your workplace emergency plan.
- Do not use a land-line telephone, use a cellular telephone.
- If an evacuation is ordered remember to take your emergency kit with you.



**Figure 8-5** | Hurricane Igor struck the island portion of Newfoundland and Labrador on September 21, 2010. More than 30 communities declared a state of emergency.

If you are in your car:

- Park the car away from trees or power lines that might fall on you.
- Remain calm and stay inside.

If you must travel:

- Wait until road maintenance crews have cleared the roads and spread sand or salt to avoid slippery conditions.
- Let someone know your route and expected arrival time.
- Never touch downed or hanging power lines.
- Keep in mind that ice, branches, or power lines may break and fall several hours after precipitation has stopped.

## FLOODS

Emergency preparedness and response plans must identify emergency procedures in responding to floods, including flash floods.

A heavy rainfall can cause floods when the ground is still frozen or still wet from previous rainfalls. In anticipation of flood conditions, precautions must be taken to:

- deal with electrocution hazards.
- store chemicals and important equipment off the ground.
- have pumps and emergency power sources available.
- protect against soil erosion.
- protect and provide water supplies.



**Figure 8-6** | On February 15, 2003, in Badger, NL, flood waters rose 2.3 metres in less than an hour. In the days that followed, extremely cold conditions froze the flood waters and encased a large portion of the town in ice for weeks.

## Important

Carbon monoxide is an odourless and colourless gas. Inhaling the toxic gas can kill you before you are aware you are being exposed. If you must shelter in your car, allow fresh air to enter by opening the window slightly on the sheltered side—away from the wind. You can run the car engine about 10 minutes every half-hour if the exhaust system is working well. Beware of exhaust fumes and check the exhaust pipe periodically to make sure it is not blocked.



## Important

Do not enter a flooded basement unless you are sure the power is disconnected.

Important reminders to follow during and after a flood include:

- Using a battery-operated or wind-up radio, listen to find out affected areas, roads that are safe to travel, and what to do if the local emergency team asks you to leave your home/workplace.
- Only follow routes specified by officials. Any other route may lead you to hazardous areas.
- Never cross a flooded area by foot or vehicle.
- If you choose to drive, do not cross bridges if the water is high and flowing quickly.
- If your car stalls, leave it and find help.
- Do not use flooded appliances, electrical outlets, switch boxes, or fuse-breaker panels until they have been checked and cleaned by a qualified electrician.

## POWER FAILURE

Most power outages will be over almost as soon as they begin, but some can last much longer—up to days or even weeks depending on the extent of damages to the electrical system. Power outages may be caused by freezing rain, sleet storms, and/or high winds. Cold snaps can also overload the electric power system.

In preparation for a power outage whether at home or in the workplace:

- Prepare for alternate sources of heat, light and water.
- Ensure you have enough water and food for 72 hours for each person.
- Ensure alternate heating sources, if used, are connected with shut-off valves by a certified tradesperson.
- Check with manufacturers regarding power requirements and safe operating procedures for using an emergency generator.
- Ensure there is a working carbon monoxide detector in the building and it has battery-powered back-up.
- Use a surge-protecting power bar for sensitive electrical appliances such as TVs and computers.

During a power outage:

- Use a battery-operated or wind-up radio to find out about affected areas and alerts from authorities.
- Use proper holders if using candles and do not leave candles unattended (battery-operated candles are a good option).
- Turn off all lights, except for one inside and one outside, so that both you and hydro crews outside know when the power is back on.

## Important

Do not use home generators, propane, or other gas-powered equipment indoors. They give off carbon monoxide.

If buildings and houses must be evacuated, protect them by following these precautions:

- Turn off main power sources through the main breaker, circuit-breaker panel, or power-supply box.
- Ensure the main electric switch is off and all appliances, electric heaters, TVs, microwaves, and computers are unplugged to prevent damage from a power surge.
- Turn off the water main where it enters the house and ensure the valve, inlet pipe and meter or pump are protected with blankets or insulation material.
- Drain the water from your plumbing system starting at the top of the house and going to the basement. Open all taps, flush toilets several times, drain the hot water tank, and open the drain valve in the basement. Note: If you drain a gas-fired water tank, the pilot light should be turned off—call the local gas supplier to re-light it.
- Unhook washing machine hoses and drain.
- Small amounts of water trapped in horizontal pipes can be treated by adding a small amount of glycol or antifreeze to water left in the toilet bowl, the sink, and bathtub traps.

After a power outage:

- Switch on main power sources through the main breaker, circuit-breaker panel, or power-supply box.
- Turn on electrical equipment starting with thermostats, and continue with turning on appliances and other items in your home or building.
- Ensure water supply and valves are turned back on.
- Make sure the hot water tank is filled before turning on the power.
- Check food supplies in refrigerators, freezers, and cupboards for signs of spoilage.
- Restock your emergency kit so the supplies will be there when needed again.



**Figure 8-7** | Never approach downed power lines.

## MEDICAL EMERGENCIES

A medical emergency is an injury or illness that poses an immediate threat to a person's life or long term health. Medical emergencies can happen anywhere. They may be linked to hazards in the workplace or to health conditions of the individuals.

Medical emergencies resulting from workplace incidents may result in:

- breathing difficulties
- serious bleeding
- broken limbs
- head or spine injury
- loss of consciousness

Medical emergencies may also arise from conditions unrelated to workplace hazards or incidents and require immediate treatment such as:

- heart attacks
- strokes
- diabetic shock
- loss of consciousness
- sudden severe pain anywhere in the body
- sudden dizziness, weakness, or change in vision

During the emergency it is critical to remain calm. Call your local emergency number. Administer first aid if you are a certified first-aider or reach out to a designated first aid respondent within your workplace.



**Figure 8-8** | Who would you call first in the event of a medical emergency at your local sports field?

## PANDEMICS

A pandemic is an outbreak of an infectious disease which affects a large proportion of the population. Pandemics can be spread out over a large region or be worldwide in scope. A pandemic is different from the regular cold viruses or influenza. Pandemics will last much longer with anywhere from 15-35% of workers being absent.

The federal, provincial and territorial governments in Canada continue to work on pandemic preparedness, and many municipalities, organizations, and health care facilities have plans in place. These plans must acknowledge:

- Health care resources may not be readily available due to the high number of sick individuals, including absent health care workers who are sick or caring for sick family.
- Everyone, including other businesses, will be affected in the same way; this leads to less resources, supplies and customers.
- Workers who are not sick may have to stay home and care for family members.
- Schools may be closed forcing parents to stay home to care for children.



**Figure 8-9** | What additional health and safety precautions may you employ during a pandemic in your community?



## THINK ABOUT IT ...

**Why might pandemics be an increasing threat around the world?**

## WORKPLACE VIOLENCE

Occupational Health and Safety (OH&S) Regulations define workplace violence as “an attempted or actual exercise by a person, other than a worker, of physical force to cause injury to a worker, and includes threatening statements or behavior which gives a worker a reason to believe that he or she is at a risk of injury.”

Workplace violence is an unfortunate reality in today’s world. Whether it is actual physical aggression or other forms of workplace violence such as verbal threats or menacing gestures, research suggests that such conflict is on the rise.

According to the Canadian Ministry of Labour, workers who work with the public face a higher risk of workplace violence, particularly those working in the health care industry and justice system. The Canadian Centre for Occupational Health and Safety identifies additional work





**Figure 8-10** Why might service stations be higher risk workplaces? What strategies can such employers use to secure worker safety?

factors, processes, and interactions that can put people at increased risk from workplace violence. Examples include:

- handling money, valuables, or prescription drugs (e.g., cashiers, pharmacists)
- carrying out inspection or enforcement duties (e.g., government employees)
- providing service, care, advice, or education (e.g., health care staff, teachers)
- working in premises where alcohol is served (e.g., food and beverage staff)
- working alone, or in small numbers (e.g., store clerks, couriers), or in isolated or low traffic areas (e.g., washrooms, storage areas, utility rooms)
- working in community-based settings (e.g., nurses, social workers, and other home visitors)
- having a mobile workplace (e.g., taxi)
- working during periods of intense organizational change (e.g., strikes, downsizing)

## BOMB THREATS

Bomb threats are another unfortunate reality in today's world. Every organization should have procedures in place to outline what to do in the event a bomb threat is issued. All threats should be taken seriously.

According to the RCMP, most bomb threats are made by telephone. A bomb threat can be highly stressful for the person who is on the receiving end. With emergency procedures already in place, workers are better able to remain calm.

If such an event occurs, it is important to get as much information as possible from the person who is making the threat. Try to keep the caller on the line as long as possible and write detailed notes by answering the following questions:

1. Is the caller male or female?
2. Does the person have a distinct or unique accent?
3. Does the voice sound disguised or muffled?
4. Is the voice sharp or deep?
5. Are there any background noises like traffic, ringing bells, fax or printer sounds, heavy equipment sounds, etc.?
6. Are the sounds indoor or outdoor sounds?

The receiver of the bomb threat should then follow the emergency response procedure of the organization. This will usually involve immediately notifying a supervisor and/or employer to activate the emergency response plan and call the police.

## SUSPICIOUS PACKAGES

Suspicious packages could be delivered to the home or workplace. Anything received that is out of the ordinary should be treated with caution. Some warning signs include:

- the absence of a return address
- abnormal odour or any type of noise
- visible wires
- visible signs of powder or liquid
- too many postage stamps for the size of the package
- not addressed to a specific person in the home/workplace
- restrictive markings (e.g., Do Not X-ray)
- any type of stains or discolouration of wrapping

If a suspicious package is received, it is important not to open it. Avoid touching or handling it at all. Keep these points in mind:

- Do not handle, shake, smell, or taste the package.
- Do not move the letter or package, leave it where it is.
- Ensure everyone leaves the room and then shut the door.
- Notify your employer immediately and activate the emergency response plan.
- Wash your hands with soap and water.
- Go to the muster area and wait for emergency responders to arrive.

## QUICK CHECK

1. Differentiate between emergencies that arise as a result of hazards in the workplace and those caused by external factors. List examples within each category.
2. Identify three types of emergency situations that you think have the greatest likelihood of impacting your local community. Explain your answer.



### It's the Law...

Under the Criminal Code, it is an offence to knowingly utter or convey a threat to cause death or bodily harm to any person. It is also an offence to threaten to burn, destroy, or damage property.



# CSA Group Emergency Preparedness and Response

CAN/CSA-Z731-03 Emergency Preparedness and Response is a standard that is designed to assist industries and businesses to determine if an emergency plan is required. This is achieved by identifying hazards created by people and natural disasters, and by estimating the degree of risk.

CAN/CSA-Z731-03 also provides assistance in developing the emergency response plan and will also ensure that legal requirements are met in emergency preparedness and response.

The **emergency preparedness and response program** is a written document that outlines step-by-step procedures for carrying out each step within the plan. The overall management of an emergency focuses on three key areas:

- available internal and external resources
- responsibilities of all workplace parties and external responders
- training requirements and access to training



**Figure 8-11** | The six steps in developing an emergency response plan.

## STEP 1—ESTABLISH THE EMERGENCY PREPAREDNESS PLANNING TEAM

An effective emergency preparedness planning team requires the collaboration of individuals with many different skill sets and experience. When establishing this team, there must be an individual or a group in charge. The number of people on the team depends on the size and complexity of the facility, the specific emergency requirements and available internal/external resources.

## STEP 2—ASSESS THE RISKS AND COMPANY CAPABILITIES

Prior to developing an emergency response plan, two types of assessment should be carried out in the workplace:

1. Assess the potential and existing hazards in the workplace
2. Evaluate the company's ability to cope in an emergency (e.g., medical treatment, emergency equipment, and lighting)

Occupational Health and Safety Regulations also require employers to conduct emergency plan risk assessments where there is need to rescue or evacuate workers. Certain work activities such as working at high angles, confined space entries, and working with hazardous substances require written rescue and evacuation procedures.



### THINK ABOUT IT...

**What occupations or work sites exist in Newfoundland and Labrador where workers may require rescue or evacuation?**

Prioritizing, or ranking, workplace emergencies is important to ensure that the emergency most likely to occur is planned for first. After the most likely is planned for, then employers should develop emergency response procedures for hazards and risk according to ranking. When determining potential emergencies, it is important to look at both the severity of the event and the likelihood of it happening.

For example, an airplane crash can happen anywhere. However, an employer whose workplace is close to an airport or in a flight path is more likely to be affected by an airplane crash than those employers who are not. Planning for an aircraft emergency would be high priority for these employers as the likelihood and severity of a plane crash is higher.



**Figure 8-12** | Consider three emergency situations from earlier in this chapter. Evaluate their priority in an emergency response plan for your school.

### STEP 3—DEVELOP THE EMERGENCY RESPONSE PLAN

The objective of an emergency response plan is to clearly outline the actions an organization will take in the event of an emergency. The development of the emergency response plan begins with a company policy and then outlines emergency response procedures.

The response procedures must be written in clear language and be specific to workplace emergencies identified in the assessment (e.g., fire, bomb threat, workplace violence, and chemical spills). They should clearly identify roles and responsibilities of the emergency response team and workers. They should outline specific emergency scenarios and consider after-hour emergencies.

The emergency response plan includes:

- an emergency organizational chart
- how to activate internal and external resources (e.g., calling fire department, ambulance, 911, etc.)
- evacuation procedures and floor plan of the workplace
- in-place sheltering instructions
- equipment and machine shut-down procedures
- location of first aid facilities/kits and procedures
- the location of emergency operations centre
- incident investigation processes

#### *Evacuation Planning*

When situations arise making it unsafe to remain inside the workplace, emergency evacuation may be required. An evacuation plan should take into consideration:

- changes of wind direction/weather conditions
- arrangements with areas taking in evacuees
- that ALL persons within the area at risk must receive emergency instructions
- the length of time it will take to evacuate
- methods of evacuation (private vehicles, public transit)
- routes of evacuation and capacity of roads to handle traffic
- availability of fuel
- care for pets and farm animals
- who and how people with special needs will be looked after
- security of evacuated homes and buildings
- when and how notification and controlled re-entry will be done

In-place sheltering may be required when:

- there is insufficient time to evacuate
- the emergency is of short duration (up to 30 minutes)
- evacuation would be a higher risk

Buildings are constructed to withstand extreme weather conditions and when openings to buildings are kept closed, the air in the building will be relatively uncontaminated and keep occupants safe during an emergency.

## STEP 4—IMPLEMENT THE EMERGENCY RESPONSE PLAN

All workplace parties require training to understand their roles and responsibilities within an emergency response plan. All personnel must have the knowledge and skills to deal with emergencies identified in the assessment.

Training should include the following key elements:

- emergency response procedures
- applicable regulations and standards
- evacuation routes and procedures
- reporting requirements
- first aid and medical assistance procedures
- WHMIS and SDS information
- location and use of fire extinguishers
- location and use of spill kits and clean-up procedures
- communication **protocols**
- use of personal protective equipment
- shut-down procedures
- emergency operations centre processes
- protocols to follow for pandemics

### **protocols**

rules or procedures outlining how something should be done.



**Figure 8-13** | How might first aid training be of benefit to you when applying for future jobs?

Emergency response procedures should be taught when workers are hired. They should then be reinforced on a regular basis throughout their employment. Training will ensure that workers know, for example, what an alarm means, the location of emergency equipment and how to use it, the proper procedures for evacuation, and where to report to be accounted for in muster areas. Clearly defined evacuation routes from all locations are important in emergency training. Mock drills will identify problems in an emergency response plan so they can be corrected before an actual emergency occurs.

Mock drills and other training exercises are important tools in the ERP. The procedures for conducting mock drills and training exercises should be incorporated during emergency preparedness activities, and should include:

- frequency and type of training exercises
- persons responsible for developing, implementing and evaluating the effectiveness of the exercises
- procedure for correcting deficiencies that are found during the exercises
- scheduling of drills and exercises
- terms for conducting annual full-scale exercises

### **STEP 5—EVALUATE THE EMERGENCY RESPONSE PLAN**

After an emergency situation is over or training exercises are completed, it is important for the employer to evaluate response time and plan effectiveness. The ERP should be reviewed and evaluated to determine if the objectives and goals of the plan were met, if problems with the plan were identified, and if recommendations for corrective actions are required.

Once the evaluation has been completed, the employer will assign people to be responsible for implementing any corrective actions, establish timelines for implementation and develop an action plan.

### **STEP 6—CONTINUOUSLY IMPROVE THE EMERGENCY RESPONSE PLAN**

The emergency preparedness and response program should be reviewed on a regular basis and/or when new equipment and work processes have been introduced to the workplace. It is critical to assign responsibilities to all emergency response team members, employer(s), supervisors and workers and to avoid the assignment of the emergency response plan to one person or department.

## QUICK CHECK

1. What is the difference between emergency preparedness and emergency response?
2. Identify the steps in developing an emergency response plan.
3. Identify five potential emergency situations that might apply to your school environment. Evaluate their potential risk. Rank them according to your results.

## Roles and Responsibilities of Employers, Supervisors, Emergency Response Team, and Workers

For an emergency response plan to be effective all workplace parties must consult and participate in the development and implementation of this program. Typically, the employer and emergency preparedness planning team work very closely to assess and identify resources and training requirements.

Roles and responsibilities in the emergency response plan may vary between workplaces, depending on the size and complexity of the workplace, identified hazards and risks, and internal/external resources. An assessment will help the employer to determine specific responsibilities of workplace parties during emergencies. Figure 8-14 on page 127-128 outlines general responsibilities of each group.

<b>Employer</b>	<ul style="list-style-type: none"><li>• provide the resources (human and financial) to develop and implement the emergency preparedness and response program</li><li>• develop emergency procedures and train workers</li><li>• provide emergency and rescue equipment, including personal protective equipment and training in how to use them</li><li>• post a list of first aid providers and location of first aid kits, emergency numbers and floor plan with exit routes and muster stations in the workplace</li><li>• communicate the emergency response plan to all workers</li><li>• ensure workplace inspection checklists include the inspection of first aid kits, current list of first aiders and emergency contact numbers, emergency equipment and exits</li><li>• review the emergency preparedness and response program every three years</li><li>• schedule and practice mock drills and exercises, and review results of emergency exercises and mock drills</li><li>• develop mutual aid agreements with external resources</li></ul>
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*continued*



continued from previous page

<b>Emergency Response Team</b>	<ul style="list-style-type: none"><li>• identify and participate in specialized emergency response training</li><li>• activate and administer the emergency response plan in consultation with the employer</li><li>• consult with the employer in the development of emergency procedures</li><li>• identify procedures for reporting the emergency to all workers and external agencies</li><li>• take command and coordinate all emergency activities</li><li>• activate mutual aid agreements</li><li>• identify hazardous materials in the workplace and provide the list of hazardous materials to emergency responders</li><li>• develop procedures for shut-downs and direct these shut-downs</li><li>• administer first aid and attend to casualties</li><li>• issue the all-clear to workers when it is safe to return to the building</li><li>• review results of emergency exercises and drills</li></ul>
<b>Supervisors and Workers</b>	<ul style="list-style-type: none"><li>• supervisors are to ensure workers understand their roles and responsibilities in the emergency response plan</li><li>• immediately report all hazards and conditions that have the potential to cause emergency situations</li><li>• participate in training exercises and mock drills</li><li>• know escape routes, location of muster stations and where to access names of first aiders, first aid kits and emergency numbers</li><li>• immediately evacuate premises in the event of an emergency and take direction from emergency response team</li><li>• stay in muster area until the all-clear signal has been given</li><li>• wear any personal protective equipment that has been provided</li></ul>

**Figure 8-14** | Roles and responsibilities in emergency preparedness and response.

## QUICK CHECK

1. How are the roles and responsibilities in emergency preparedness and response similar to roles in other components of occupational health and safety?
2. Why is it beneficial to have a designated emergency response team?

 **SPREAD THE WORD**

Visit the website of Fire and Emergency Services–Newfoundland and Labrador (FES–NL) where you will find ideas for creating an emergency response plan for your home that considers such things as:

- safe exits from your home and neighborhood
- meeting places to reunite with family or housemates
- a designated person to pick up young children if necessary
- contact persons close-by and out-of-town
- health information
- a place for your pet to stay
- location of your fire extinguisher, water valve, electrical box, gas valve and floor drain

After reviewing the website, create your home emergency response plan.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 111). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

From your list at the outset of the chapter, identify one type of emergency that may impact your community. Using sites such as the FES–NL, prepare a report that outlines:

1. The nature of the emergency
2. Why you feel it poses a risk to your community
3. The steps you would take before, during, and after such an emergency

 **DIG DEEPER**

Research a significant emergency event that has impacted your community or the province.

1. Identify the event, when it happened, and the impact it created.
2. Describe the emergency response to the event. Who responded? What was the response?
3. Evaluate the effectiveness of the response. To what extent was it effective? Was there something more in your opinion that could have been done?

# Personal Protective Equipment

Workplace health and safety hazards are ideally controlled at the source of the hazard by elimination or substitution, or by other engineering controls. When the hazard cannot be removed from the workplace or the risk reduced to an acceptable level, administrative controls and/or personal protective equipment (PPE) must be used.

PPE is worn by a worker to minimize exposure to occupational hazards. It acts as a barrier to protect the worker from the hazard. The best way for an employer to determine the PPE to be used by workers is to develop a PPE program as part of the OH&S program.

## LEARNING GOALS

This chapter will enable you to:

- explain the purpose of personal protective equipment
- outline the main elements of a personal protective equipment program and the training required in such a program
- examine several types of personal protective equipment, OH&S regulations, and applicable CSA standards
- review the maintenance, care, storage, and pre-use inspections of personal protective equipment

## SPREAD THE WORD

Does it surprise you that 25% of young people entering the workforce show early signs of hearing loss? Why might this be the case? Are we becoming louder as a community? Or is something else happening?

Discuss possibilities with a partner then share your findings with the class.



## WHAT WOULD YOU DO?

Albert has worked for three months at a local grocery store. The tasks in his day are varied. Sometimes he is at the check-out, sometimes at the deli counter, and some days he stocks shelves and creates store displays. He enjoys being able to meet new people and help them locate what they need.

On this particular afternoon, the store is short-staffed. Customers are complaining that there are no grocery carts in the store. Albert agrees to retrieve them from the outside corral. It is a rather dark day with rain showers about to start. Albert checks the locker room beside the door to grab his high visibility vest but there are none to be found. Customers are getting impatient.

**What would YOU do?**



**Figure 9-1** | Why would someone wear a safety vest to retrieve carts from a store parking lot?

## CHAPTER CHALLENGE PREVIEW



The use of PPE varies across industries according to the type of work being conducted. It has become a common element within workplaces. For example, we now expect to see hard hats and work boots on construction sites, life jackets on fishing vessels, and high visibility clothing on road crews.

With a partner, compile a list of where you see personal protective equipment used throughout the community. When or where have you used PPE? What community members or occupations do you observe wearing PPE?

**Figure 9-2** | How many sporting activities can you think of that require personal protective equipment?

# The Purpose of Personal Protective Equipment

**Personal protective equipment (PPE)** provides a layer of protection for workers when other controls are not enough. The Occupational Health and Safety Regulations require the skin, eyes, hands, ears, feet, respiratory system or body to be protected with properly fitting PPE that is appropriate to the work when there is a danger of injury, contamination, or infection.

PPE includes:

- head protection (e.g., hard hats)
- eye and face protection (e.g., glasses, goggles, face shields)
- hearing protection (e.g., ear muffs, ear plugs)
- limb and body protection, skin barriers (e.g., sunscreens and lip balms), full body suits or coveralls, disposable clothes, thermal clothes, flame-resistant clothing, leg protective devices, high-visibility safety apparel (e.g., reflective safety vests)
- hand protection (e.g., gloves, skin barriers)
- foot protection (e.g., steel toe boots)
- respiratory protection (e.g., respirators)
- personal fall arrest systems (e.g., full body harness)

PPE should only be used in the following situations:

- as a short-term solution before final solutions or permanent engineering controls are implemented
- where technology for engineering controls is not available or when an engineering control does not provide enough protection
- during maintenance, clean up, and repair where engineering controls are not feasible or effective
- during emergencies

## QUICK CHECK

1. What is the purpose of PPE?
2. Under what conditions should PPE be used?
3. Where have you seen PPE used? Identify three situations and describe the hazards that might have been present in that situation.

# Elements of a Personal Protective Equipment Program

A personal protective equipment (PPE) program must consider and address all health and safety hazards encountered in a workplace. The success of the program requires the commitment and compliance of employers, supervisors and workers.

To develop an effective PPE program, employers should:

1. Develop a PPE policy for the workplace
2. Conduct a risk assessment for all potential hazards
3. Select appropriate engineering and administrative controls (e.g., signage)
4. Select proper PPE for hazards that cannot be adequately controlled by other means
5. Properly fit PPE to each individual
6. Conduct training and education on its proper use and care
7. Evaluate program effectiveness
8. Modify the program as necessary



**Important**

PPE does not remove the hazard, nor does it provide complete protection for the worker. The hazard still exists in the workplace. For example, wearing and using hearing protection properly lessens the likelihood of hearing damage; however, hearing protection does not eliminate the noise.

## ROLES AND RESPONSIBILITIES RELATED TO PERSONAL PROTECTIVE EQUIPMENT

Employers, supervisors, and workers have responsibilities in a personal protective equipment (PPE) program.

Employers must ...	Supervisors must ...	Workers must ...
<ul style="list-style-type: none"> <li>• perform a risk assessment to identify and control safety and health hazards</li> <li>• develop a PPE program and periodically review the effectiveness of the program</li> <li>• identify appropriate PPE</li> <li>• train workers in the selection, use, care, and storage of PPE</li> <li>• train workers in pre-use inspections</li> <li>• monitor and enforce the use of PPE</li> </ul>	<ul style="list-style-type: none"> <li>• provide proper written and oral instruction regarding precautions of PPE</li> <li>• ensure that workers use or wear PPE, devices, or other apparel</li> </ul>	<ul style="list-style-type: none"> <li>• conduct pre-use inspections</li> <li>• properly wear PPE</li> <li>• participate in training</li> <li>• care, clean, maintain, and properly store PPE according to manufacturer's guidelines</li> <li>• report any PPE concerns to supervisors</li> </ul>

**Figure 9-3** | How do responsibilities within a personal protective equipment program relate to the concept of the Internal Responsibility System?



## THE IMPORTANCE OF TRAINING WITH PERSONAL PROTECTIVE EQUIPMENT

Any PPE program is incomplete without training to ensure that it is worn and used properly. Workers can be trained in groups or on a one-to-one basis. When developing a training program, all workers who use any type of PPE, either on a short-term or long-term basis, should be included.

Worker training should include:

- the reasons why the PPE was chosen according to the risk assessment
- the goals of the PPE program
- how to properly fit the equipment
- how to conduct a pre-use inspection
- how to properly wear the equipment
- limitations and capabilities of PPE
- proper care of PPE
- proper disposal of damaged or expired PPE

Regular evaluation of the PPE program will help ensure that the program is effectively working for the workplace.

## QUICK CHECK

1. How could the use of PPE without proper training lead to incidents and occupational diseases?
2. What might you discover in a pre-use inspection for (a) safety glasses, (b) hard hats and (c) a body harness?

## Types of Personal Protective Equipment

There are many types of PPE, including head protection, eye protection, hearing protection, personal fall arrest systems, respiratory protection, hand protection, and foot protection.

### HEAD PROTECTION

Workers exposed to hazards that may lead to head injuries must be given protective headwear such as hard hats. Hazards that may lead to the requirement for head protection include falling, flying or thrown objects or any other activity that can cause injury to the head. It is the employer's responsibility to conduct a risk assessment to determine if any of these conditions exist. If so, workers are to use and wear protective headwear.



**Figure 9-4** | There are many types of work operations where head protection is used including tree trimming, construction work, shipbuilding, logging, mining, electric and communication line construction/maintenance.

The CAN/CSA Z94.1 standard “Industrial Protective Headwear” outlines the requirements of head protection. Employers and workers may reference this standard when selecting head protection for the workplace.

**Important**

Bump Caps are worn when there is a risk of impact with stationary objects such as working in spaces with low ceilings or that have hanging fixtures that you might bump against. They do not offer protection from falling/flying objects. They are not to be used when CSA-approved protective headwear is required, since they do not offer the same level of protection. Hard hats are more durable and have a shock absorbent lining.

Do	Don't
<ul style="list-style-type: none"> <li>• wear and care for hard hats according to manufacturer guidelines</li> <li>• conduct a pre-use inspection</li> <li>• replace if showing signs of wear and tear</li> <li>• clean head protection regularly</li> <li>• contact manufacturer before adding any accessories such as bandanas, scarves or stickers</li> <li>• winter liners can be worn, but inspect them to ensure they do not interfere with the fit</li> <li>• if using caps or liners to cover the entire head of hair, ensure they are flame resistant if exposed to sparks and hot metals</li> <li>• use only CSA-approved head protection</li> </ul>	<ul style="list-style-type: none"> <li>• wear hard hats backwards unless it has been approved by CSA to be worn in that manner</li> <li>• drill holes or puncture the hat in any way</li> <li>• apply paint to the shell as this covers cracks and dents</li> <li>• leave hard hats in direct sun because UV rays can break down plastic</li> <li>• wear baseball hats under hard hats</li> <li>• remove headgear (suspension)</li> </ul>

**Figure 9-5** | The Do's and Don'ts of Head Protection



**Figure 9-6** | Bump caps can resemble hard hats. Some are much more casual. But, they should never be worn as a substitute for hard hats.

## Important

Contact lenses do not offer protection from eye hazards. Only safety glasses or goggles can provide adequate protection.

## EYE AND FACE PROTECTION

When workers are exposed to hazards that may lead to eye and facial injuries they must be given protective eye and face protection such as glasses, face shields, and goggles. Many work environments exist where the eyes and face must be protected from injury by safety hazards such as flying or falling particles, protruding objects, and health hazards such as solvents, radiation, heat, sparks, or glare.

The CAN/CSA Z94.3-07 standard “Eye and Face Protectors” identifies seven classes of eye and face protection:

- spectacles (e.g., glasses)
- goggles
- welding helmets
- welding hand shields
- non-rigid helmets
- face shields
- respirator face pieces

## Really!?!



Every day an estimated 1 000 eye injuries occur in the North American workplace. With proper eyewear, it is estimated that 90 per cent of these injuries could be prevented.

Source: CNIB

## CAUSES OF EYE INJURIES IN THE WORKPLACE

Studies show that 70% of all eye injuries result from flying or falling objects or substances. The most common causes of workplace eye injuries are:

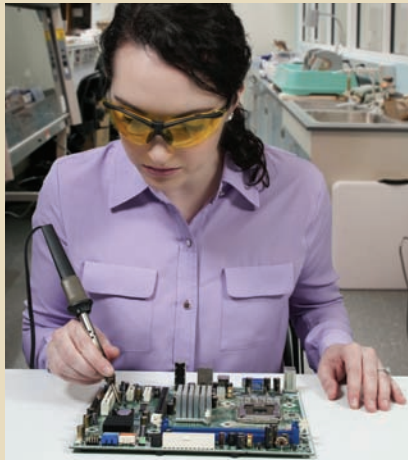
- flying objects, such as bits of metal, glass, stone, or wood
- unsafe handling of tools
- particles such as sand or sawdust
- chemical splashes
- radiation
- sparks and slag from welding and cutting
- pipes and wire sticking out of walls
- objects hanging from ceilings
- sun and wind

Source: CNIB

Conditions where workers are exposed to dust, smoke, irritating fumes or vapours, radiant heat, molten metals, or liquid irritants will require an assessment by the employer to determine if additional precautions are needed.

## Safety Glasses

- partial and/or side protection for impact resistance and non-ionizing radiation
- sturdier frames than regular glasses and often heat resistant
- lenses made of materials such as glass, plastic, or polycarbonate, which help make them impact resistant and stronger than regular glasses
- lenses designed so they cannot be pushed into the eyes
- available as prescription lenses



## Goggles

- worn when more protection is required than safety glasses
- provide protection from chemical splashes and particles
- a complete barrier is formed around the eye and held in place by a headband or other suitable means
- available in a number of different styles, including flexible or cushioned goggles, plastic goggles and eyecups
- goggles must be properly fitted if wearing over prescription glasses



## Face Shields

- protect the face and neck from high-hazard impact such as flying particles, sprays of hazardous liquids, splashes of molten metal, radiant energy in welding, etc.
- worn with safety glasses or goggles



**Figure 9-7** | It is the employer's responsibility to conduct a risk assessment to determine what level of protection is required and to deliver training and instruction in any PPE required for a job.

## Do

- wear and care for eye and face protection according to manufacturer guidelines
- conduct a pre-use inspection
- replace if scratched, dented, or broken
- ensure eye and face protection is tight-fitting where appropriate
- use only CSA-approved eye and face protection
- change prescription safety glasses when prescription changes

## Don't

- consider prescription eyeglasses as protective equipment
- wear eye and face protection that is not properly fitted
- use face shields without safety glasses or goggles
- wear contact lenses if you are a welder or welding personnel

**Figure 9-8** | The Do's and Don'ts of Eye Protection

## decibels

a unit of measure for sound

## HEARING PROTECTION

Occupational health and safety legislation states that during an eight-hour work day, 40-hour work week, the average daily exposure to noise must not exceed 85 **decibels**. When noise cannot be reduced to acceptable levels through engineering controls and/or administrative controls, then hearing protection devices are required. The type of hearing protection is selected based on the risk assessment completed at the workplace and must be appropriate to the job and individual.

The CAN/CSA Z94.2-02 standard “Hearing Protection Devices—Performances, Selection, Care and Use” outlines different types of hearing protection. They include:

1. Ear plugs
  - pliable inserts that are placed inside the ear canal
  - generally inexpensive
  - service life ranges from single time use to several months
  - made from soft materials such as rubber, plastic, or foam
  - compact and useful in work situations where other PPE such as respirators and safety glasses or goggles are worn
2. Semi-insert ear plugs (canal caps)
  - seal the external opening of the ear
  - a soft, rubber-like material is held in place by a lightweight headband worn under the chin
  - easy to insert and remove
  - convenient for workers who are in and out of noisy areas during a shift
3. Earmuffs
  - consist of two cups or dome-shaped devices that fit over the entire external ear
  - cups are held in place by a headband
  - can be used in conjunction with earplugs
  - highly visible, easily retrievable
  - convenient if worker is wearing gloves or hands are dirty



**Figure 9-9** | What additional hazards might be present working on an airport tarmac?



**Figure 9-10** | Consider your list of youth-related jobs. Would any of them require hearing protection?



## Selection of Hearing Protection

There are several factors that must be considered when choosing hearing protection. These include:

- the daily noise exposure of workers
- the physical characteristics of workers who will be wearing the equipment and any limitations they may have
- compatibility with other PPE that may be worn at the same time
- the temperature, humidity and any other environmental conditions of the workplace
- comfort level and individual preferences
- the ease of use
- communication needs of the worker who is using it

Do	Don't
<ul style="list-style-type: none"><li>• wear hearing protection at all times during periods of noise exposure</li><li>• wear and care for hearing protection according to manufacturer guidelines</li><li>• clean devices regularly</li><li>• conduct a pre-use inspection</li><li>• replace hearing protection if it is showing signs of wear and tear</li><li>• ensure you can still hear what is going on around you</li><li>• ensure hearing protection is compatible with other PPE</li><li>• use only CSA-approved hearing protection</li><li>• get fit-tested to ensure you are using the correct protection</li><li>• speak to your employer about finding what works best for your comfort</li></ul>	<ul style="list-style-type: none"><li>• wear hearing protection if it does not fit properly</li><li>• modify hearing protection</li><li>• wear radio headsets as a replacement for hearing protectors</li><li>• wear dirty hearing protection</li><li>• remove hearing protection due to discomfort</li></ul>

**Figure 9-11** | The Do's and Don'ts of Hearing Protection

## LIMB AND BODY PROTECTION

PPE is available to provide limb and body protection to workers. Hot surfaces, open flames, sharp edges, knives, chain saws, electricity, chemicals, moving vehicles and heavy equipment, temperature, biohazards, and radiation are just some hazards from which workers need to be protected.

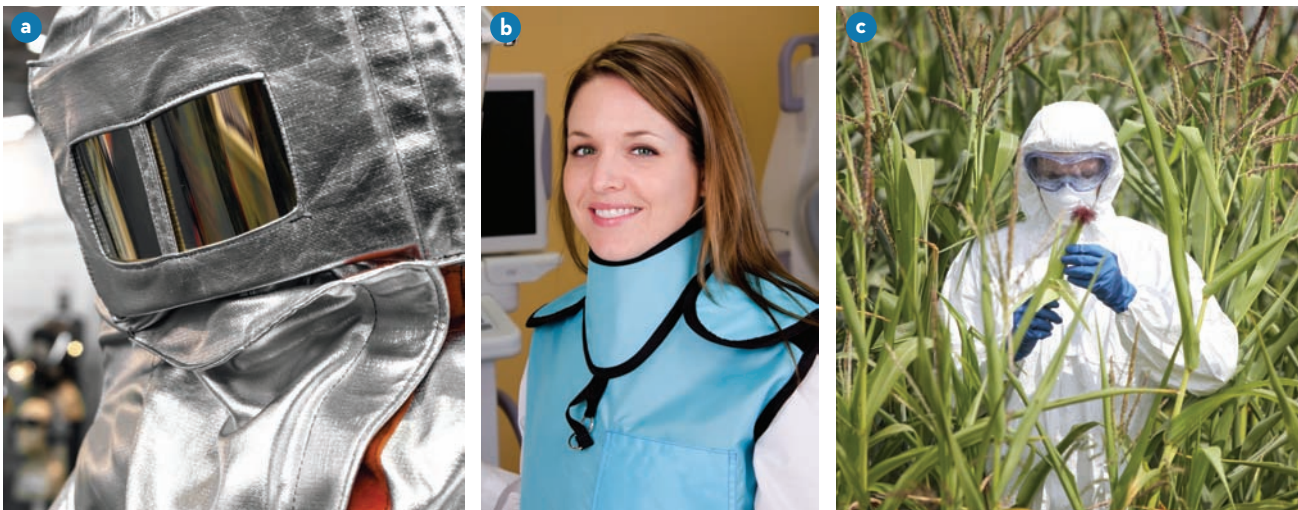
Examples of PPE for limb and body protection include:

- high-visibility safety apparel (HVSA)
  - provides visibility of workers to other workers and the public in daytime and nighttime conditions when working around moving vehicles or heavy equipment
  - includes reflective safety vests
  - three colours may be used: red, orange-red or yellow-green



- disposable clothing made of plastic or reinforced paper
- leaded clothing such as aprons and gloves to protect against x-rays or gamma radiation
- cold weather clothing such as thermal insulating underwear
- pants or chaps with sewn-in ballistic nylon pads to protect the legs
- flame-resistant clothing
- immersion suits (e.g., survival suits)
- personal flotation devices and lifejackets

Workers should always dress appropriately for workplace, weather, or environmental conditions. Consider rain suits, rain boots, winter boots and snow suits, sunscreens and lip balms, hats with a wide brim for sun protection, knee pads, and insect repellent.



**Figure 9-12** | Limb and Body Protection is used in many occupations. What could these workers be protecting themselves from?

Do	Don't
<ul style="list-style-type: none"> <li>• use the right limb and body protection for the job</li> <li>• follow manufacturer's guidelines</li> <li>• clean equipment before and after use</li> <li>• store limb and body protection properly</li> <li>• use only CSA-approved equipment, if applicable</li> <li>• ensure protection does not have any holes or defects</li> </ul>	<ul style="list-style-type: none"> <li>• leave clothing out in the weather</li> <li>• wear clothing that does not fit properly</li> <li>• throw disposable clothing in regular garbage if soiled or contaminated</li> </ul>

**Figure 9-13** | The Do's and Don'ts of Limb and Body Protection

## HAND PROTECTION

Hand protection must be worn to protect against hazards such as skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, or harmful temperature extremes.

When selecting hand protection, it is critical to consider the type of work that is being done, including the products, tools and equipment that are being used to do the job (e.g., chemicals, biohazards, moving/rotating parts). Additional considerations include:

- the amount of protection required
- the amount of dexterity and flexibility needed
- the amount of grip that is needed
- the comfort of the individual
- potential or known latex allergies
- skin conditions (e.g., eczema, psoriasis, etc.)
- cuts and abrasions on hands
- environmental factors such as temperature, humidity, and moisture
- the hand size of workers
- disposable versus reusable options and costs

### Types of Hand Protection

#### 1. Gloves

Many different gloves exist, made of different types of material, each providing protection against a specific hazard.



**Figure 9-14** | How do these gloves provide protection for the workers using them?

## ? Really!?!

Young workers in NL have suffered more than 800 hand injuries in the past five years.

Type of Glove	Use
General Work Gloves	<ul style="list-style-type: none"> <li>• protect against sharp objects and abrasions but not against liquid</li> <li>• used mostly as liners in rubber or synthetic rubber</li> <li>• leather worn when handling rough/sharp objects or when working around sparks</li> </ul>
Metal Mesh or Cut-resistant Gloves	<ul style="list-style-type: none"> <li>• protect against lacerations when using tools with sharp edges or cutting materials (e.g., meat cutter)</li> <li>• should not be worn when working with electrical equipment</li> </ul>
High Voltage Rubber Gloves	<ul style="list-style-type: none"> <li>• protect against electrical shock hazards when working on or near electrical equipment</li> </ul>
Chemical-resistant Gloves	<ul style="list-style-type: none"> <li>• made of rubber, neoprene, butyl rubber, Teflon, etc.</li> <li>• used when dexterity is required and prevents skin contact with harmful chemicals and solvents</li> </ul>
Lead-lined Gloves	<ul style="list-style-type: none"> <li>• may be rubber, plastic, or leather shell</li> <li>• protect against radiation hazards as lead acts as a barrier to x-rays</li> </ul>
Heat-resistant Gloves	<ul style="list-style-type: none"> <li>• protect against flames and elevated temperatures</li> </ul>
Anti-vibration Gloves	<ul style="list-style-type: none"> <li>• protect against vibration hazards associated with some tools</li> </ul>

**Figure 9-15** | Characteristics of Protective Gloves

**Important**

When working with chemicals and controlled products, it is **CRITICAL** that SDSs are used to determine what type of PPE is required. The type of protection required is based on the chemical or hazardous product, work activity (e.g., totally immersed versus splash), the concentration of the product, and the length of time of contact.

Do	Don't
<ul style="list-style-type: none"> <li>• use the right glove for the right job</li> <li>• follow manufacturer's guidelines</li> <li>• clean before and after use</li> <li>• store gloves and creams properly</li> <li>• ensure to review the SDS of hazardous products and manufacturer's guidelines</li> <li>• ensure gloves do not have any holes or defects</li> </ul>	<ul style="list-style-type: none"> <li>• wear gloves that do not fit properly</li> <li>• touch the outside of gloves with your bare hand when removing</li> <li>• touch door knobs, light fixtures, etc. with your gloves on</li> </ul>

**Figure 9-16** | The Do's and Don'ts of Hand Protection

**2. Barrier Creams**

Barrier creams provide protection to the hands and other areas of skin from harmful substances. Creams are used by workers to prevent irritation due to work activities such as frequent hand washing. They do not provide protection from highly corrosive substances. Sunscreens are a type of barrier cream that protect workers from the harmful effects of the sun. They must be reapplied periodically in order to be effective.

## FOOT PROTECTION

Protective footwear must be worn by workers in areas where there is a potential for foot or ankle injuries. Hazards include falling and rolling objects, sharp objects that can pierce the sole of the boot, electrical shocks, or slips and falls.

The employer is responsible to assess the workplace and work activities to determine the appropriate protection needed for the worker's feet and ankles and to ensure that workers wear the appropriate footwear. Comfort and fit are important factors. Employers are required to take the following factors into consideration when selecting the type of protection needed:

- the possibility of slipping
- uneven ground
- ankle protection
- foot support
- the potential for crushing of the feet
- temperature extremes (i.e., extremely hot or cold)
- the possibility of working with corrosive products
- puncture probability
- the possibility of electrical shock and static charges

Type of Footwear	How It Works
Protective Toecap	Protects against impact to the toes
Protective Sole	Protects against penetration of sharp objects through the sole of the shoe
Metatarsal	Protects the metatarsal (top side) of your foot
Electric Shock Resistant	Made of insulating materials that protects against electric shock
Static Dissipative	The sole of the shoe allows for small charges of electricity to be dissipated into the walking surface
Conductive	Made of conductive materials that allows the shoe to be electrically grounded
Chainsaw	Made of materials that will prevent chainsaws from cutting through the footwear

**Figure 9-17** | There are many types of protective footwear to reflect the specific needs of workers within varied work situations.



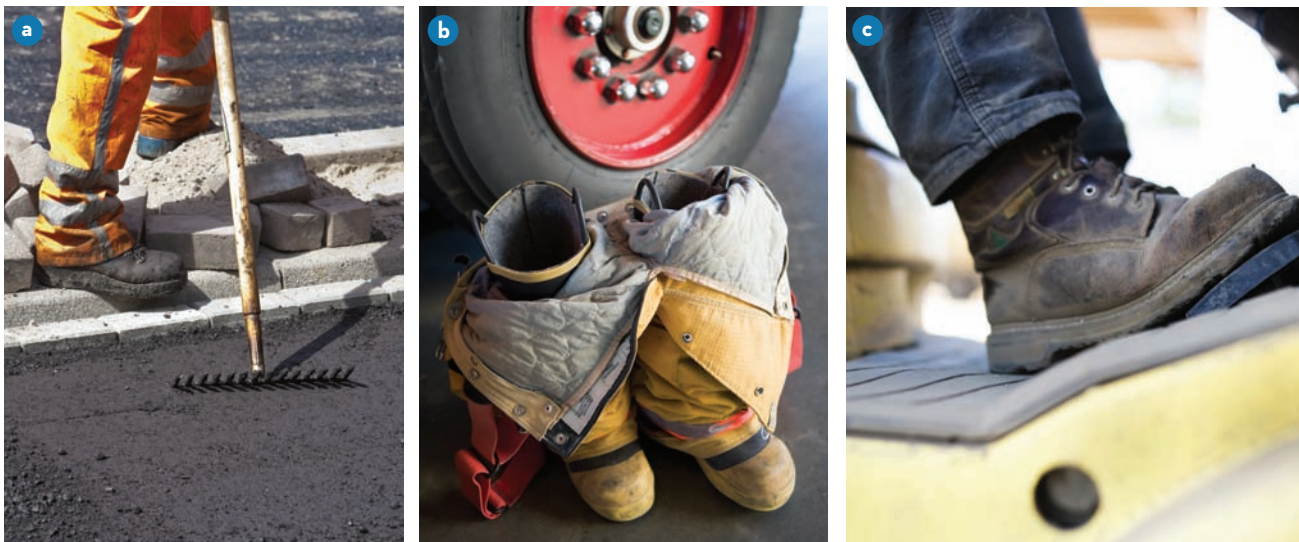
## Do

- try on footwear towards the end of the day. Feet typically swell throughout the day and you'll get a better fit
- try on both to ensure they fit the same
- try footwear on with your work socks
- ensure footwear is CSA-approved
- ensure footwear does not have any holes or defects

## Don't

- leave laces untied on the job, they can get caught in moving equipment or create a tripping hazard

**Figure 9-18** | The Do's and Don'ts of Protective Footwear



**Figure 9-19** | How do the boots in these images provide protection to workers?

## Really!?!?



Among teachers and workers in clerical occupations foot injuries account for 15 percent to more than 20 percent of all disabling injuries. Not knowing about the need for foot protection in workplaces like schools or offices can play a role in the onset of foot problems.

Source: CCOHS

A grading system is also used to identify the protection class of footwear by using numbers and letters. You will find these grading codes on the outside or inside of one of the shoes.

1. Level of toe protection (1 for Grade 1, 2 for Grade 2, 0 if not)
2. Puncture-resistant sole (P if present, 0 if not)
3. Metatarsal protection (M if present, 0 if not)
4. Type of electrical protection (E if shock resistant, S if static dissipative, C if conductive, 0 if no protection)
5. Chainsaw protection (X if present, 0 if not)

## RESPIRATORY PROTECTION

When workers are exposed to hazardous atmospheric conditions, such as chemical and biological hazards, the employer is responsible to conduct an assessment to identify ways of controlling these health hazards. The employer should look at ways of eliminating or removing these hazards from the workplace. Respiratory protection, such as respirators, should only be used when other controls are impractical.

Respirators cover the mouth and nose or the entire face of workers and protect workers by removing contaminants or supplying air. Respirator selection is based on:

- the assessment of atmospheric hazards, work processes, and environment
- an understanding of regulatory guidelines or standards
- manufacturer's guidelines on respirator types and limitations to identify which is the best for the job and the worker

Selection of a respirator is made by a qualified person only. If respirators are required to be used in the workplace, the employer is responsible to develop and implement a respiratory protection program that meets the requirements of CAN/CSA Z94.4 "Selection, Use and Care of Respirators."

### Types of Respirators

There are three types of respirators that may be used as part of a respiratory protection program.

Type of Respirator	How It Works
Atmosphere-supplied Respirators	Supply clean breathing air to workers through either: <ul style="list-style-type: none"><li>• a supplied air breathing apparatus (SABA) where air is supplied through an airline or hose</li><li>• a self-contained breathing apparatus (SCBA) where air is supplied through a canister that is carried by the worker. SCBA respirators do not clear or filter the air.</li></ul>
Air-purifying Respirators	Use an air-purifying filter or cartridges to clean the air before it is inhaled: <ul style="list-style-type: none"><li>• particulates such as dust, mist, fumes, etc. are removed</li><li>• clean breathing air is not independently provided</li></ul>
Special Use Respirators	Supplied air suits: <ul style="list-style-type: none"><li>• escape only respirators</li><li>• air supply is limited</li></ul>

**Figure 9-20** | Can you think of workplaces within the province where each type of respirator might be used?





**Figure 9-21** | What type of respirators do you see in each photograph?

### Do

- train with a competent and qualified trainer
- use the right equipment for the right job
- follow manufacturer's guidelines
- clean respirators before and after use
- store respirators properly
- get fit-tested
- complete a user seal check before each use
- follow a regular change-out schedule
- use only *National Institute of Occupational Safety and Health (NIOSH)* certified respirators

### Don't

- wear a respirator with a tight-fitting face piece if you have a beard, or any facial hair. Facial piercings will have to be evaluated during fit-testing
- leave the respirator in dusty or unsanitary areas
- break the air seal

**Figure 9-22** | The Do's and Don'ts of Respiratory Protection

## PERSONAL FALL ARREST SYSTEMS (PFAS)

When a worker is exposed to the hazard of falling from a work area, the employer is responsible for conducting an assessment to identify ways of preventing falls. First and foremost, the employer should look at ways of eliminating or removing the fall hazard from the workplace. If this is not practical, then he/she should go through the hierarchy of controls to determine how falls will be prevented in the workplace.

**Fall protection** is required in any of the following work situations. Work that is:

- three meters or more above the nearest safe surface or water
- above a surface or object that could cause injury to the worker if the worker were to fall on it; or
- above an open tank or pit that contains hazardous materials

The employer is responsible to write a fall protection plan for workers who use personal fall arrest systems (PFAS) or personnel safety nets.

Fall protection systems are either passive or active. They are differentiated by the equipment required and how the worker makes use of them.

**Passive systems** do not require special equipment or active participation from the worker. Passive systems are not considered PPE as the worker is not required to wear equipment or devices. Some examples of a passive system include:

- guardrails/hand rails
- personnel safety or debris nets
- control zones
- temporary flooring
- ladder cages

**Active systems** require workers to actively participate by putting on a harness and connecting to anchor points. An active fall protection system includes fall restraint or travel restraint and personal fall arrest systems (PFAS), which consist of the full body harness, connecting device, and anchorage point. Active systems also require a fall rescue plan.

### fall protection

a system that includes a full body harness, personnel safety net, body belt, structure or other equipment or device that restrains a worker who is at risk of falling or stops a worker who has fallen



### It's the Law...

Anyone who uses fall protection equipment must be trained by a WorkplaceNL-approved Fall Protection Training Provider.



**Figure 9-23** | How many occupations can you think of where fall protection systems are required?

## The Welder Who Wouldn't Give Up

Tom Walsh of Placentia has been welding for 25 years and can tell many stories. The one freshest in his mind unfolded on Monday, March 7, 2011 while working for Pennecon Heavy Civil at Long Harbour. Sometimes life puts you in places you don't expect to go, and on this day, Tom's life changed forever.

Just after lunch, Tom got a call at the welding shop, asking if he could drive down to the wharf to do some work on a single barrel tagline located on a crane boom. The tagline operates on a coil spring system that maintains constant positive tension on a clamshell bucket or other types of crane loads. Tom's task was to cut two inches off the recoil spring.

Prior to carrying out the work, a job safety assessment was completed, with 'stored energy' listed as a hazard associated with cutting the recoil spring. In physics, stored energy is power that has not been used or dissipated, and can take on many forms, such as unused electricity or tension in a spring.

Tom and his coworkers were confident completing the task at hand—after all, they had carried out similar repairs many times before, including a job earlier that day.

Heavy equipment mechanics working on the crane discovered that the cable reel had been forced forward, and that approximately one centimetre of the 150 centimetre long recoil spring had become jammed around the cable reel which leads to the crane bucket. This caused the cable reel to be forced forward, preventing access to the retaining bolt.

Tom's job was to cut the recoil spring so it could be removed from around the shaft, allowing the cable reel to be returned to its normal position for access to the retaining bolt. The spring assembly was left in the barrel, keeping the 45 centimetres that had already been removed, outside. Workers at the site conducted a visual inspection of the recoil spring to determine if it was under any tension. Finding no visual evidence, a physical test was carried out by tapping the spring in several places. When no evidence of tension was identified, Tom was advised to start cutting.

In addition to the PPE he was wearing, Tom donned a personal flotation device (PFD) because he was working near water, pulled his welding shield down over his face and lit his welding torch. "I was standing about arm's length from the recoil spring and when I started cutting, the spring snapped and the casing blew apart," recalls Tom. "I was knocked off my feet and could feel a stinging pain in my chest and left hand." When he reached for his face, the welding shield disintegrated. Tom credits the welding shield and the padded PFD with saving his life.

Tom was immediately assisted by two heavy equipment mechanics and a labourer working nearby, and then taken to the onsite medic's office. For the next several months Tom was back and forth to the hospital for CT scans, rehabilitation, physiotherapy, and emotional therapy. He was also fitted with a splint. "I was in an awful mess both physically and emotionally," says Tom. "I had some great people looking out for me and that helped a lot."

Every effort was made to save his fingers, but on July 19, 2011, Tom learned that his bones weren't healing and one of his fingers would need to be amputated. "I was prepared for it," he says. "I knew everything that could be done for me was being done."

In April 2012 Tom went back to work on an ease back program, working only a few hours per day. Only a few weeks into his ease back program, Tom learned a second finger needed to be amputated. "I was prepared mentally to lose one finger, but not two. The doctors wanted me to have the fingers cut off at the joints, but I told them to remove the whole fingers. They would just get in the way."

Tom has undergone five surgeries since the March 2011 accident at Long Harbour, but is now back to working fulltime in his pre-injury job. While recovering, Tom wasn't idle. He completed several online health and safety training courses, as well as a welding inspector course. He has also dedicated himself to conditioning exercises strengthening his hand. He laughs, "My bad hand is probably stronger than my good one now."

In addition to his online safety courses, Tom learned to sew, and modified his welding gloves so the left glove had three fingers instead of five. These gloves are now being professionally modified by WorkplaceNL.

Through it all, Tom is still one of the most positive people you will ever meet. "You really have to make the best of what you have," he says. "I had an unfortunate accident, but it could have been worse."

As a result of Tom's March 2011 accident, several measures have been taken by Pennecon Heavy Civil to ensure something like this never happens again. It was determined that the tag-line assembly should have been taken offsite and repaired in a controlled environment. Any additional review of specialty equipment will be conducted to ensure manufacturer recommendations are followed. The company is also ensuring that a section on 'stored energy' be added to their health and safety manual and reviewed by all workers.



**Figure 9-24** | Tom credits a welding shield and personal flotation device with saving his life.



Do	Don't
<ul style="list-style-type: none"> <li>• get trained by a WorkplaceNL-approved training provider before you use fall protection equipment</li> <li>• use the right equipment for the right job</li> <li>• follow manufacturer's guidelines</li> <li>• inspect your equipment before each use</li> <li>• ensure your employer has a fall rescue plan before you use fall protection equipment</li> <li>• use only CSA-approved fall protection equipment</li> <li>• store equipment protected from sunlight, heat, cold, and chemicals</li> <li>• get equipment inspected by a competent inspector every year or according to manufacturer guidelines</li> </ul>	<ul style="list-style-type: none"> <li>• work at heights or do any work activity that requires a PFAS without being trained in its use</li> <li>• use defective equipment (report defective equipment to the employer immediately)</li> <li>• use any equipment that was involved in a fall</li> <li>• use equipment if the manufacturer labels are missing</li> <li>• use equipment that is not compatible (i.e., not meant to be used together)</li> </ul>

**Figure 9-25** | The Do's and Don'ts of Fall Protection Equipment

**Really!?!**



Statistics show that the majority (66%) of falls happen on the same level resulting from slips and trips. The remaining 34% are falls from a height.

Source: CCOHS

## MAINTENANCE AND CARE OF PERSONAL PROTECTIVE EQUIPMENT

The effectiveness of PPE cannot be certain without proper maintenance, inspection, care, cleaning, repair and storage.

All PPE must be inspected before each use. Pre-use inspections are critical to identify damaged or malfunctioning parts. Manufacturer specifications will provide direction to users on how to properly inspect and maintain the equipment.

If PPE is not performing as it should, it must be removed and properly discarded. Using poorly maintained or broken PPE could be more hazardous to workers than not using any form of protection at all. Workers gain a false sense of security and think they are protected when, in reality, they are not.

## ADDITIONAL PRECAUTIONS IN THE WORKPLACE

While some workers may not require PPE, we can apply additional best practices to minimize risk of incident or injury.

### Clothing

Workers must wear clothing that does not expose them to unnecessary hazards. Oversized and ill-fitting clothing can become hazardous when working around machinery and equipment with moving parts. The potential for getting caught is higher than it would be if the clothing fit closely to the body.

### Jewellery

Hanging earrings, wristwatches, bracelets, and rings are not to be worn in workplaces where there is a hazard of them getting caught in machinery and equipment. The only exception is a Medical Alert bracelet which is then worn with transparent bands that keep it close to the wrist.

### Hair and facial hair

Long hair or beards could get caught in rotating or moving machinery, chains, belts, etc. Ensure it is tied back while in the workplace.

## QUICK CHECK

1. Create a graphic organizer to record each type of PPE, examples of each, and when they should be used.
2. Who determines what PPE should be utilized in the workplace?
3. PPE is only as good as the people who use it. Would you agree with that statement? Why or why not?





## SPREAD THE WORD

Consider that a chainsaw has a decibel level of 120. A power mower has a decibel level of 96. A quiet suburb has a decibel level of 50 while a quiet rural area has a decibel level of 30.

Research the decibel level of noises you hear on a regular basis. Can we, as a community, minimize the risk to our hearing? Create an infographic that shares a message of safety as it applies to ear protection. You might include statistics, images, cartoons, or examples of local cases to convey your findings.



## WHAT WOULD YOU DO **NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 131). After reading this chapter, would your answer change? Why or why not?



## CHAPTER CHALLENGE

Identify a local industry, or industry of interest to you, that might require personal protective equipment. Conduct research through the Internet, interviews with local businesses, or workers in the field to determine:

1. The nature of the work requiring PPE
2. The PPE required
3. Training required to use the PPE
4. Additional engineering or administrative controls used in the environment to keep workers healthy and safe

Prepare a brief report to share with the class.



## DIG DEEPER

Personal protective equipment is used outside the workplace. One common application is sports where athletes, amateur and professional, use protective equipment to avoid injury. Select a sport of interest to you. Research to determine how the use of protective equipment has evolved throughout the years. What standards and regulations are in place for the sport? Are they, in your opinion, adequate to protect athletes?

## MY OH&S

It is time to update your course portfolio. But before you do, quickly review the pages of Unit 2. Revisit the activities you completed for the unit. What information stood out for you the most? Did anything surprise you? What information would you want to share with a friend or co-worker? Consider those items for possible inclusion in your portfolio.

### THE BIG IDEAS...

Select a minimum of five critical ideas that you have learned from the unit. To complete your list, consider the following:

- Why is it important?
- Why is it relevant to me?

### LEGALLY SPEAKING

Identify any significant information related to the law, your rights and your responsibilities that you might expect to encounter as a worker, supervisor, or employer.

### USEFUL RESOURCES

Create an annotated list of resources for future reference. Your list should include:

- the name of the resource
- why it was included
- where it can be located

Remember, resources may include documents, brochures, videos, web pages, organizations, and people.

### CAREER POSSIBILITIES

Identify at least one potential career related to occupational health and safety that might be of future personal interest including:

- a brief description of that career
- what it is you find interesting about that career
- any qualifications required
- programs of study and their locations

Your career option may be selected from within the unit or from external sources.

# Occupational Health and Disease Prevention

A healthy workplace is important. Too many workers are affected by occupational illnesses and diseases, as well as musculoskeletal injuries. Maintaining our physical and psychological well-being is key to a positive and productive work life. Becoming aware of risk factors and developing control strategies to avoid their ill effects are important first steps.

To what extent do you agree that “laughter is the best medicine”?



## UNIT AT A GLANCE

**CHAPTER 10** Occupational Health and Disease Prevention

**CHAPTER 11** Psychological Health and Safety

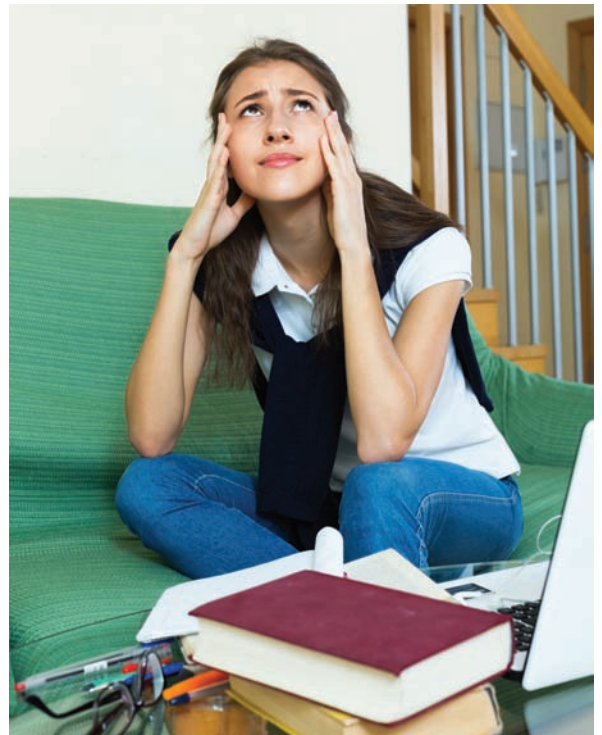
**CHAPTER 12** Ergonomics

### LET'S GET STARTED

In small groups, brainstorm answers to the following questions:

- How would you define stress?
- How are high school students subject to stress?
- Can stress have a physical impact?
- What strategies do you find effective in dealing with stress?

As a group, represent your answers through a collage of images or other visual media. Present your response to the class.



### My OH&S

This course is about you and your future in the workplace. As you complete unit three, keep in mind the following questions:

- What are the most important OH&S ideas for me to remember?
- What OH&S laws affect me?
- What OH&S resources could be useful to me now and in my future work life?
- What careers might be available in the area of OH&S?

# Occupational Health and Disease Prevention

The nature of occupational disease makes the issue difficult to address. Occupational diseases result from a variety of biological, chemical, and physical factors encountered in the course of employment. These diseases usually (but not always) arise from repeated exposures to a health hazard over time and, in the case of diseases with long latency, symptoms may take decades to manifest. Education and awareness is the key to prevention of occupational disease.

## LEARNING GOALS

This chapter will enable you to:

- describe common occupational health hazards
- define the term occupational toxicology
- examine the various routes of entry of health hazards into the body
- explain the various ways chemical substances may affect the body
- examine ways to evaluate a worker's exposure and determine if a risk is acceptable
- outline three levels of control of workplace health hazards
- explain the purpose of a health surveillance program
- differentiate between the roles of occupational health team members
- examine four common occupational diseases

## SPREAD THE WORD

An ounce of prevention is worth a pound of cure. How often have you heard that expression? With a partner, brainstorm what it means to you. How does this quote apply to occupational health and disease prevention?

What does being proactive mean to you? What does it mean in the context of occupational health and disease prevention? With your partner, brainstorm at least five examples of proactive measures that would increase good health and well-being in the workplace.

## WHAT WOULD YOU DO?

Crystal works at a home building supplier processing inventory receipts. She has an office located near the entrance of the warehouse where she can watch the propane-fueled forklifts carrying materials in and out of the facility to load onto the storage shelves.

On a particularly cold January day, a large shipment of lumber arrives. The forklifts are in full swing unloading the trucks. Once everything is inside, the operators close the large entrance doors to keep warm while they shift inventory to make room for new materials.

Later that morning, Crystal happens to glance out across the warehouse and sees one of the forklift operators seemingly slide off his lift. Another is lying on the floor near the warehouse door. Obviously something is wrong.

**What would YOU do?**



**Figure 10-1** | What health hazards might exist in a warehouse facility?

## CHAPTER CHALLENGE PREVIEW

“Learn from others’ mistakes” is another often used saying. It has particular relevance in the area of occupational health and safety where mistakes can be costly.

Research an example of a local or provincial news story where someone experienced an illness related to their jobs. Share the story with your classmates highlighting what went wrong and how it may have been prevented.



# Occupational Health Hazards

To prevent occupational illness and disease, workers' exposure to health hazards must be controlled and the risk of exposure minimized. In Chapter 5 you learned there are four types of health hazards: chemical, physical, biological, and ergonomic. This chapter explores each type of health hazard in more detail.

## CHEMICAL HAZARDS

**Chemical hazards** are substances that can cause harm or damage to a person's body. They may be natural to the environment or artificially-made. Examples of common chemical hazards can be found in Figure 10-2.

Hazard	Examples
Dust/Fibres	Solid particles of materials such as silica, coal, cotton, asbestos
Fumes	Particles formed when material from a volatized solid condenses in cool air such as nickel, beryllium, zinc, and iron
Smokes	Solid or liquid particles resulting from incomplete combustion of materials such as wood, coal, plants, and petroleum products
Mists/Aerosols	Liquid particles suspended in air, such as chromic acid, hydrochloric acid, and sulphuric acid
Gases	Formless fluids that expand to occupy the space or enclosure to which they are confined such as hydrogen sulphide, chlorine, and carbon monoxide
Vapours	The gaseous form of normally solid or liquid substances subject to evaporation, such as gasoline, alcohol, paint, thinners, and solvents

**Figure 10-2** | Identify environments where one of the above chemical hazards might be present.



**Figure 10-3** |

Pyrotechnicians create spectacular fireworks displays. What health hazards might be present in their field of work?

## PHYSICAL HAZARDS

**Physical hazards** are conditions or situations that can cause injury or stress to a worker's body.

Physical hazards include:

- noise
- temperature (high or low extremes leading to heat stress or cold stress)
- illumination (lighting level, intensity, and glare)

- vibration
- radiation (energy in the form of rays such as x-rays or gamma rays used in some cancer treatments, electric and magnetic fields, ultraviolet light from the sun, microwaves and radio waves)

## BIOLOGICAL HAZARDS

**Biological hazards** are living micro-organisms or toxins that may cause harm to a worker's body.

Biological hazards include:

- bacteria such as tetanus and tuberculosis
- viruses such as hepatitis C and human immunodeficiency virus (HIV)
- fungi and moulds
- mites
- insects such as fleas and ticks
- parasites such as those which can cause malaria
- plants such as giant hogweed and cow parsnip
- animals carrying disease such as rabies from dogs and campylobacter from chickens



**Figure 10-4** | What precautions are being taken to avoid exposure to biological hazards in this research lab?

## ERGONOMIC HAZARDS

**Ergonomic hazards** are physical factors within the environment that may harm a worker's **musculoskeletal system**. Ergonomics is discussed further in Chapter 12.

## QUICK CHECK

1. Identify three industries or occupations not represented in this chapter in which exposure to chemical hazards might be a risk.
2. Research one type of biological hazard from the list on this page. Identify where it might be found and how it may impact someone with whom it came into contact.
3. In what occupation or role might a worker's body be subjected to each type of physical hazard listed on page 158-159?

### **musculoskeletal system**

the combination of the muscular and skeletal systems working together including the bones, joints, muscles, tendons, and ligaments of the body

## Exposure—Know the Hazards in the Welding Trade

Welders are exposed to numerous workplace hazards. However, health hazards that may contribute to developing an occupational disease are often overlooked. According to the International Labour Office (ILO), gases, smoke, and fumes associated with welding may lead to respiratory problems, lung infections, and asthma. Depending on the materials used, welding fumes have been linked to certain types of cancers, including liver, stomach, and lung. Welders can also be at an increased risk of developing hearing loss due to the high noise levels, and exposure to ultraviolet light from using a welding torch can result in chronic damage to the eyes and skin.

In general, welders are reporting numerous injuries to WorkplaceNL. In 2014, 110 welding-related claims were filed with WorkplaceNL. The most common injuries among welders in this province are to the eyes (23 per cent of claims received); while the second highest statistic is for back injuries, including the spine and spinal cord, at 14 per cent.

According to the Canadian Centre for Occupational Health and Safety (CCOHS), welders should be mindful of the following health hazards:

- **Chemical hazards**—Welders are exposed to gases, smokes and fumes. These toxic materials can cause respiratory problems and various cancers.
- **Biological hazards**—While it depends on the workplace itself, welders may be exposed to bacteria, waste products, and other biological material.
- **Ergonomic hazards**—Many injuries to welders are the result of strains, sprains, and musculoskeletal injuries (soft-tissue). Welders often have to lift or move heavy objects, and work in awkward positions for long periods of time, handle and hold heavy welding equipment, and perform repetitive motions.
- **Physical health hazards**—Welders can be exposed to excessive noise levels, heat, and cold. Welding arcs also give off radiation that increases the risk of chronic damage to the eyes and skin.



**Figure 10-5** | It is important to know the materials being welded in order to take appropriate precautions.

## Toxicology

In our daily activities at home, work, or play, we are exposed to potentially dangerous agents that can have negative outcomes on our health. To determine how toxic a substance is to the human body, it is necessary to consider:

- the route of exposure—how the substance will enter the body
- the duration of exposure—how long the person is exposed to the substance
- the dose—the amount of substance to which the body is exposed

As an example, when a person is stung by a bee, the dose of bee venom is injected into the person's body through the sting. The dose of one bee sting is small but it may cause localized swelling, itching, and redness. If a person is stung multiple times however, the dose of venom is increased in the body. This may lead to additional symptoms such as nausea, headache, fainting, convulsions, and fever. In this case, the components of the venom did not change. But, the dose in the body changed to produce more serious health effects.

### OCCUPATIONAL TOXICOLOGY

In the workplace it is necessary to identify any toxic agents that have the potential to cause a negative effect in the body. This field of study is known as **occupational toxicology**.



**Figure 10-6** | Identify the personal protective equipment this beekeeper uses in handling his bees.

### occupational toxicology

the study of adverse effects of agents that may be encountered by workers while they are in the workplace



**Figure 10-7** | All work involving asbestos materials must be conducted by an asbestos abatement contractor that is registered with the provincial government.





The Asbestos Abatement Regulations under the *Occupational Health and Safety Act* provide the legislative requirements for safe handling of asbestos products in NL workplaces. The maximum fine of \$250 000 per violation can be levied as a result of non-compliance with OH&S legislation.

By reviewing scientific research, standards can be developed to determine how much of a particular substance can accumulate in the body without negative health effects.

## ROUTES OF ENTRY

When identifying hazardous substances in the workplace it is useful to investigate how they may enter the body. For example, it may be obvious that workers pumping gas can get gas on their hands and it may be absorbed through the skin. They can also inhale the gasoline vapours and it may enter their lungs. They may accidentally ingest the gasoline on their hands if they do not wash their hands before eating or drinking. All routes of exposure should therefore be controlled to protect the worker's health.

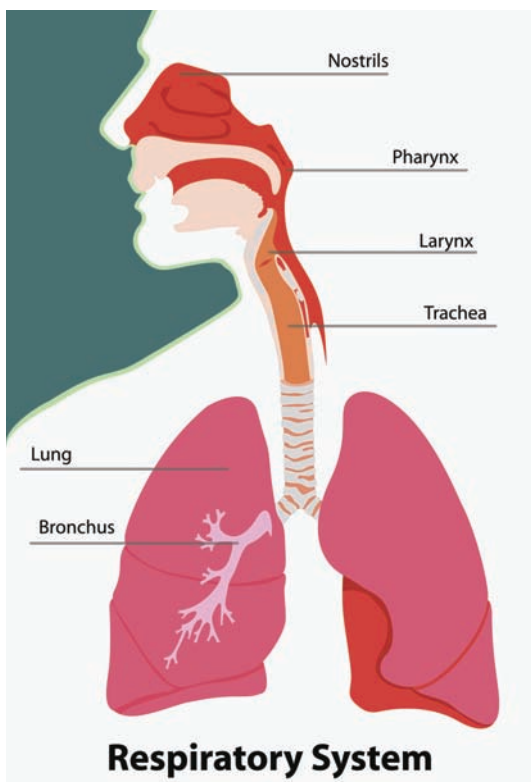
Routes of entry of health hazards into the body include:

- inhalation
- absorption
- ingestion
- injection

### Inhalation

**Inhalation** is one of the most common routes of exposure. Through the simple process of breathing, a person can take in the contaminants along with the air. If a person is breathing heavily because of heavy lifting, for example, they may take in more air and more contaminants.

As a person breathes, the upper respiratory tract composed of the nose, larynx and pharynx may be the first organs, along with the mouth, that are affected. Next the contaminated air passes through the lower respiratory tract including the trachea, bronchi, and the lungs. Once in the lungs there are small air sacs at the end of the bronchi called alveoli. This is where gas exchange of oxygen and carbon dioxide take place. Therefore, any contaminants that reach the alveoli can now be distributed along with oxygen in the blood throughout the body.



**Figure 10-8** | Depending on the nature of the contaminant, damage may take place along the respiratory tract. For example, if an acid vapour is inhaled it may cause burning of the nose and throat as it passes with air into the body.



**Figure 10-9** | What toxic substances might be present during a home renovation?

There is particular concern when the solid particles of some substances, such as asbestos or silica, reach the alveoli. They can remain in the lung and can cause scarring of the lung tissue leading to an occupational disease.

### Absorption

**Absorption** refers to hazardous substances entering the body through the skin. Hands and forearms are the body parts most exposed to chemicals especially when there are cracks or cuts on the skin. Therefore, it is important that workers who must handle chemicals wear the appropriate protective equipment.

Some substances may cause a breakdown of the skin leading to dermatitis. Substances may also enter the body through the eyes. This is normally the case in a chemical splash where liquid droplets may enter the eyes. Depending on the chemical this may lead to burning of the eyes and loss of sight.

### Ingestion

**Ingestion** refers to substances that enter the body through eating or drinking. Workers do not normally plan to ingest a hazardous substance. However, in situations where there are poor hygiene practices, substances may enter the body accidentally. Workers should wash their hands before eating or drinking. They should also change out of contaminated clothing before entering lunch rooms.



**Figure 10-10** | Eating and drinking is usually not permitted in some areas of schools such as science labs. The desk top may become contaminated with chemicals, often times acids, which could burn the digestive system.



## Important

Never dispose of needles or other sharp objects on their own in trash cans, recycle bins, or flush them down toilets. They should always be placed in puncture proof and leak proof containers. If you are accidentally stuck by a needle or other sharp object, wash the exposed area right away with soap and water or an antiseptic cleaner, then seek medical attention.

## Injection

**Injection** may be more common in some workplaces such as hospitals, health care facilities, and veterinary clinics. In these instances workers administering needles to patients may accidentally be stuck by a contaminated needle. Unwanted medications and viruses such as HIV or hepatitis C may infect a worker.

Some other workers may not be administering needles but the risk of exposure to dirty needles may still exist. Consider garbage collectors, cleaners, hotel and laundry workers. These jobs may lead to exposure to needles or other sharp objects.



**Figure 10-11** | Where do you see needle disposal units such as the one in this image?

## THE DOSE RESPONSE CURVE AND TOXIC EFFECTS ON THE BODY

Once the route of exposure has been identified, an employer must determine if there is a safe level of exposure to the substance. How much can a worker be exposed to without suffering ill effects? Determining the amount of exposure will help identify the types of controls that will be necessary. There are two types of exposure that workers may experience:

- **acute exposure**—an exposure that is of brief duration. It may also be the result of a single exposure. Examples include exposure to ozone gas or ammonia during a chemical spill.
- **chronic exposure**—an exposure that is persistent over a long period of time. It may be a daily exposure at a low level. Examples include a road builder's exposure to silica dust over a 35 year career, and a jack-hammer operator's exposure to noise after 15 years at a workplace.

Duration of exposure is not the only consideration however. The **dose** of exposure must be determined. From there it can be determined whether or not the body can remain healthy at this dose. **Threshold** is related to

### dose

the amount of the substance that a body receives

### threshold

the dose that must be exceeded for an effect to happen

the dose. When exposed to a substance there are times when an effect is not seen. It is only after the exposure reaches a certain level, or threshold, that a negative effect occurs. Below the threshold dose there is no negative health effect—the body can recover and remain healthy.

The **dose-response curve** is a relationship in occupational toxicology that is used to determine the level of risk to workers' health. Consider the example of a lit fireplace in the home—carbon monoxide is produced and is exhausted through the chimney. However, there may be some low levels of carbon monoxide that are leaked into the room. Due to the low level in the air, the person in the home is only receiving a very low dose and there is no health effect felt. But if the chimney is not working properly and the carbon monoxide in the room increases, the dose received by the person increases. As the dose increases, the person will begin to experience negative health effects including headaches, nausea, and light-headedness. As the dose reaches a high enough level, unconsciousness and death can result.

There may be times when a worker is exposed to a toxic substance but the level of exposure may pose minimal risk to human health. This is referred to as the **threshold dose**—below this level, there is little risk to human health and the worker may continue to be exposed.

## QUICK CHECK

1. How would you define occupational toxicology?
2. Identify the routes by which toxic substances may enter the body. Provide at least one example of an illness/disease that may be the result of that route of entry.

## Risk Evaluation

As you will recall from Chapter 5, once a hazard has been identified it must be evaluated to determine its potential to cause injury, illness, or discomfort among exposed workers.

Evaluation of a hazard involves measuring the level of risk of exposure to the worker. The risk evaluation process takes into account:

- the severity of the potential consequences of the hazard
- the probability of an incident or illness occurring as a result of the exposure
- an estimate of worker exposure to the hazard or frequency



Chimney fires remain one of the most frequent calls to municipal fire departments. All residents should regularly inspect and clean chimneys and flue pipes. Carbon monoxide detectors are also recommended.

Source: Fire and Emergency Services NL

## DATA COLLECTION

Estimating a worker's exposure to a health hazard is often completed through data collection. **Sampling** is a form of data collection whereby a small sample of the potentially dangerous substance is analyzed to determine its potential impact on workers. This is especially useful with health hazards involving chemicals that we cannot see, taste, or smell. Think back to our examples involving carbon monoxide. In these situations it is necessary to measure the amount of carbon monoxide to decide what controls must be in place to protect the health of the worker.

The most appropriate method of substance collection is usually decided based on the route of exposure and the chemical properties of the substance. As discussed, inhalation is one of the most common routes of entry into the body. Many gases, mists, vapours, fumes, and dusts are breathed in from the air. Therefore, the best way to determine how much a worker is breathing in is to measure the amount of the substance in the air.

To measure the amount of a substance in the air, there are three commonly used options: area monitoring, personal monitoring, and spot/instantaneous sampling. Each option has advantages and disadvantages and often times a combination of all three methods will be used.

### Area Monitoring

**Area monitoring** measures the level of a given substance within a particular work area, room, or building. Measurements for area monitoring are taken at fixed locations throughout the work site. This means the monitoring equipment is left in one place (e.g., a work station, desk, or is mounted on the wall) for a period of time and is collected at the end of the time period. An example would be a carbon monoxide detector placed in the upstairs hallway of a home. The detector will measure the amount of carbon monoxide gas in that area. Once carbon monoxide is detected at a pre-determined level an alarm will notify the occupants.

There are advantages to conducting area monitoring. Area measurements are useful for detection. Alarms may be set particularly in areas which may have a high concentration of a substance. For example, in water treatment plants, there may be area monitoring of ozone in a particular room so workers are aware they cannot enter that room when ozone is detected at a certain level.

One of the disadvantages of area monitoring is that it does not measure a worker's individual exposure to a particular substance.



**Figure 10-12** | Smoke and carbon monoxide detectors should be tested frequently to ensure they are operating properly. During the test is a good time to remind family members of what to do when alarms sound.

## Personal Monitoring

**Personal monitoring** occurs when a measurement of a gas, vapour, or particulate is taken in the worker's breathing zone to determine his or her personal exposure. The worker will wear the appropriate monitoring device to measure the substance for the entire work shift. At the end of the shift, the monitor can tell the amount to which the person was exposed during that time period.

The advantage of personal monitoring is that it determines an individual's potential exposure during that specific time period. Therefore, in the case of workers who may move throughout the workplace during their shift, their individual exposure is still determined.

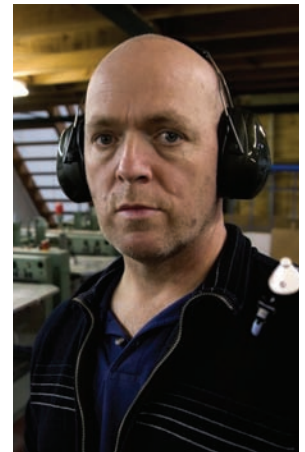
The disadvantage of personal sampling is that it can be very time consuming and may become costly. If there are a large number of workers it may not be possible to sample each worker individually. If this is the case, a method must be determined to sample a **representative number** of workers. In other words, enough workers must be tested to make assumptions about the entire group.

## Spot or Instantaneous Sampling

**Instantaneous sampling** is often times referred to as spot sampling. **Spot sampling** identifies the concentration of a substance at a given location at a given moment in time. Some examples of substances that may be measured include gases, vapours, mists, and dusts.

One advantage of conducting instantaneous sampling is that it provides immediate feedback to the user. It is often used to check the effectiveness of a control measure that is put in place. For example when new ventilation has been installed, it is useful to conduct spot sampling to verify that the levels of the substance in the air have decreased and the control is working.

Another advantage of using spot sampling is that it may determine any problem areas and may help identify the source of a leak or a potential exposure. For example, ice rinks often use ammonia in refrigeration systems. When there is a leak in the ammonia system workers will use a gas monitor to determine on the spot where the ammonia concentration is highest which indicates where the leak is occurring and where it must be corrected.



**Figure 10-13** Why is the sampling device worn high on the worker's shoulder?



**Figure 10-14** Once ammonia is initially detected, personal protective equipment may be utilized until the risk has been reduced.

A disadvantage of spot sampling, similar to area monitoring, is that the sampling will not provide an indication of the worker's individual exposure over the course of the working shift. It is only a snap shot in time and will only provide a measurement while the person is in the location with the measuring device.

Determining a worker's potential exposure to a substance in the workplace through the use of one, two, or all different types of sampling methods now makes the decision of determining appropriate controls a little easier. The level of exposure can help guide the evaluation of the risk to the worker's health.

## DEVELOPING SAMPLING PLANS

Designing a sampling plan is one of the most important steps in ensuring that sampling will provide useful information to the workplace. It is important to identify clear objectives of sampling and define the desired outcomes before beginning.

Many questions must be considered when developing the sampling plan. Some of these include:

- Is the sampling going to be baseline monitoring?

**Baseline monitoring** is generally conducted during a specific time period to determine potential worker exposure. It will then be used in the future to identify any improvements or any changes that may take place.

- Is the sampling being conducted to determine compliance with legislative requirements?

For many substances there are acceptable limits of exposure that have been defined in occupational health and safety legislation.

- Will the sampling reflect worst case scenarios?

Sometimes the objective may be to determine the absolute highest exposure that a worker may be exposed to on a given day.

- How many samples need to be taken and will the sampling be random?

To reflect normal operations it is often necessary to collect many samples of different areas, different workers and at different times throughout the day. The sampling must be **representative** of the entire population exposed. For example, a workplace with 500 workers exposed to dust will require more samples to be taken compared to a workplace with 25 workers exposed.

- When will the samples be taken?

It is important to conduct sampling for appropriate periods of time. When there are both day and night shifts it must be decided if both



shifts will be sampled. In some cases this may not be necessary if job activities on both shifts are identical. If this is not the case then both shifts would have to be sampled.

- Once the sampling plan is developed and conducted how will the results be communicated to workers?

Workers have the right to know the results of exposure monitoring, any potential risk of exposure and the possible health effects.

## MONITORING EQUIPMENT

A number of factors must be considered in selecting an appropriate monitor or piece of equipment that you will use to conduct sampling at the workplace. If the hazard, for example, is carbon monoxide then a gas detector that can detect that particular gas is selected.

### Air Sampling Pumps

An **air sampling pump** is a lightweight battery operated pump that draws air, along with the substance, onto a medium which can then be analyzed. Since the pump is drawing air and therefore the airborne substance onto a medium it can be used to collect gases, vapours, or particulates such as dust.

Air sampling pumps are commonly set up to measure dusts such as silica, asbestos, wood dusts, and welding fume particulates. They are also used frequently to measure gases and vapours such as those in paints and other solvents including alcohols. They may be used to collect worker's full shift exposure or used for area sampling.

### Gas Monitors

**Gas monitors** are direct reading instruments that can measure the concentration of a gas in the air at a particular point in time. They are readily available and come in a variety of makes and models. Gas monitors are available for many different substances. Some can measure one gas at a time or may be a multi-gas detector measuring a couple of gases at the same time.

Gas detectors are commonly used to measure gases in a confined space such as oxygen, carbon monoxide, and hydrogen sulphide. They may also be used to measure ammonia, ozone, sulfur dioxide, etc. Again it is critical to know the gas you wish to measure in order to select the appropriate monitor.

**Figure 10-16** | This gas monitor can measure multiple contaminants.



**Figure 10-15** | A personal air sampling monitor for one gas only. The one in this image may only measure the amount of hydrogen sulphide in the air.





The advantage of using gas monitors is that decisions can be made immediately because they provide an instantaneous reading. Decisions can be made about choosing personal protective equipment or making changes to the ventilation system or allowing entry into a confined space. The disadvantage of gas monitors is that the samples are often collected only for one point in time. As well, the gas monitor will have to be specific to the gas being measured.

### Sound Level Meters

A **sound level meter** provides an instantaneous noise measurement at a given point in time. It is a hand held device that is used in many workplaces as a first measurement to determine if there is a noise issue in a particular area. Decisions can be made quickly to provide temporary hearing protection until a full noise assessment can be conducted and the risk of hearing loss can be evaluated.

The use of a sound level meter is good for workplaces where there is continuous noise. In workplaces where there is intermittent or impact noises that change throughout the day, this meter will not measure those changes unless the person is there to measure the changes. For this reason, the sound level meter is useful for making a noise map which would take the floor plan of the workplace and identify areas or machinery that are producing high noise levels.

The disadvantage of the sound level meter is that it will not provide an accurate measure of the worker's total daily noise exposure.

### Noise Dosimeter

A **noise dosimeter** is a device that measures the personal noise exposure of the worker. The monitor is attached to the worker with the microphone positioned near the ear. It will measure the noise levels throughout the shift but it does not record the worker's speech.

Conducting noise dosimetry is useful in workplaces where the noise levels vary throughout the shift or the worker moves throughout the workplace. When moving around the workplace workers typically are exposed to varying levels of noise. The noise dosimeter will measure the noise levels and provide an average exposure over the entire work shift.

## ACCEPTABLE LIMITS OF EXPOSURE

Once a substance has been measured appropriately a decision can be made as to whether the exposure is acceptable or unacceptable. This decision-making process often involves a trained individual.



**Figure 10-17** Sound level meter.

Measurements are compared to the acceptable level that has been provided by a reputable organization and/or as set out in occupational health and safety legislation. In the province of Newfoundland and Labrador this usually means there is a comparison made with the limits established by the American Conference of Governmental Industrial Hygienists (ACGIH).

A **threshold limit value** (TLV) refers to airborne concentrations of substances, and represents conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effects. They are developed as guidelines to assist in the control of health hazards and are not fine lines between safe and dangerous conditions.

Not all workers will react the same way upon exposure to a substance. Therefore, although a worker's exposure may be below the TLV or the acceptable limit, due to many factors they may still suffer negative health effects. Some reasons why some people may react differently to an exposure include:

- age
- gender
- ethnicity
- pre-existing medical conditions
- lifestyle choices (smoking, diet, drug usage)
- medications
- genetics or family history
- exposure to more than one chemical at a time—the combination of exposure

While there are TLVs set for many agents in the workplace there are also some limitations. These include:

- They apply to the average, healthy adult. They are not meant to be used for making decisions for children's exposure or for public exposure.
- The limits apply to traditional workplaces. They are not to be used to make decisions about community exposures.
- The limits have been set for traditional exposures—an eight hour work day, 40 hour work week. If workers are working outside of these arrangements, such as a 12 hour work shift, the TLV will have to be adjusted.
- It is recognized that with more research being conducted, TLVs can and will change over time. Therefore, what may have been an acceptable exposure in the past may not be in the future.

The ACGIH have three categories of TLVs that provide guidance for decision making on acceptable exposures. They are:

### 1. **Threshold Limit Value—Time Weighted Average (TLV-TWA)**

This is the average concentration that is calculated for the eight hour

work day, 40 hour work week. It is calculated by taking one or more samples during the time period.

**2. Threshold Limit Value—Short-Term Exposure Limit (TLV-STEL)**

This is a 15 minute TWA exposure. It is calculated by taking one or more samples during no more than a 15 minute time period. The TLV-STEL usually (but not always) accompanies the TLV-TWA because it attempts to protect workers from a short exposure period usually from effects that may be acute.

**3. Threshold Limit Value—Ceiling (TLV-C)**

This TLV is a concentration that should NEVER be exceeded during any part of the working exposure.

Note: The airborne concentrations provided by the ACGIH are given either in **ppm** units or **mg/m<sup>3</sup>** units.

The ACGIH publication *Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices* not only outlines guidelines for TLVs but also discusses biological exposure indices.

**Biological exposure indices (BEI)** are additional guidelines to determine the potential exposure and health risk to workers. They usually indicate the uptake of a substance in the human body. As a way to ensure that controls are effective for certain substances in the workplace, you can measure the amount in a person's body usually through collecting a human specimen such as urine or blood. Once the specimen has been collected from the person and is analyzed, the amount in the body can be compared to the BEI to determine if the controls are effective.

The BEIs assess the amount of a substance that is absorbed and still is remaining in the body. However, they are not intended to be used to diagnose an occupational illness or disease. They only detect body absorption.

Some substances that have a BEI include: benzene often encountered in the oil and gas industry, styrene found in the fiberglass industry, and lead and carbon monoxide which are found in many different industries.

## QUICK CHECK

1. What factors are taken into account when evaluating health risks to workers?
2. Create a chart to outline the four types of monitoring equipment and the advantages and disadvantages of each.
3. Why may some people exposed to less than the TLV of a substance still experience health effects?

**ppm**

parts per million

**mg/m<sup>3</sup>**

milligrams per metre cubed

# Controlling Health Hazards

As you learned in Chapter 5, controls are directed at the source of the hazard, the pathway of transmission, and at the receiver. Controls exist on three levels:

1. Engineering Controls
2. Administrative Controls
3. Personal Protective Equipment (PPE)

## ENGINEERING CONTROLS

Engineering controls continue to be the first and best line of defence to eliminate or remove health hazards completely from the workplace. Several approaches may be taken as illustrated in Figure 10-18.

Engineering Control	Example
Eliminating the hazard by initial design change	When designing a heating system for a building, place the furnace which produces noise in a separate area that is not occupied by workers.
Substitution of a less hazardous process or product	Substitute a paint that contains <b>isocyanates</b> , which may cause occupational asthma, with a paint that does not contain isocyanates.
Isolation or enclosure of the source of the hazard	During asbestos removal, isolate or enclose the area where work is being performed so that the other building occupants are not affected by airborne fibres.
Ventilation	Install local exhaust ventilation that attaches to the tailpipes of vehicles to exhaust the emissions to the outdoors.

### isocyanate

an organic compound used especially in plastics and adhesives

**Figure 10-18** | Where have you seen engineering controls that protect workers against occupational health hazards?



**Figure 10-19** | Ventilation is a common engineering control for health hazards. It can be effective when it is designed properly for the task and is adequately maintained. These are ventilation control panels on the wall of a spray booth in an automotive shop.

## ADMINISTRATIVE CONTROLS

Once engineering controls have been considered and/or implemented it may be necessary to develop administrative controls. Attention to healthy workplace practices and processes can be effective in minimizing workplace health hazards.

Administrative Control	Example
Good housekeeping	Regularly scheduled cleaning of floor dust by wet mopping or vacuuming (no dry sweeping of dusts should be conducted since it throws the particles in the air and in the worker's breathing zone)
Scheduling work to minimize hazardous exposures	Limiting the time workers spend working with a cancer causing chemical or conducting construction activities after the normal operating times when there are fewer people in a building
Health surveillance	Ensuring workers who are exposed to lead have their blood sampled on a regular basis

**Figure 10-20** | Administrative controls to minimize health hazards in the workplace.

Worker education and training is often listed as an administrative control however it is important to note that it should accompany all types of controls. Even when an engineering control is implemented, education and training is required. The same applies to personal protective equipment.



**Figure 10-21** | This worker is using a high pressure washer to clean the floor in this factory. Why might he be wearing personal protective equipment as part of the cleaning process?

## PERSONAL PROTECTIVE EQUIPMENT

The use of personal protective equipment is the last line of defence against occupational health hazards. It is to be used when engineering and administrative controls cannot eliminate or safely minimize the hazard.

Examples of personal protective equipment to guard against health hazards include hearing protection, respiratory protection, sunblock, barrier creams, eye protection and gloves.

## QUICK CHECK

1. Identify the three categories of controls used to eliminate or minimize health risks to workers. Provide at least one example of each type.
2. Outline one workplace example to illustrate how these categories of control may be combined to maximize protection of workers from health hazards.

## Health Surveillance

Health surveillance has been identified as an administrative control for health hazards. It is a way for employers and workers to manage their health throughout their careers.

### HEALTH SURVEILLANCE PROGRAMS

Depending on the hazard, an effective health surveillance program may be another added level of protection. A health surveillance program should be created for each individual workplace since it will best reflect the health hazards that workers are exposed to during their job tasks.

To be effective, the health surveillance program should be linked with measuring workplace exposures as part of the risk evaluation process. For example, if a worker is exposed to lead in a workplace, blood lead levels may be regularly monitored as part of the health surveillance program. Airborne levels of lead must also be monitored in the workplace to ensure exposures do not rise above the recommended exposure limits.

According to the International Labour Organization, the primary purpose of a health surveillance program is to prevent the development of illnesses and diseases as a result of work exposure. They are also intended to:

- evaluate the effectiveness of control measures in the workplace (e.g., measuring the amount of lead in the blood ensures that the ventilation in the workplace is effective and workers are not accumulating lead in the body)



**Figure 10-22** | X-ray workers in dental offices often move around a corner or leave the room when taking the x-ray. In addition to a leaded apron they use distance and/or a wall to shield themselves.



- provide early detection of any disease development
- prevent further deterioration of workers' health due to early detection methods
- provide an on-going assessment of workers' fitness to work
- identify trends that may be occurring in the development of occupational diseases
- initiate research studies to explain the causes of occupational injuries and diseases

## MEDICAL EXAMINATIONS

Normally the health assessment process will involve a medical examination. The makeup of the medical surveillance will vary depending on the specific hazards at the workplace. Some health surveillance programs will include blood work or x-rays. Other workplaces may need to conduct functional measurements such as the ability to lift varying weights as a result of tasks performed at the job site.

Various tests may be conducted as part of the medical examination. Some examples include:

- urine sampling—detects various chemicals such as benzene, toluene, or drugs and alcohol in a worker's body (Many oil and gas workers undergo such sampling.)
- blood sampling—detects various chemicals in the body such as lead and carbon monoxide



**Figure 10-23** | A doctor studies a chest x-ray looking for any impairment.

- chest x-rays—detect any signs of lung diseases such as silicosis, asbestosis, etc. (Many miners and construction workers undergo such sampling on a regular basis.)
- pulmonary lung function testing—determines lung capacity (Decreased lung function may occur in the development of asthma, silicosis, asbestosis, chronic obstructive lung disease, etc.)
- audiometry—testing that is conducted to determine hearing levels

As part of a health assessment all workers should document their medical history and occupational history. An occupational history details the job title, job tasks and description of tasks performed, length of time spent in jobs and tasks, hazards at the workplace, concentration of exposures, any personal protective equipment worn, etc. In many cases, these may be completed through the use of a medical questionnaire.

A worker's answers to these questions may provide clues as to whether his or her symptoms are job-related or they have been exposed to hazardous materials. In that case a more comprehensive occupational history should be completed.

Although the healthcare provider will keep the occupational and medical history of the worker as a confidential document, the employer in many cases may assist the worker and the healthcare provider. For example, employers may provide information on the hazards commonly encountered at their workplace and controls that are in place.

### SAMPLE OCCUPATIONAL EXPOSURE HISTORY RECORD

Employer	Dates		Job title and tasks	Major exposures	Controls in place	Protective equipment worn
	From:	To:				
ABC Concrete	2010	2015	labourer: mixing, pouring, and cutting concrete	silica dust, chemicals, noise, lifting, awkward postures, vibration, cold environments	exhaust fans, heaters, wet saws	work gloves, Class B earplugs, respirator
Galloway Construction	2004	2009	heavy equipment operator	noise, awkward postures, dust	air conditioned filtered cab	ear plugs

**Smoking history:** \_\_\_\_\_

**Any relevant information:** (Any major spills, previous illness of workers, assessments completed by employer, medical surveillance such as hearing tests completed, etc.)

\_\_\_\_\_

\_\_\_\_\_

**Figure 10-24** | People often change their career fields throughout their working life. For this reason, it is important for workers to keep track of their own occupational history.



**Figure 10-25** | An audiometric evaluation measures hearing loss by testing such things as frequencies heard and whether the loss is one-sided or two-sided.

### audiometry

measurement of the range and sensitivity of a person's hearing

### disease latency period

the time it could take for a disease to develop after exposure to a health hazard

## TIMING OF HEALTH ASSESSMENTS

Health assessments should be conducted before the start of the job, at regular intervals throughout a person's working career with an employer, and at the end of the job. The timing of the assessments is important as it provides valuable information to both the worker and the employer.

Health assessments typically should include:

- **Pre-placement assessments**—conducted typically before a worker begins a particular job with an employer. It is used as a baseline measurement and to determine whether any medical conditions may put the worker at an increased risk of developing a disease as a result of workplace exposures.
- **Regular and periodic assessments**—conducted at an interval appropriate to the workplace. Timelines vary between workplaces depending on the health hazards present and the amount of risk that is associated with developing an illness or disease. For example, **audiometry** is usually conducted on an annual basis. Chest x-rays may be conducted once every five years for some workers.
- **Post-employment assessments**—conducted when the job has been completed or at the employment termination such as retirement or moving to a different employer. These assessments may also be conducted at the end of the **disease latency period**.

## OCCUPATIONAL HEALTH TEAMS

Health hazards are normally identified, evaluated, and controlled by occupational health and safety professionals. In Chapter 4 you studied the roles of industrial hygienists, occupational physicians, occupational health nurses, and occupational health and safety officers and advisors. These professionals have individual roles to play in the prevention of injuries and illnesses at the workplace. But it is important they also work together as a team to develop and implement a complete occupational health and safety program.



## THINK ABOUT IT...

**What do you recall from Chapter 4 about professions that support occupational health and safety? What do they have in common?**

As an example, consider how each member of the occupational health team would be involved in the recognition, evaluation and control of noise hazards in the workplace. What are some tasks they would conduct to control a noise hazard?

Industrial Hygienists would:	<ul style="list-style-type: none"><li>• conduct a noise assessment in the workplace</li><li>• develop and implement the hearing conservation program</li><li>• identify noise controls including engineering controls</li></ul>
Occupational Physicians would:	<ul style="list-style-type: none"><li>• conduct health assessments for workers in noisy environments</li><li>• provide health surveillance for workers who may have hearing loss on return to work activities</li></ul>
Occupational Health Nurses would:	<ul style="list-style-type: none"><li>• conduct audiometric testing</li><li>• provide education and training to workers</li></ul>
Ergonomists would:	<ul style="list-style-type: none"><li>• identify noise sources that may originate as a result of vibration</li></ul>
Occupational Health and Safety Officers and Advisors would:	<ul style="list-style-type: none"><li>• participate in the development and implementation of the hearing conservation program</li></ul>

**Figure 10-26** | Activities conducted by occupational health and safety professionals.

## QUICK CHECK

1. Explain the purpose of a health surveillance program.
2. What is the benefit of maintaining your own occupational work history?
3. Using the example of a furniture making factory, outline how different members of an occupational health and safety team may play a role in protecting workers' health against exposure to wood dust.

## Four Common Occupational Diseases

There are many occupational illnesses and diseases that may develop as a result of exposure to substances in the workplace. One of the most common occupational diseases in Newfoundland and Labrador is noise-induced hearing loss.

Other relatively common occupational diseases in Newfoundland and Labrador are asbestosis, silicosis, occupational asthma, and occupational dermatitis. The potential exists for future cases to develop in this province as workers continue to be exposed to the agents that can lead to these diseases. It is important to have an understanding of how these diseases develop and what treatment options are available so that efforts can be made to prevent future occurrences.

### ASBESTOSIS

Asbestos is a group of naturally occurring fibrous minerals that have been used in common building materials. Most products no longer contain asbestos but it can still be found in buildings throughout Newfoundland and Labrador, particularly in those constructed before the late 1980s.

Asbestos can be found in some products common in the building and construction trades. It may be present in such items as fireproofing, pipe insulation, vinyl floor tiles, ceiling tiles, drywall joint compound, vermiculite, cement water pipes, roof coatings, and disc brake pads.

Depending on the nature of the work, some workers may be more at risk than others when working with asbestos. For instance, workers who are directly involved in removing asbestos or engaged in construction activities where asbestos is present may be at a higher risk than workers in a building where the asbestos is managed and is not disturbed.

The most common way asbestos enters the body is through inhalation of airborne particles usually once the material is crushed or disturbed. Therefore, the lungs are negatively affected. Smoking increases the risk of developing an asbestos-related disease. Asbestos-related diseases may take 20-50 years to develop.



### THINK ABOUT IT...

**Why would smoking increase the risk of developing an asbestos-related disease?**

**Asbestosis** is a serious, irreversible, incurable, and fatal disease that causes scarring of the lung tissue. It is caused by breathing in airborne asbestos fibres. Because asbestos fibres are small, once inhaled they are deposited in the lungs reaching the alveoli where they remain over time. Asbestos causes the alveoli to stiffen and scar tissue develops. This means that people will have difficulty breathing because they will have to work harder to breathe air in and out.

There is no cure for asbestosis. It may be possible to slow down the progression of symptoms or lower the risk of developing complications. Treatment often involves trying to make the patient more comfortable. Sometimes inhalers may be given to people to try to ease their breathing or oxygen may be administered through tubing in the nose.

It is important that health surveillance is conducted with workers who are exposed to asbestos. Asbestosis can be detected through a chest x-ray and/or pulmonary lung function testing. Early detection can help with treatment options and to slow down the progression of the disease.

## SILICOSIS

**Silica** is a mineral that is naturally found in the earth's crust.

Silica is commonly found throughout Newfoundland and Labrador. It is a component of rock found in sand, granite, sandstone, slate, shale and clay. For this reason, silica is found in many industries including hard rock mining, quarrying, construction, foundries, asphalt plants, pottery manufacturing, shipbuilding and repair, cement products manufacturing, porcelain, and jewellery manufacturing. You cannot see the silica particles that can impact health.

The most common way silica enters the body is through inhalation of dust that contains respirable crystalline silica. These small particles cannot be seen with the eye and are so tiny that they enter the body and work their way into the deepest regions of the lungs—the alveoli. Once in the lungs the silica remains there and over time causes damage. For example, it could take 20 years for silicosis to develop. It is also known that smoking causes lung damage which can add to the damage caused by breathing in silica.



### It's the Law...

NL OH&S Regulations do not permit people under the age of 18 to work in a silica process nor in cleaning or maintenance work likely to involve exposure to silica dust. Exceptions may be made for work that is a recognized part of an apprenticeship or comparable course of training.



Silicosis is an irreversible, incurable, often times disabling, and sometimes fatal lung disease. It has three different forms:

- **acute silicosis**—may develop within a few months to two years following a very high level of exposure. This form of silicosis is the least common but is possible if concentrations of silica in the air are very high. Such would be the case with intense sandblasting or a similar activity completed without any controls. In today’s workplaces this is a rare occurrence. It is more likely today for accelerated or chronic silicosis to develop.
- **accelerated silicosis**—may develop after more intense exposures of shorter duration within 5-10 years of exposure. The symptoms however are similar to those seen in the chronic form. Deterioration in lung function is more rapid, and many workers with accelerated disease may develop infections or autoimmune diseases.
- **chronic silicosis**—may develop after a long exposure (usually 15 years or more). Chronic silicosis may continue to develop and cause health effects even after exposure to the silica-containing dust has stopped.

There is no cure for silicosis. It may be possible to slow down the progression of symptoms or lower the risk of developing complications. Treatment often involves trying to make the patient more comfortable. Sometimes inhalers may be given to people to try to increase their ease of breathing or oxygen maybe be administered through tubing in the nose.

It is important that health surveillance is conducted with workers who are exposed to silica. Silicosis can be detected through a chest x-ray and/or pulmonary lung function testing. Early detection can help with treatment options to slow down the progression of the disease or to help minimize complications. For example, workers with silicosis are at an increased risk of infections such as tuberculosis.

## OCCUPATIONAL ASTHMA

**Occupational asthma** is the same as asthma that is seen in the general population. It is a lung or respiratory disease—and a chronic condition. Unlike in the general population, occupational asthma occurs in response to one or more agents, or triggers, that are found in the workplace.

Occupational asthma causes a narrowing of a person’s air passages which results in difficulty in breathing, tightness of the chest, coughing, and wheezing. Occupational asthma can be allergic or non-allergic. While the non-allergic response is not well understood, allergic asthma involves an immune response and the person becomes sensitized to an

agent in the workplace. The sensitization develops after varying periods of workplace exposure to certain dusts, fumes, vapours or other agents. This sensitization may not show any symptoms of disease or it may be associated with skin rashes, hay fever-like symptoms, or a combination of these symptoms.

Not all workers react with an asthmatic response when exposed to agents in the workplace and only a few people in a workplace may develop asthma even though all workers are potentially exposed. This can be a frustrating and complicated issue for workers. The affected workers may not realize their asthma is work-related since not everyone at the workplace is having symptoms. Or, the worker may not have asthma symptoms all the time at work. Likewise, employers may have a difficult time attempting to control the agent since they may not know what is causing the symptoms and not all the workers are feeling ill.

Some workers may also develop a **work-exacerbated asthma** which is asthma that is made worse because of exposure to a substance at the workplace. In this case a worker may have already had asthma but have not had any symptoms for a number of years (maybe since childhood). An agent at the workplace, such as mould, may trigger an asthma attack. The substance at the workplace may not be causing the asthma but is contributing to the ill health of the worker.

There are many agents that are known to cause occupational asthma including:

- grains, flours and plants (wheat, flour, wool, grain dust)
- animals, insects and fungi (feathers, shellfish, rats, mice, pigeons)
- chemicals (latex, chlorine)

Occupational asthma may be a lifelong and chronic condition in which affected workers learn to manage their symptoms. There are various treatments available including medications and, where possible, workers should be encouraged to end the exposure to the triggering agent.

## OCCUPATIONAL DERMATITIS

Absorption is a route of entry for many substances into the body through the skin and/or the eyes. The skin plays a very important role as a barrier to chemicals and other contaminants entering the body. Substances more easily enter when this barrier is dry, cracked or broken. Occupational skin disease is similar to that seen in the general population, but occupational skin disease is wholly or partially caused by a person's work activity.



A substance in crab can cause occupational asthma known as “crab asthma.” There are workers throughout Newfoundland and Labrador who live and work while affected by crab asthma.

Most occupational skin diseases affect the hands and forearms since they are the parts of the body most often in contact with hazardous substances. The most common skin disease is **contact dermatitis** (also known as **contact eczema**). Symptoms include redness, dryness, itching, swelling, cracking, blistering, flaking and bleeding.

### Really!?!

Too much exposure to water can cause irritant dermatitis. Those involved in wet work including hairdressers and workers in the food industry are particularly vulnerable and must take special care.

Source: Institution of Occupational Safety and Health

There are two types of contact dermatitis:

- **irritant dermatitis**—caused by a physical or chemical substance that damages the cells. When contact with the irritating substance ends, the condition stops. Causes of irritant dermatitis include cleaning products, organic solvents, metalworking fluids, some plants, and water.
- **allergic dermatitis**—caused by exposure to an allergen or sensitizer, normally a hazardous substance. When the worker's immune system reacts to it, they become sensitized. Once sensitized, the problem is usually lifelong. Allergic contact dermatitis can be caused by allergens such as cement, metals (e.g., nickel and chromium), and resins. Latex is a common cause of allergic dermatitis. It is commonly found in the health care industry, where latex gloves used to be routinely worn. Since we now know the hazard and risk, latex gloves have been replaced with non-latex gloves.

## QUICK CHECK

1. Create a graphic organizer to identify four occupational diseases, how each develops, industries where risk of developing the disease may be high, and common treatments for each.
2. Research to identify one additional occupational disease that may develop in workplaces in this province.

 **SPREAD THE WORD**

With a partner, select an occupational health hazard that may exist in a workplace in this province.

1. Create a slogan or logo that encourages prevention strategies to guard against this particular hazard.
2. Create a 30-second audio or video public service announcement to alert the public to the benefits of prevention.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 157). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Review each of the four categories of occupational health hazards. For each category, identify or create a case study that illustrates what might happen when a particular hazard within that category is ignored or managed inappropriately.

Exchange your case studies with a partner so he or she can:

- a) describe the situation
- b) identify what happened and the health hazard in question
- c) identify what should have been done differently

 **DIG DEEPER**

Health Canada estimates that the cost of illnesses in Canada, many of which are preventable, to be in the hundreds of millions of dollars. Identify the financial and non-financial implications of workplace-related illness to Newfoundland and Labrador. What recommendations might you put forward to the provincial government to urge greater prevention efforts and thereby reduce costs?

# Psychological Health and Safety

Healthy working relationships and working environments are key to promoting the mental well-being of today's workforce. The importance of maintaining a healthy stress level in the workplace and appropriately addressing mental health issues that may arise cannot be overlooked.

A better understanding of these health issues combined with the implementation of effective policies and practices will go a long way for you to secure a healthy and productive work life.

## LEARNING GOALS

This chapter will enable you to:

- investigate factors that cause high levels of stress and mental health issues for workers
- outline the main components of a psychological health and safety management system for a workplace
- explain the role of employee assistance programs
- examine the impact of harassment on mental health and stress
- explain the importance of a Canadian standard for workplace mental health

## SPREAD THE WORD

What does psychological health and safety mean to you? What words or expressions come to mind? What emotions do you feel? What images do you see? In a small group, brainstorm words, expressions, or images that come to mind when you hear the term psychological health and safety.



## WHAT WOULD YOU DO?

Carson recently started a job as an office assistant in a local car dealership. His job is to provide administrative support to a group of sales people which usually means cleaning up display areas, copying documents, retrieving vehicles for test drives, and sometimes bringing coffee to prospective purchasers while they wait.

He likes the job, particularly driving the new vehicles and meeting customers, but he is having difficulty with several of the sales team members. They constantly tease him, calling him names such as “bozo” and today someone called him “the office idiot” in front of customers when he spilled the coffee. Carson finds it uncomfortable and embarrassing but has been hoping his co-workers will eventually just get tired of teasing him. He’s about to leave for the day and finds “klutz” written in ink across his new jacket.

**What would YOU do?**



**Figure 11-1** | When does good-natured teasing become a problem?

## CHAPTER CHALLENGE PREVIEW

Consider the following statistics from the Mental Health Commission of Canada:

- Every day in Canada, more than half a million workers are absent from work due to a mental illness.
- Nearly 50% of Canadians will experience a mental illness by the time they reach age 40.
- In 2011, mental illness in the workplace cost the Canadian economy \$50 billion.

What are the implications of these statistics to the future of Canadian workplaces?





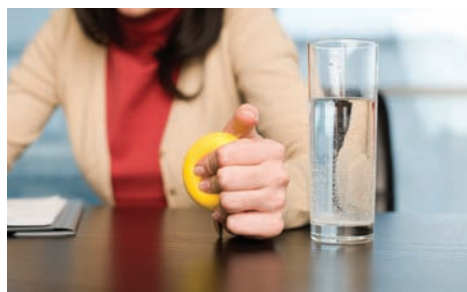
## Stress

Stress is a normal part of life—both inside and outside the workplace. Stress can be both positive and negative. Positive stress provides mental alertness and motivation, and helps us to accomplish our goals. Negative stress, also known as distress, occurs when our bodies cannot relax—even when the stressor itself is gone.

How people react to various stressors depends on the individual. Distress may result in physical issues such as headaches, pain, upset stomach, colds, and infections. It may also manifest itself emotionally with increased frustration, lack of concentration, and anxiety. Recent studies have linked stress with heart and cardiovascular diseases, cancer, and musculoskeletal disorders.

In the workplace, stress can result from any number of situations. The Canadian Centre for Occupational Health and Safety (CCOHS) identifies several workplace factors that can cause stress including:

- workload (overload and under load)
- lack of appreciation
- level of responsibility
- pace or variety in the work
- hours of work, shift work
- lack of training for the job
- autonomy (lack of ability to make decisions)
- threat of violence or harassment
- isolation at the workplace
- job security (fear of losing job)

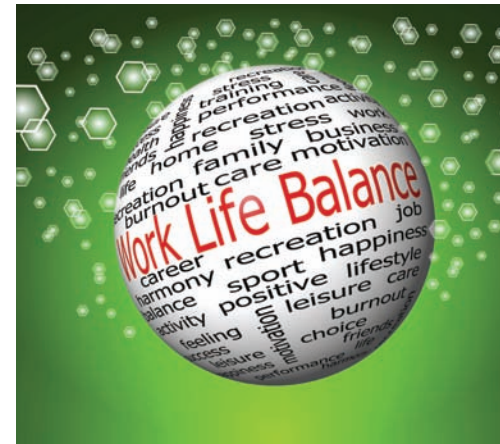


**Figure 11-3** | What strategies do you employ to manage stress?

## WORK-LIFE BALANCE

A good work-life balance is key to the prevention and management of mental health issues. When stress is being experienced in the workplace, and/or at home, the overall wellness of a person may be affected. **Work-life balance** is a state of well-being such that workers can effectively manage multiple responsibilities at work, at home, and in their community. Work-life balance is different for everyone.

**Work-life conflict** occurs when workers are unable to achieve a positive work-life balance. Workers may find their roles overwhelming or it may seem they are interfering with one another. The worker may find it difficult to get away from stress and feel as if it follows him or her from one place to another at an overwhelming rate. Poor work-life balance can negatively impact a worker's mental health and wellness.



**Figure 11-4** | What would work-life balance mean to you?



**Figure 11-5** | Working from home and home-based businesses are growing trends. What opportunities and challenges might arise in such an arrangement as they relate to stress and/or work-life balance?

## IMPACT OF STRESS IN THE WORKPLACE

Many workers have a difficult time balancing their home and work-life. This inability to effectively manage roles and responsibilities can have a negative impact in the workplace. Presenteeism, job burnout, and substance abuse are just some of the ways that workplaces are affected by stress.



**Figure 11-6** | Heavy workload has often been cited as a strong predictor of increased presenteeism in the workplace. Workers often feel pressure to work and not be absent.



**Figure 11-7** | Have you ever experienced what you thought to be burnout at school? How did you manage it? Share your strategies with a partner.

## Presenteeism

**Presenteeism** refers to workers continuing to work when they are experiencing a physical or mental health issue that would typically justify an absence. They are not giving themselves the time they need to recover and, as a result, their performance may suffer and result in incidents that could have otherwise been avoided.

## Job Burnout

Job burnout is generally characterized as a state of exhaustion caused by long-term exposure to demanding work situations. Workers become cynical about the value of their occupation and their ability to perform the work. The three elements of job burnout tend to appear in the following order:

### 1. Exhaustion

Workers' emotional and physical resources are depleted. Their energy levels are low and they feel like they have nothing left to give to the job.

### 2. Cynicism

Once their emotional resources have been depleted, workers feel increasingly cynical about the value of their work. They are unable to see the positive aspects of their job.

### 3. Reduced Performance

As a result of this exhaustion and cynicism, workers feel less effective in their job, experience poor job-related self-esteem, and their performance decreases.

Burnout can result from many negative conditions at work including:

- unclear work expectations
- not enough resources to do the work
- lack of control or inability to influence decisions regarding the work
- extremes of work activity—too much at times, too little at others
- a mismatch in values between an organization and the worker
- lack of support from supervisors and colleagues
- lack of recognition

Job burnout can also impact a worker's personal life and can contribute to physical and mental health issues. It is important to recognize the signs of burnout and respond accordingly as soon as possible.

## Substance Use, Misuse and Abuse

Substance use, misuse, and abuse at work is also recognized as having a potentially significant impact on mental health at work. The Canadian Mental Health Association has recognized the incidence of parallel

mental health conditions and addictions as an issue affecting some workers. This is known as **concurrent disorder**; however, it is often the addiction that first gets noticed—especially in the workplace.

Organizations should have detailed substance abuse policies (i.e., regarding the use of illicit drugs and alcohol consumption at work) and make sure that all workers are provided training to make them aware of what these policies entail. This provides a basis for supervisors and employers to talk to workers about their substance use. These policies let workers know that breaching the rules while at work can put their job security at risk.

## QUICK CHECK

1. How does stress play a role in our psychological health and wellness?
2. What factors have the potential to negatively impact our psychological well-being?
3. How can workplace policies help support workers' psychological well-being?

## Psychological Health and Safety Programs

**Psychological health** encompasses an individual's ability to reason, reflect, and behave in a way that facilitates effective performance in the workplace, at home, and in the community. **Psychological safety** on the other hand involves the risk of injury to the psychological well-being that a worker may experience. Enhancing the psychological safety of a work environment includes taking precautions to minimize the risk of injury to workers' psychological health and well-being.

The psychological health and well-being of workers should be an integral part of any workplace occupational health and safety program. Two programs that support worker psychological health and well-being include a Psychological Health and Safety Management System (PHSMS), and an Employee Assistance Program (EAP).

### PSYCHOLOGICAL HEALTH AND SAFETY MANAGEMENT

A Psychological Health and Safety Management System (PHSMS) can help ensure that an organization is effective in managing human resources. Psychological health and safety should be viewed as an integral part of all operations. The components of an organizational PHSMS should include:

- the development of a policy statement showing a commitment to create and continually improve a mentally healthy and safe workplace

### concurrent disorder

a condition in which an individual experiences both a mental illness and a substance abuse problem



### Really!?!

According to the Mental Health Commission of Canada, nearly one quarter of the country's working population is currently affected by mental health problems or illnesses leading to absenteeism, presenteeism, and turnover. Adults in their early and prime working years are among the hardest hit.



- a set of practices and procedures that promote a positive psychological health and safety environment
- an education and training component that clearly delineates the roles and responsibilities of both the employer and the workers
- regular monitoring and improvement in the practices

A PHSMS can be integrated into existing occupational health and safety policies and procedures.

## EMPLOYEE ASSISTANCE PROGRAMS (EAP)

**Employee Assistance Programs (EAPs)** are employee benefit programs offered by many employers. EAPs are intended to help employees deal with personal problems that might adversely impact their work performance, health, and well-being. EAPs generally include short-term counseling and referral services for employees and their household members.

The concept of the EAP originated in the 1970s in an effort to reduce substance abuse and intoxication in the workplace. Since that time, EAPs have evolved to deal with a variety of issues such as marital problems, depression, anger management, anxiety, and physical illness.

While EAPs offer help with the resolution of problems that are affecting work, these problems do not have to be caused by workplace issues. EAPs are designed to help people understand or overcome their personal problems. While most EAPs offer a wide range of services, they often refer to other professionals or agencies that can offer more or extended care in particular areas.

EAPs are typically funded by the employer and are freely available for workers and their immediate family. Two of the important features of a successful EAP are that they are voluntary and confidential.



**Figure 11-8** | Why is confidentiality a critical element of an EAP?

## QUICK CHECK

1. Outline the main components of a psychological health and safety management system for a workplace.
2. Differentiate between psychological health and psychological safety.
3. Explain the role of Employee Assistance Programs.

## Harassment and Bullying

Employers are responsible for protecting the physical AND mental health of workers. This includes protection from harassment and bullying in the workplace.

## WORKPLACE HARASSMENT

**Workplace harassment** has been defined as engaging in a course of **vexatious** comment or conduct against a worker in a workplace that is known or ought reasonably to be known to be unwelcome. The Public Service Secretariat of Newfoundland and Labrador cites the following as examples of harassment:

- unwelcome comments or jokes
- spreading rumours or gossip
- displaying or sending sexist, racist, or other offensive pictures or emails
- actual or threatened physical assault
- threatening or bullying
- insulting gestures

The Canadian Mental Health Association provides examples of practical measures that employers can put in place to reduce the risk of workplace harassment. They encourage employers to:

- create written workplace harassment policies and train workers on such policies
- include this element in the health/risk assessments done in the workplace to determine the possibility or prevalence of workplace harassment
- provide ways for workers to report instances or risks of workplace harassment
- enforce workplace harassment policies and procedures
- if available to the organization, promote Employee Assistance Program (EAP) services so that workers who are subject to workplace harassment can talk to someone confidentially about issues they are facing
- ensure that proper security measures are in place at the workplace to protect workers from members of the public or customers
- keep detailed records of any workplace harassment, investigation or work refusal

## WORKPLACE BULLYING

The CCOHS describes bullying as acts or verbal comments that could “mentally” hurt or isolate a person in the workplace. Sometimes, bullying can involve negative physical contact as well. Bullying usually involves repeated incidents or a pattern of behaviour that is intended to intimidate, offend, degrade, or humiliate a particular person or group of people. It has also been described as the assertion of power through aggression.

### **workplace harassment**

engaging in a course of vexatious comment or conduct against a worker in a workplace that is known or ought reasonably to be known to be unwelcome

### **workplace bullying**

repeated, unreasonable, or inappropriate behaviour directed towards a worker or group of workers that creates a risk to health and safety

### **vexatious**

causing annoyance, frustration, or worry



### **Really!?!**

The Kavanagh Decision (Newfoundland Association of Public and Private Employees v. Newfoundland) in 2003 was a landmark case in workplace harassment. The province of Newfoundland and Labrador was sentenced to pay damages to the government worker whose employment was terminated after a campaign of harassment by his co-workers.





**Figure 11-9** Why do you think some people accept bullying in the workplace? What could you say to help them change their attitude?

It is sometimes hard to know if bullying is happening at the workplace. Many studies acknowledge that there is a “fine line” between strong management and bullying. Comments that are objective and are intended to provide constructive feedback are not often considered bullying, but rather are intended to assist the worker with their work.

### Common Tactics Used by Workplace Bullies

1. Falsely accusing someone of “errors”
2. Staring, glaring, and other non-verbal intimidation
3. Discounting a person’s thoughts or feelings (e.g., “oh, that’s silly”) in meetings
4. Using the “silent treatment” to “ice out” and separate from others
5. Making up rules on the fly
6. Disregarding satisfactory or exemplary quality of completed work
7. Harshly and constantly criticizing
8. Starting, or failing to stop, destructive rumors or gossip
9. Encouraging people to turn against the person being tormented
10. Publicly displaying gross or undignified behavior
11. Yelling, screaming, and throwing tantrums in front of others to humiliate a person
12. Stealing credit for work done by others
13. Making verbal put-downs/insults based on gender, race, accent, age, language, disability
14. Creating unrealistic demands (workload, deadlines, duties)
15. Ensuring failure of a person’s project by not performing required tasks, such as sign-offs, taking calls, working with collaborators

Source: Workplace Bullying Institute

The Canadian Mental Health Association suggests that a bullying prevention policy should:

- include a statement from top management to all workers stating that bullying is inappropriate and will not be tolerated
- describe bullying and the types of behaviour that constitute bullying
- include a statement of risks to the organization and individuals
- identify where complaints should go (e.g., human resources)

- encourage workers who experience or witness bullying to report it
- clearly state that retaliation against or victimization of workers who report workplace bullying will not be tolerated
- state the process that will be followed if a complaint is received
- state a commitment to prompt action if workplace bullying occurs

## IMPACTS OF WORKPLACE HARASSMENT AND BULLYING

People who are the targets of harassment or bullying may experience a range of effects. These reactions include:

- shock
- anger
- feelings of frustration and/or helplessness
- increased sense of vulnerability
- physical symptoms such as inability to sleep or loss of appetite
- psychosomatic symptoms such as stomach pains or headaches
- panic or anxiety, especially about going to work
- family tension and stress
- inability to concentrate
- low morale and productivity

Harassment and bullying can also affect the overall health of an organization. An unhealthy workplace can have many effects. In general these include:

- increased absenteeism
- increased turnover
- increased stress
- increased cost for employee assistance programs
- increased risk of incidents
- decreased productivity and motivation
- decreased morale

## QUICK CHECK

1. How would you differentiate between workplace harassment and workplace bullying?
2. Explain the impact of workplace harassment or workplace bullying on mental health.
3. How are harassment and bullying the same or different inside and outside the workplace?

## Making Safe and Healthy Choices for Overall Employee Wellness

Workplace health and wellness programs should be a part of a company's strategy for achieving a healthy and safe workplace. According to the Canadian Centre for Occupational Health and Safety (CCOHS), legislation and other workplace policies or programs can provide a basis for a workplace health (or health promotion) program. When setting up any health program, remember to include training, workers' input, and other support (e.g., time to attend sessions) and choices where possible.

The purpose of a workplace health and wellness program is to offer a comprehensive health service to employees. Therefore it is important to remember that employees are potentially exposed to a wide variety of health hazards or situations at work on a regular basis. As such, it is impossible to deal with workplace health and wellness issues in isolation from health and safety, and vice-versa.

The Newfoundland and Labrador Construction Safety Association (NLCSA) decided in 2011 to start a wellness program because it was something their employees wanted. "When preparing our annual budget, we always send a note to staff asking for recommendations or suggestions for something they would like to do as a team," says Jackie Manuel, Chief Executive Officer. "They researched a corporate wellness program and brought me a proposal."

To develop the organization's health and wellness program, the NLCSA enlisted the services of an international fitness and health firm specializing in personal training and strength coaching, corporate wellness provisions and human safety services. They focus on enhancing individual performance with a safe and injury-free mindset based on four fundamentals of energy:

- build your energy—exercise with purpose
- focus on wellness, not just weight loss
- nutrition—eat right for your needs
- recovery—rest, stress management and recovery

The goal of the NLCSA’s workplace health and wellness program is to send people home healthier than when they arrived. If people are less fatigued at work and more cognitively aware of potential hazards around them, they are less likely to get hurt. “It all comes down to energy, fatigue management, and what an individual wants to get out of our program,” says Manuel.

She explains that the most startling result from the program is when her accounting manager who has been involved in administering medical benefits programs for about 20 years—came to her and said she is seeing health costs go down. “For the last two years, we have seen the premiums for our health and medical benefits coverage go down—that’s huge.”

In addition to individualized programming, the NLCSA has introduced lunch and learn sessions, onsite yoga and stretching, and foam rolling massage. “I remember the first time I participated in a yoga session, I went home that night and had the best night’s sleep in years,” Manuel laughs.

Any wellness program in the workplace needs to be leadership driven. The health and wellness culture at the NLCSA is support driven and the program works because staff have found something that interests them, and their leadership is there to cheer them on.



**Figure 11-10** | How could you better manage your health and wellness?

## Canadian Mental Health Standard

While there are many contributors that factor into an individual's well-being, the workplace comprises a large portion of our lives and is therefore an integral component in maintaining and promoting good psychological health and safety. In 2013 a Canadian standard was launched to provide guidelines for employers to develop and continuously improve psychologically safe and healthy work environments for their workers.

Entitled “*Psychological Health and Safety in the Workplace—Prevention, promotion and guidance to staged implementation*”, this National Standard of Canada (CSA Z1003-13) is a voluntary standard that focuses on mental illness prevention and mental health promotion.

According to the Mental Health Commission of Canada, the standard includes information on:

- the identification of psychological hazards in the workplace
- the assessment and control of the risks in the workplace associated with hazards that cannot be eliminated (e.g., stressors due to organizational change or reasonable job demands)
- the implementation of practices that support and promote psychological health and safety in the workplace
- the growth of a culture that promotes psychological health and safety in the workplace
- the implementation of systems of measurement and review to ensure sustainability of the overall approach

The voluntary standard can be utilized differently by businesses and organizations depending upon their needs. Some businesses may use the standard to focus on creating policies and processes to promote good mental health, while others may use it to inform training programs.

The standard is a starting point for many workplaces. It is important to note that the full range of workplace mental health issues cannot be addressed by meeting the standard alone. Strong leadership and a comprehensive approach to organizational change are also required.

### QUICK CHECK

1. What is meant by a national standard?
2. What is the purpose of the Canadian Mental Health Standard?
3. How can a national standard be an effective strategy in support of mental health and wellness?

 **SPREAD THE WORD**

One of the challenges of mental health issues is that they cannot be “seen” on the outside in the same way as, for example, a person wearing a cast or having a bruise. They are sometimes referred to as being “masked.”

Return to the ideas you brainstormed at the beginning of the chapter. What ideas or images would you now add to or delete from your list? Using these ideas, design a mask, or another piece of artwork, to reflect your understanding of the issues behind psychological health and safety.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 187). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

You’ve now had a chance to consider the implications of mental illness in the workplace...both to workers and employers. Write an account predicting the state of affairs in Canadian workplaces 30 years from now if further steps are not taken to successfully address psychological health and safety.

Your account may take the form of an editorial, poem, or song. It should include statistics and other evidence to strengthen the arguments for support.

 **DIG DEEPER**

Research the “Respectful Workplace Program” on the Public Service Commission website. This program is offered to public service employees in Newfoundland and Labrador. After examining the elements of the program consider the following: Why would a government invest human and financial resources in such a program?



# Ergonomics

Ergonomics is the science of arranging and adjusting your work environment to fit you and your body. While ergonomics can be applied at home and in recreation, it is most commonly used in workplaces where jobs, tasks, products, environments, and systems are designed to make them compatible with the needs and abilities of workers.

Occupational health and safety policies and procedures should incorporate an ergonomics component into all elements of the OH&S program. The overall goal is to optimize the health, safety, comfort, and efficiency of workers by preventing musculoskeletal injuries (MSIs).

## LEARNING GOALS

This chapter will enable you to:

- describe the principles of human movement
- describe ergonomics and its relationship to the prevention of musculoskeletal injuries
- examine the components of an ergonomic risk evaluation
- explain how ergonomic risk factors can be controlled

## SPREAD THE WORD

How often do you text, use a computer keyboard, or play video games? Do you enjoy sports? Have you heard the terms “texting thumb,” “tennis elbow,” or “jumpers’ knees”? What do you think these terms mean? As a class, brainstorm what they may all have in common.



**Figure 12-1** | Can you estimate how many minutes a week you spend texting?

## WHAT WOULD YOU DO?

Jonathan works part-time for a moving company. He enjoys helping families move into their new homes and being a part of their excitement. It is hard work though—carrying boxes and furniture of all shapes in and out of dwellings and on and off the truck. Jonathan often suffers aches and pains by the end of a work day.

Summer months are particularly busy for Jonathan and the moving crews. Everyone, it seems, wants to move before school starts. The company divides into two person crews to handle smaller in-town moves. Jonathan and his partner have been busy all day at a work site and had been hoping to finish early. His partner has a dinner date

and is anxious to get going. He asks Jonathan if he will finish unloading the remaining boxes on his own. He should be able to haul the boxes down off the truck and carry them in using their trolley.

Jonathan gives it some thought, glancing at the oversized mirror boxes and arm-chairs still remaining on the truck. He is already thinking about his aching muscles.

**What would YOU do?**



**Figure 12-2** | Are safe lifting techniques being used here? What do you already know about safe lifting techniques? Brainstorm a list with a partner.

## CHAPTER CHALLENGE PREVIEW



Where do you normally do your homework? How is your workspace set up? Are you comfortable? If you could design your ideal workspace, what would it be? Share your thoughts with a partner.

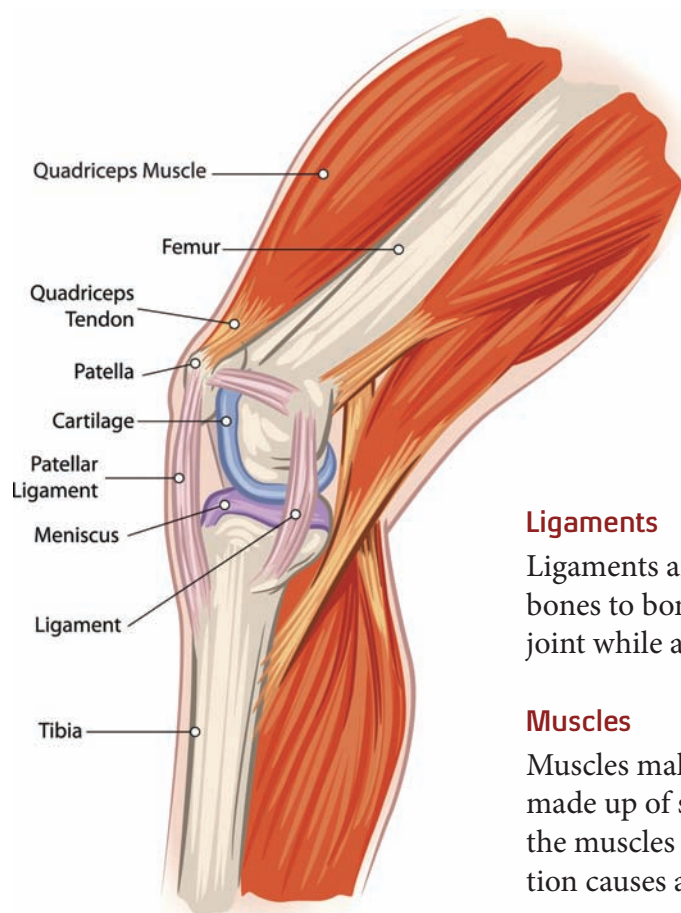
**Figure 12-3** | How much time do you spend each week in class, doing homework, and studying?

# Principles of Human Movement

Our bodies are designed for efficient movement. Understanding how our bodies work enables us to maintain this movement and better protect ourselves from injury whether at home, school, or work.

## HOW OUR BODY PARTS WORK TOGETHER FOR MOVEMENT

To perform work tasks, the various tissues that make up the body are utilized. Human movement occurs when a bone moves in relation to another bone at various joints within the body. When a muscle contracts, or shortens, its tendon pulls on an attached bone causing it to move.



**Figure 12-4** | The anatomy of a human knee joint where the femur and tibia bones meet together.

### Bones

The 206 bones that make up the skeletal system give the body structure and strength. They help connect, anchor, and support the various structures of the body. Bones provide levers and locations for the attachment of muscles that allow movement.

### Joints

Joints are formed where two or more bones connect. Examples of joints include the elbow, knee, and shoulder. Joints allow movement of body parts and provide stability.

### Ligaments

Ligaments are long bands of fibrous tissue that connect bones to bones within the body. They provide stability to a joint while also allowing flexibility and movement.

### Muscles

Muscles make movement of body parts possible. Muscles are made up of smaller muscle fibres that work together to make the muscles contract, or squeeze together. A muscle contraction causes an attached bone to move.

### Tendons

Tendons are cordlike bundles of fibres at the ends of muscles that connect muscles to bones. When a muscle contracts, it pulls on the tendon and causes the attached bone to move.

## NEUTRAL POSTURES

**Posture** refers to the position of a body part in relation to an adjoining body part. **Neutral posture** refers to the resting position of joints. In neutral posture, joints are under minimal physical strain. As a body part, such as an arm, moves away from its resting position, increased energy must be generated by the muscles. This can lead to strain on muscles, tendons, and other tissues.

### Standing Neutral Posture

Figure 12-5 illustrates the characteristics of standing neutral posture:

- standing erect
- face straight ahead
- eyes look ahead with slight downward gaze
- arms rest at sides
- wrists straight
- ears over shoulders
- shoulders over hips
- palms face towards sides of body



**Figure 12-5** | How is this man demonstrating a neutral standing posture?

### Sitting Neutral Posture

Figure 12-6 illustrates the characteristics of sitting neutral posture:

- natural spinal curves
- face straight ahead
- ears over shoulders
- arms rest at sides
- elbows bent at 90 degrees
- wrists straight
- hands placed in handshaking position
- hips at 93-103 degree angle
- knees at a 90 degree angle
- feet firmly supported on floor or footrest

**Figure 12-6** | Does your classroom desk and chair enable you to apply a neutral sitting posture?







**Figure 12-7** | The human spine has a natural “S” shaped curvature.

### The Scoop about Your Spine...

The human spine is made up of several vertebrae bones that stack on top of one another. The vertebrae are separated by intervertebral discs that provide shock absorption and stability for the spine and also allow mobility about the spine. It is important to maintain the natural curvature of the spine when working. This can be achieved by working in neutral postures as often as possible. Otherwise, pressure can be placed on the intervertebral discs.

- For seated work, having a chair with good back support and the feet firmly supported on the floor or a footrest helps maintain the natural spinal curves.
- For standing work, a footrest to raise one foot (alternating feet frequently) helps support the natural spinal curves.

## WHAT IS ERGONOMICS?

**Ergonomics** is a science dedicated to fitting the job or task to the worker rather than fitting the worker to the task. Ergonomics considers human characteristics and how the design of work systems relates to people. The goal is to optimize or improve the interaction between people and their work such as the tools and equipment they use, the products they work with, the tasks they perform, how their work is organized, the technology they use, and the environment in which they work.

Every person is different—height, weight, width, and limb length vary between individuals. Therefore, a tool or piece of equipment suitable for one worker may not be suitable for all. Rather than making people fit their work, ergonomics is about designing jobs, tools, tasks, equipment, and processes such that they suit the individual capabilities of the worker. Effective and successful matches ensure high productivity, avoidance of illness and injury, and increased satisfaction among the workforce.

Examples of how ergonomics can be applied in workplaces include:

- designing a workstation to fit the worker
- ensuring workstations for multiple users are easily adjustable
- ensuring equipment is appropriate for the task at hand
- redesigning a process to make it more efficient
- designing products to make them “user friendly”

## QUICK CHECK

1. Describe how bones, joints, ligaments, muscles, and tendons all work together for movement.
2. Demonstrate, to a partner, the neutral postures for standing and for sitting.
3. Define ergonomics and its importance to occupational health and safety.

## Musculoskeletal Injuries

Occupational Health and Safety (OH&S) Regulations define a **musculoskeletal injury** (MSI) as an injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels, or related soft tissue, including a sprain, strain, and inflammation that may be caused or aggravated by work. Other terms with similar meanings include:

- soft-tissue injuries (STI)
- musculoskeletal injury disorder (MSD)
- work-related musculoskeletal disorder (WRMSD)
- repetitive strain injury (RSI)
- repetitive motion injury (RMI)
- occupational overuse syndrome (OOS)
- cumulative trauma disorder (CTD)

MSIs are examples of what some people refer to as ergonomic-related injuries. They are caused by known risk factors in the workplace.

### TYPES OF MSIs

Poorly designed workstations, tasks, and task processes can cause many different types of MSIs including:

- muscle or tendon strains (pulling a muscle or tendon)
- ligament sprains (overstretching a ligament)
- pinched nerves
- tendinitis (inflammation of a tendon and surrounding tissue)
- epicondylitis (tendinitis of the elbow or “tennis elbow”)
- carpal tunnel syndrome (compression of a nerve in the wrist)
- trigger finger (swelling of a tendon in the finger joint that causes the finger to lock into a fixed position)



On average, 68% of claims submitted to WorkplaceNL are for musculoskeletal injuries.



**Figure 12-8** | Tendinitis, carpal tunnel syndrome, and repetitive stress injuries are often associated with people who work on computers all day, have jobs requiring repetitive movements, or have an improper workstation set up.



## SIGNS AND SYMPTOMS OF MSIs

Signs and symptoms of MSIs may appear suddenly, for example, following a single event of lifting a heavy object. Often times, they develop gradually over a period of time. Some may not present themselves until weeks, months, or even years following the overuse of muscles, tendons and other soft tissues, depending on the level of exposure to the risk factors, and the individual's level of tissue tolerance.

It is important for workers and employers to be aware of the signs and symptoms of MSIs so that necessary changes can be made to job tasks to prevent further harm. MSI signs and symptoms may include:

- numbness
- tingling/burning sensations
- pain/tenderness
- swelling
- redness
- restricted movement
- loss of strength (e.g., grip strength)

## ERGONOMIC RISK FACTORS

MSIs are most often associated with work patterns that involve forceful exertions, repetitive movements, or sustained and/or awkward postures. These work patterns, also known as **ergonomic risk factors**, generally do not occur separately to cause a MSI. MSIs usually result from a combination of two or more risk factors being present at once, such as working in an awkward posture on a repetitive basis.



The primary ergonomic risk factors include:

- forceful exertions
- repetitive movements
- sustained and/or awkward postures

Other ergonomic risks factors include:

- contact stress
- environmental factors
  - temperature
  - vibration
  - lighting

**Figure 12-9 J** What ergonomic hazards may be found in this situation?

## Forceful Exertions

**Force** refers to the amount of work or muscular effort our bodies must exert to complete tasks. All tasks require workers to use their muscles to exert some level of force. When the level of force exerted is too high it can damage muscles, tendons, or other soft tissues. This damage can occur from a single action such as lifting a heavy object. Damage can also occur when muscles generate moderate to high levels of force repeatedly, for a long duration, and/or in an awkward posture (e.g., lifting moderately heavy items several times a day). The greater the effort and stress on the body, the greater the risk of a MSI.

Work activities that require forceful exertions include lifting, lowering, pushing, pulling, carrying, holding, and gripping. Muscular effort depends on more than just an object's weight. A relatively light object may be difficult to lift and require high forceful exertions. Here are some points to remember:

- bigger, heavier, and bulkier objects require more muscular effort
- objects held away from the body require greater effort
- lifting in awkward postures puts more stress on tissues
- the higher the object needs to be lifted, the greater the effort required
- risk increases with increasing frequency and duration of force exposure
- handling a load with one hand or to one side of the body puts more stress on the body compared to using both hands

By minimizing the muscular effort required to complete tasks, the risk of injury decreases.

## Repetitive Movements

**Repetitive movements** refers to the same or similar work activities being performed frequently, or for extended periods, causing the same muscles to be used steadily with little time to recover.

Examples of repetitive job tasks include:

- typing
- turning lumber
- stacking pallets
- using a screwdriver
- hammering
- stapling

Employers have legislative roles and responsibilities to prevent MSIs in the workplace under the provincial OH&S Regulations.

Employers shall:

- recognize, evaluate, and control risks of MSIs
- educate and train workers in identified risks and the use of specific control measures
- monitor control measures for effectiveness
- consult with workers and the OH&S Committee, Worker H&S Representative or Workplace H&S Designate when performing risk assessments

Under the regulations, there are also specific requirements for seated and standing work as well as for lifting and handling loads.



**Figure 12-10** | What ergonomic risk factors might impact this house painter?

MSI risk increases as:

- the number of actions increase
- the speed of actions increase
- muscles exert higher levels of force
- body joints move farther away from neutral position
- the length of time the task is done without rest breaks increases

Lesser forces repeated over time may eventually cause tissues to fatigue. Blood flow may not be able to meet the demands of tissues without sufficient rest and the tissues will not be able to repair themselves due to oxygen and nutrient deficiency.

### Sustained and/or Awkward Postures

A **sustained posture** refers to holding the body or a body part in one posture for an extended period. To hold a posture, muscles must continuously contract, which affects blood flow and causes fatigue. Even neutral posture can be hazardous if held for prolonged periods. Ensure to change your neutral postures throughout the day to lessen the amount of time in one posture.

Examples of sustained postures include prolonged sitting at a computer workstation or prolonged standing at an assembly line.

**Awkward postures** refers to work activities requiring a body part to move away from neutral position. When a body segment moves away from its resting position, increased force must be generated by muscles leading to strain on muscles, tendons, and other tissues. Awkward postures can also reduce blood flow to various tissues and place pressure on nerves. The greater the distance the body segment moves away from its neutral position, the more awkward the posture and the greater the risk of a MSI.



**Figure 12-11** | How might ergonomic risk factors affect these workers?

The following awkward postures should be avoided or reduced:

- reaching in front of the body or to one side
- twisting the back
- bending the back forward or to one side
- reaching overhead
- bending or twisting the wrists
- turning or bending the neck
- kneeling

### Contact Stress

When a body part presses against a hard surface, nerves, tendons, blood vessels, and other tissues can become injured due to pressure and decreased blood flow. Examples of contact stress include:

- resting forearms against a desk edge
- sharp handle of a tool digging into the hand
- kneeling to complete floor-level work
- striking an object with the hand like a hammer

### Environmental Factors

Characteristics of the work environment can cause or contribute to the risk of a MSI developing.

### Temperature

Cold temperatures can reduce blood flow to tissues resulting in reduced nutrient, fuel, and oxygen supply, and increased muscle fatigue. Reduced blood flow can inhibit sensation in fingers and hands and cause workers to grip tools harder to ensure control. To grip harder, increased force must be produced by the muscles. Working in extreme heat can present a similar scenario whereby a worker with sweaty hands will grip harder to handle an object.

### Vibration

Vibration exposure can occur when working near or on vibrating machinery and when using vibrating hand tools. When vibration physically shakes the whole body (e.g., when operating a tractor), it is known as whole body vibration exposure. Body segmental vibration exposure occurs when only a body segment gets shaken (e.g., hand and arm when hammering nails). Too much of either type of vibration exposure can lead to a variety of conditions due to increased force demands on muscles and reduced blood flow and physical sensation.

### Lighting

Insufficient lighting can cause workers to use awkward postures to see their work. When painting a room with shadows, a painter



**Figure 12-12** | What ergonomic risk factors might impact the driver of this excavator?



is more likely to use awkward postures to check for imperfections. Too much lighting can also cause problems. Glare from sunlight shining on a computer screen can cause eye strain.

### Other Contributing Factors

There are many other workplace factors that could contribute to MSI risks being present. Examples include workplace or workstation layout, characteristics of loads and equipment, work organization, and age.

### Workplace or Workstation Layout

Improperly designed workplaces can contribute to the development of MSIs because workers may be forced to use awkward postures. For example, a work bench that is too low for a worker would require him or her to bend forward at the waist to work.



**Figure 12-13** | How might the characteristics of loads and equipment pose a challenge for workers in the fishing industry?

### Characteristics of Loads and Equipment

The following characteristics of loads and/or equipment can affect the level of risk:

- weight
- dimensions (length, height, width)
- shape
- stability
- rigidity (how firm or hard the object is)
- surface texture
- absence or placement of handles

Handling large and/or awkward loads can cause workers to use awkward postures, and place additional force demands on the body (e.g., restraining a distressed animal).

### Work Organization

The way work is organized determines what jobs need to be done and how they are carried out. Some organizational factors can contribute to risk including:

- not enough time allowed for recovery between tasks
- work pace and duration (e.g., work is moving at a fast pace for long periods of time)
- lack of task variety
- high work loads

- work schedules (e.g., long shifts/inconsistent shift times)
- lack of rest breaks
- improper maintenance of equipment (e.g., mechanical lifting devices)
- inadequate staffing levels
- inadequate work procedures

### Age

Young workers may be at a greater risk of injury due to inexperience in a task or because they are still developing physically. Young workers are also generally more comfortable exerting high amounts of force which could lead to injury. On the other hand, increasing age may be associated with decreasing physical ability and endurance. However, risk cannot be evaluated based on age alone as older workers may be able to make up for any physical loss through experience and skill.

## QUICK CHECK

1. What is a musculoskeletal injury?
2. What are the signs and symptoms of MSIs?
3. Identify five ergonomic risk factors and provide an example of an occupation or workplace where each of these factors might be present. Explain your examples.

## Risk Evaluation and Hazard Control

Risk evaluation is an examination of work tasks to determine the level of risk present where ergonomic risk factors have been identified. Not all risk factors will be severe enough or occur over a long enough time to cause a MSI.

To determine injury potential, each risk factor should be evaluated in terms of:

- magnitude or intensity of exposure (i.e., how much)
- frequency of exposure (i.e., how often)
- duration of exposure (i.e., how long)

Additionally, the combination of risks present should be considered. When two or more risk factors are present at the same time, the risk of injury increases.



## CONTROL MEASURES

To prevent MSIs, ergonomic risk factors should be eliminated or reduced as much as possible using one or more control measures. The primary risk factors to consider include forceful exertions, repetitive movements, and awkward and/or sustained postures.

As with other health and safety hazards, the hierarchy of controls (engineering, administrative, and personal protective equipment) is applied to ergonomic hazards and a combination of controls may be required to ensure the safety of workers.

### Engineering Controls

Engineering controls consist of the design or redesign of a process, task, equipment, product, or work environment to eliminate or reduce risks of MSI. Some examples include:

- automating a task using machinery thereby eliminating the risk
- ordering 10 kg bags of potatoes instead of 20 kg bags to reduce force demands
- providing height-adjustable work tables, workstations, and platforms so neutral postures can be used
- providing mechanical assistive devices to reduce manual materials handling

### Administrative Controls

When engineering controls cannot eliminate or minimize risks of MSI, administrative controls must be considered to further reduce the risks. Administrative controls alter the way the work is done. Examples include:

- assigning a variety of tasks to reduce exposure time of repetitive movements and sustained postures (e.g., task rotation)
- implementing safe work practices and procedures (e.g., proper body mechanics and techniques for manual materials handling tasks)
- allowing micro-breaks for postural changes
- alternating sides of an assembly line to change muscle activity
- training workers in the use of specific controls to prevent MSIs (e.g., safe work practices and procedures, how to operate mechanical assistive devices, and how to use personal protective equipment)



### THINK ABOUT IT...

**Think back to Chapter 5. What administrative policies were put in place to protect workers from repetitive strain injuries? Why were they effective?**

## Personal Protective Equipment (PPE)

As a last resort, PPE can be used to minimize risk of injury. Some examples include:

- knee pads for floor-level work
- vibration-absorbing gloves for operating vibrating hand tools
- footwear with shock-absorbing insoles for working on hard floors

## QUICK CHECK

1. What four elements are considered when evaluating the risk potential of MSIs?
2. How does the hierarchy of controls apply to the prevention of MSIs?
3. What risk factors exist in your school environment for MSIs to occur? What control measures are, or could be, in place to prevent these injuries?

## Manual Materials Handling

Manual materials handling is a common workplace activity. A person's back is at risk of injury when lifting and handling loads. The principles that follow can help reduce the risk:

- push or pull rather than lift (pushing and pulling is safer if applied at or around waist level)
- reduce the weight and size of the item
- reduce the number of objects carried at once
- reduce the distance objects are carried or transported by relocating storage areas

When manual handling tasks are required in the workplace, a worker's job should be organized such that these tasks are rotated between lighter tasks that do not stress the same muscles.

## STEPS IN LIFTING

When lifting cannot be avoided, the act of lifting should be broken into four steps:

1. Plan the move
2. Perform the lift
3. Carry the load
4. Lower the load

### 1. Plan the move

The worker must first determine the safest means of performing the move and whether help is needed such as a lifting assistive device or carrying out a team lift.

The best handling technique involves balance while avoiding unnecessary bending, twisting, and reaching. The lift should be performed with a steady and smooth motion and with minimal bending of the low back.

To determine the safest method of handling:

- test the load—its size, weight, shape, condition, stability, and weight distribution
  - if lifting has to be performed frequently, or for long time periods, the weight of the load should be decreased
- ensure a secure grip is possible
  - use a comfortable power grip (whole hand) versus a pinch grip (fingers only)
  - use handles where possible
- ensure adequate space for movement
- determine where the load will be placed (on floor, table, or overhead)
- check for a clear path—anticipate distance, stairs, ramps, and obstacles

## 2. Perform the lift

When lifting, it is important to use proper body mechanics to minimize excessive curvature of the spine and reduce strain on the low back. The start and finish height of the object should be between mid-thigh to shoulder height, and preferably at the worker's waist height. The most common technique used to lift low-lying objects (at or near floor level) is as follows:

- face the direction of the object
- move closer to the object and form a wide stance
- in a smooth motion, keep your back straight, push your buttocks out, and bend your knees
- use your legs and hips to lower your body down to the object
- engage your core by tightening your stomach muscles
- grip the object by its handles, if present, otherwise grasp the object firmly with both hands
- pull the object in close to your body, bringing its center of mass as close to your spine as possible
- lift slowly and smoothly by extending your legs with your back straight
- breathe as you lift

## 3. Carry the load

Keep the following principles in mind when carrying objects:

- do not carry heavy or awkward loads over long distances
- keep the object's center of mass close to your spine
- distribute the weight of the object evenly on both sides (avoid one-handed carrying)

- look where you are walking and be mindful of any obstructions
- do not twist your back—move your feet to turn
- maintain an upright posture

#### 4. Lower the load

When a load must be lowered, keep your back straight, push your buttocks out, and bend your knees. Use your legs and hips to lower your body down in a smooth motion. In addition:

- face the direction of where you want to place the object to avoid twisting or bending the back sideways
- do not over-reach or over-stretch—to deposit the load on a bench or shelf, safely place it on the edge and push it into position
- do not swing or throw objects—release the object slowly and smoothly, without jerking

### OVERHEAD LIFTING

Manual lifting from shoulder height to overhead should be avoided when possible. If a worker has to stretch on his or her toes to reach an object, an assistive device should be used to raise the worker. In the event overhead lifting is performed, the following principles should be applied:

- maintain a staggered stance, one foot in front of the other
- avoid excessively arching the back backwards
- minimize the length of time the object is held at or above shoulder height

### MECHANICAL HANDLING AIDS

The use of mechanical handling aids is one way to minimize the amount of force a worker must exert to handle an object. Some examples include:

- trolleys
- dollies
- utility carts
- fork lift trucks
- two-wheeled hand trucks
- belt and roller conveyors
- sliding rails
- overhead travelling cranes
- patient lifts

Workers must be trained in the use of such equipment to ensure they know how to safely operate it.



**Figure 12-14** | How have suitcases, backpacks, and other cases evolved over the years to make them easier on our bodies to transport?

## Former Paramedic Sets His Sights on a New Career in Health and Safety

Being a good paramedic means being able to do as much as you possibly can to save a life, and knowing how to accept it when this is just not enough. During his 20-year career, Fred Wiscombe of Placentia lived by this philosophy until a workplace injury in July 2011 forever changed his life.

Fred's role as a paramedic was to provide ambulance service, emergency and routine patient care in and around the Placentia area, as well as to and from St. John's.

"I loved my work," says Fred. "It's a job I would never tell anyone not to get into, but being a paramedic is also a job that you're not going to get a lifetime career from because of the nature of the work and the potential for back injuries."

Being a paramedic involved a lot of heavy, repetitive lifting. "I remember lifting a little 35-40 kilogram elderly lady and taking her down the stairs of her home in my arms because putting her on a backboard was going to be too uncomfortable," he recalls. "Because of my size and strength, there were many times I would lift people and cradle them in my arms." Fred says looking back, it may have been unwise to personally carry patients, but he believed he was providing a better level of care, and their families seemed to appreciate it.

### The Injury

The day of his injury was the end of Fred's career as a paramedic. "We got a call to pick up a lady at her house in Placentia and we ended up having to transfer her to St. John's for x-rays. While lifting the stretcher in preparation for the drive back to Placentia, Fred says he felt something pop in his back. "It was a sharp, stabbing pain," he recalls. "I bit my tongue and continued to move the lady to the ambulance."



“When I got in the ambulance, I knew something was seriously wrong—the pain just wouldn’t go away. We continued back to Placentia and radioed ahead to advise that once the patient was taken out of the ambulance, that I would have to be put on a board and lifted as a second patient.”

Once in Placentia, Fred went to see the doctor on call in the emergency department at the local hospital. He was given pain medication and a note to stay off work for a week. After a few days, Fred was told he would need to stay off longer. After two weeks there was still no improvement, in fact, things had worsened. Fred’s doctor ordered a CT scan. The scan revealed bulging discs.

An appointment was scheduled to see a surgeon in St. John’s. “I was told there was only a 50/50 chance that the problem could be corrected with surgery,” he says. Six months post-injury, Fred knew he would not return to the job he loved. “I was told that if I went back to work as a paramedic that I would eventually end up in a wheelchair,” he says. “This was a hard pill to swallow.” Being a paramedic was the only job he ever had, and he had only worked for one employer. “I was emotional and I was angry.”

Following his injury, Fred’s employer was not able to accommodate him in a return-to-work program. WorkplaceNL facilitated a labour market re-entry assessment. Several retraining options were identified, one of which was to study occupational health and safety. With the support of his case manager, Fred went back to school.

Now, in addition to his new career, Fred and his wife have become caregivers to a medical service dog. Miki, as she is affectionately called, is trained for post-traumatic stress disorder and psychiatric emergencies. Fred’s wife, a Registered Nurse, works with the dog at the Waterford Hospital in St. John’s. “It’s a great experience and we are enjoying it,” he says.



**Figure 12-15** | Fred Wiscombe and his medical service dog Miki.

## Important

Communication is key to a safe lift. Use a lifting cue (e.g., 1-2-3-lift) and communicate it to your partner in advance. Eye contact is also helpful.

## TEAM LIFTING

When assistance is needed, team lifting can reduce force demands on the body, but should only be performed when mechanical assistance is not available. Principles of safe team lifting include the following:

- partners should be of similar height and strength to enable load sharing
- partners should be trained in proper lifting techniques
- one partner should be nominated as leader to develop a lifting strategy and coordinate the lift
- when carrying on stairs, the tallest and/or strongest person should be at the bottom
- when lifting a long object, partners should both face the direction of the destination with a clear line of vision and carry the object on the same side



**Figure 12-16** | What elements of safe handling and lifting are being taught in this image?

## QUICK CHECK

1. What are the four steps for conducting a lift?
2. Demonstrate, for a partner, how to safely conduct an overhead lift.
3. Name two additional techniques to handle loads more safely.

# Computer Workstation Setup

The computer is often the center of most office activities. Although computers make office work more efficient, they decrease the variety of movement required by workers to complete tasks. Additionally, improper setup of equipment can force workers to use awkward postures.

The following ergonomic principles apply when designing or adjusting a computer workstation setup.

## 1. Posture

A workstation should be designed to allow workers to use neutral postures when working with their computer, documents, and other desktop items. Proper seated posture includes:

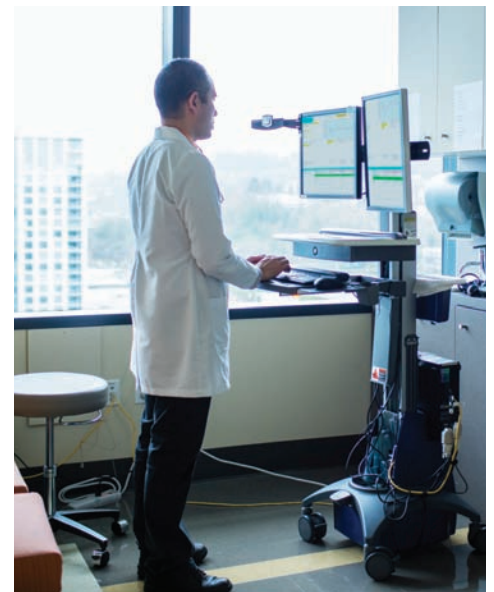
- head upright and face forward (ears over shoulders) in a relaxed position
- eyes face forward with slight downward gaze
- shoulders and upper arms relaxed with elbows resting at your sides
- elbows bent at 90-degrees (right angles), forearms parallel to floor
- wrists straight (not bent up, down or to one side)
- backrest supporting the low back
- thighs resting horizontally on chair, parallel to floor with hip angle at 93-103 degrees
- feet fully supported on floor or footrest, with approximately 90-degrees at the ankles

Height-adjustable work surfaces allow computer and desktop work to be performed in standing posture. Having this option available provides an opportunity for regular postural change. This is important because it is unhealthy to maintain any one posture for long periods, including neutral postures. Neutral standing posture looks the same as neutral sitting posture with the exception that the worker is standing fully upright. While standing, both feet are firmly supported on the floor or one foot is raised on a footrest (alternate feet frequently).

## 2. Office Chairs

Workers who sit for prolonged periods should be provided a suitably designed chair that allows them to work in neutral posture. There are many adjustable features available and variances in office chairs, including:

- seat pan height, depth, width, and tilt (there should be about five centimetres between front of seat pan and back of knees)



**Figure 12-17** | Evaluate the ergonomic effectiveness of this computer workstation.

- back rest height and angle
- lumbar support height, size and depth
- armrest height, length, width, and pivot

### 3. Keyboard

Positioning of the keyboard can have a positive ergonomic impact. Apply the following principles:

- keyboard height should be equal to the worker's elbow height when shoulders are relaxed and arms are rested at the sides. Raise or lower the work surface to achieve the required height. If the work surface is not height-adjustable, adjust the chair height and use a footrest if feet are no longer firmly supported on the floor. Alternately, use a keyboard tray.
- adjust the angle of the keyboard to allow the wrists to be straight at all times and the hands to be in line with the forearms
- with elbows at your sides, place the keyboard within reach of your fingers to avoid reaching

### 4. Mouse Use

Apply the following principles when positioning and using a mouse:

- mouse should be placed beside the keyboard and at the same height and distance
- wrist should be straight with arm relaxed by the side
- shift the keyboard and mouse back and forth, to allow the arm and wrist to be straight whenever using either device



### 5. Monitor

Computer monitors should be set up as follows:

- position the monitor at arm's length away and directly in front of you
- raise or lower the monitor so your neck is in neutral position (ears over shoulders) when viewing the top row of text on the screen
- to avoid glare on a computer screen, position the monitor parallel with overhead lights (not directly below) and sit with line of sight parallel to windows

**Figure 12-18** Evaluate this workstation according to ergonomic principles.

## 6. Documents

When working with documents while using a computer, use a document holder. It should be positioned in front of the monitor (in-line document holder) or immediately to either side. When completing paperwork on a desktop, use a task light to make reading easier, but never shine a light on the computer screen.

## 7. Telephone use

Prolonged or frequent telephone use may cause MSIs. Use a headset or speaker phone to avoid cradling the receiver. Headsets are recommended when frequent telephone use and/or multitasking is required (e.g., typing while using the telephone). Keep the telephone and headset within easy reach.

## 8. Laptops

Laptops promote awkward body postures. To minimize the risk of injury:

- place the laptop on a platform at a height that allows the neck to be in neutral position (ears above shoulders) when viewing the top row of text on the screen
- use a separate keyboard and mouse and position them as per Steps 3 and 4 on the previous page
- use a wheeled case for transporting the laptop

## 9. Work Organization

Changing postures frequently allows blood to recirculate to tissues, providing tissue recovery. Here are some suggestions to change postures frequently:

- alternate computer work with other duties throughout the work day
- take frequent micro-breaks when prolonged computer use is required
- stretch regularly
- take regularly scheduled breaks and spend at least some of that time in the opposite posture

## QUICK CHECK

1. Describe how computer work can pose ergonomic hazards.
2. Evaluate your classroom for ergonomic hazards.
3. Consider where you most frequently do your homework. Are there any facets you could change to minimize your risk of MSIs?





## SPREAD THE WORD

Do you text frequently, play video games, or participate in a favourite sport? Perhaps you are a runner or play tennis. Maybe basketball or another sport? Research to identify the primary risk factors associated with one such activity to determine if your own habits are placing you at risk. Research how you might control any hazard. Create a hazard alert to share with other young people.



## WHAT WOULD YOU DO **NOW?**

Review the What Would YOU Do? at the beginning of the chapter (page 201), recalling your initial response. After reading this chapter, would your answer change? Why or why not?



## CHAPTER CHALLENGE

Working in a small group, you will form an ergonomic design team whose challenge is to design the ideal student or teacher workstation within your classroom.

1. Construct a survey that queries other students in the school about the comfort level of the desks and chairs they use in their classrooms.
2. Next, complete a risk evaluation of the desks and/or computer workstations in the school based on the proper set up of a computer workstation.
3. Finally, use your findings to design the ideal student or teacher workstation. Your final design should be in the form of an annotated sketch that highlights your design and the rationale for the various elements included in your design.



## DIG DEEPER

Many consumer products today are labelled as being “ergonomically designed” or “ergonomically friendly.” Research to identify several samples of such products. Do you think they live up to their claims? Explain your answer.

## MY OH&S

It is time to update your course portfolio. But before you do, quickly review the pages of Unit 3. Revisit the activities you completed for the unit. What information stood out for you the most? Did anything surprise you? What information would you want to share with a friend or co-worker? Consider those items for possible inclusion in your portfolio.

### THE BIG IDEAS...

Select a minimum of five critical ideas that you have learned from the unit. To complete your list, consider the following:

- Why is it important?
- Why is it relevant to me?

### LEGALLY SPEAKING

Identify any significant information related to the law, your rights and your responsibilities that you might expect to encounter as a worker, supervisor, or employer.

### USEFUL RESOURCES

Create an annotated list of resources for future reference. Your list should include:

- the name of the resource
- why it was included
- where it can be located

Remember, resources may include documents, brochures, videos, web pages, organizations, and people.

### CAREER POSSIBILITIES

Identify at least one potential career related to occupational health and safety that might be of future personal interest including:

- a brief description of that career
- what it is you find interesting about that career
- any qualifications required
- programs of study and their locations

Your career option may be selected from within the unit or from external sources.

# Occupational Health and Safety Hazards

In previous units you explored many facets of occupational health and safety including legislative requirements, systems and processes, safety awareness, and disease prevention. Unit 4 enables you to delve deeper into specific groups of hazards that you may encounter in the workplace as well as in your daily life.



How many health and safety hazards can you identify in this cartoon?

## UNIT AT A GLANCE

- CHAPTER 13** Working Alone and Workplace Violence
- CHAPTER 14** WHMIS
- CHAPTER 15** Fire Protection
- CHAPTER 16** Electrical Safety
- CHAPTER 17** Machine Safeguarding
- CHAPTER 18** Confined Space Entry
- CHAPTER 19** Hearing Conservation
- CHAPTER 20** Outdoor Safety

## LET'S GET STARTED

Join with a small group of three students.

1. Create a chart that provides a column for each of the chapter headings in this unit and a row below each to capture some notes. Appoint a note taker for your group.
2. For three minutes, brainstorm as many health and safety issues as you can that would relate to the chapter topic.
3. At the end of three minutes, exchange your list with the group next to you and repeat the process, adding to the list from the last group.
4. Repeat this process one more time.
5. Compare your list with other groups in the class to determine whose list is more complete.



### My OH&S

This course is about you and your future in the workplace. As you complete unit four, keep in mind the following questions:

- What are the most important OH&S ideas for me to remember?
- What OH&S laws affect me?
- What OH&S resources could be useful to me now and in my future work life?
- What careers might be available in the area of OH&S?

# Working Alone and Workplace Violence

What jobs come to mind when you hear the phrase “working alone”? What would appeal to you about working alone? What particular risk factors might be associated with working alone?

What images come to mind when you hear the term “workplace violence”? What does it look like? What factors contribute to workplace violence?

Occupational health and safety initiatives continue to focus on mitigating the risks of working alone and the threat of workplace violence.

Legislative requirements, effective hazard recognition, risk evaluation, and control methods are all important elements of worker protection.

## LEARNING GOALS

This chapter will enable you to:

- discuss regulations that apply to individuals who work alone
- discuss regulations that address violence in the workplace
- outline the essential components of working alone and workplace violence policies and procedures
- examine several health and safety hazards associated with working alone
- examine instances where violence may occur in the workplace
- outline steps that are taken to recognize, evaluate, and control health and safety hazards associated with working alone and violence in the workplace

## SPREAD THE WORD

According to OHS Insider statistics, the top four most common locations for workplace violence are:

- commercial locations—49%
- hospitals—31%
- schools—10%
- restaurants—10%

Discuss with a partner why each of these locations may be prone to violent encounters. What do they have in common? How are they different?



## WHAT WOULD YOU DO?

Charlie works weekends making deliveries for a pizza parlour. It is a great job for Charlie who likes to be out and about meeting people. He loves driving and listening to good music along the way.

Late one Saturday evening, Charlie sets off to deliver a large order to an unfamiliar location. He gets lost along the way but finally locates the house. The owner answers the door, yelling at Charlie for being late with his order and threatening not to pay for the pizza. In fact, he throws the pizza box back at Charlie! Charlie isn't sure what to do next. He's angry with the customer and doesn't want to go back to the store without payment.

### What Would YOU Do?



**Figure 13-1** | What unique risks are faced by workers who make home or business deliveries?

## CHAPTER CHALLENGE PREVIEW

To what extent would the potential for workplace violence impact your pursuit of a job? Are there some jobs or locations you would consider too high risk? What would make you feel more secure working in such an environment? And finally, to what extent can any workplace be free from the threat of violence?

Discuss your answers to these questions within a small group. What thoughts did you have in common? Where did you differ?

## Working Alone

For some people, working alone has its merits. But working alone, whether by choice or by necessity, also carries different risks than working in the company of others. If a lone worker experiences an incident on the job, help may not be readily available. Workers on their own may be more vulnerable to robbery or assault. But with controls properly in place, the risk to health and safety can be minimized.

### LEGISLATION

Working alone is defined under Occupational Health and Safety (OH&S) Regulations. Working alone or in isolation means to work in circumstances where assistance would not be readily available to the worker in case of an emergency or in case the worker is injured or ill.

Individuals are alone at work when:

- they cannot be seen or heard by another worker
- they cannot expect a visit from another worker or member of the public for some time
- assistance is not readily available

The OH&S Regulations address the roles and responsibilities of employers in situations where workers are required to work alone or in isolation. Employers are required to:

- conduct a risk assessment where a worker is assigned to work alone or in isolation
- develop and implement a written procedure for checking the well-being of a worker assigned to work alone or in isolation
- develop the procedure in consultation with the worker assigned to work alone or in isolation, and with the occupational health and safety committee, the worker health and safety representative, or workplace health and safety designate

Working alone is also addressed in federally-regulated workplaces. The federal working alone legislation is covered under the Canada Health and Safety Regulations Part XX and Part II of the *Canada Labour Code*.

### WORKING ALONE POLICY AND PROCEDURES

A working alone policy and working alone procedures outline the responsibilities of all workplace parties. This document outlines specific responsibilities that employers, supervisors, and workers must follow to protect workers while working alone or in isolation.

The policy should include a statement of how the employer is committed to keeping workers safe when working alone. Roles and responsibilities of the workplace parties including the employer, supervisors, workers, and contractors are stated in the policy and may include:

- preparing a daily work plan and schedule so it is known where a lone worker will be at all times
- identifying one person as the office contact, plus a backup
- identifying circumstances under which the lone worker will check in and how often
- creating a visual check or call-in schedule
- creating a written log of contact with the lone worker
- having the contact person call or visit the lone worker periodically
- assigning a code word that will be used to identify or confirm that help is needed
- developing an emergency response plan to be followed if the lone worker does not check-in as scheduled

## HAZARDS RELATED TO WORKING ALONE

Common workplace hazards can result in a more serious injury when someone is working alone. For example:

- using a ladder that results in a fall
- working around hot cooking oil that results in a burn
- lifting heavy boxes that results in a sprain or strain
- using cleaning products, paint products, or other potentially hazardous materials that results in chemical exposure

It is the employer's responsibility to have procedures developed to follow during an emergency. Failing to develop procedures that includes having assistance readily available during an emergency may result in serious injury to workers.

## QUICK CHECK

1. How is working alone defined in the context of occupational health and safety?
2. Where would you access legislative requirements regarding working alone situations?
3. Identify three additional scenarios where workers may be working on their own. What risk factors might be present in each scenario?



**Figure 13-2** | How are these workers particularly vulnerable: a) using a ladder to change a lightbulb after hours in a warehouse, b) a night security guard in an office building, and c) a geologist collecting rock samples in an isolated river valley?

## Workplace Violence

The majority of our lives are spent in the workplace, where we expect to remain safe from violent encounters. This is not always the case for some workplaces. Effective hazard recognition, risk assessment, and control measures help to minimize the occurrence of violent episodes.

### LEGISLATION

Workplace violence is defined, under Occupational Health and Safety (OH&S) Regulations, as an attempted or actual exercise by a person, other than a worker, of physical force to cause injury to a worker, and includes threatening statements or behavior which gives a worker a reason to believe that he or she is at a risk of injury.

Workplace violence can come in many forms such as physical, threats or behaviours. The OH&S Regulations address the roles and responsibilities of employers with regard to workplace violence.

- A risk assessment shall be performed in a workplace where a risk of injury from violence arising out of their employment may be present.
- When a hazard is recognized, appropriate controls shall be implemented to eliminate the risk of violence.
- Where the risk cannot be eliminated, controls should be put in place to minimize the risk associated with the hazard.
- An employer shall inform workers who may be exposed to the risk of violence of the nature of the risk and the precautions that should be taken. This includes the duty to provide information related to the risk of violence from persons who have a history of violent behaviour and whom workers are likely to encounter in the course of their work.

Workplace violence is also addressed in federally-regulated workplaces. The federal legislation for workplace violence is covered under the Canada Health and Safety Regulations Part XX of the *Canada Labour Code*.

- The employer shall carry out its obligations in consultation with the policy committee or, if there is no policy committee, the workplace committee or the health and safety representative.
- In this Part, “workplace violence” constitutes any action, conduct, threat or gesture of a person towards an employee in their workplace that can reasonably be expected to cause harm, injury or illness to that employee.
- The employer shall develop and post, at a place accessible to all employees, a workplace violence prevention policy.
- The employer shall identify all factors that contribute to workplace violence.
- The employer shall assess the potential for workplace violence.
- The employer shall develop and implement controls to eliminate or minimize workplace violence or a risk of workplace violence to the extent reasonably practicable.
- The employer shall develop, in writing, and implement emergency notification procedures to get assistance in response to workplace violence.

## WORKPLACE VIOLENCE POLICY AND PROCEDURES

The policy statement outlines the company’s commitment to protect workers from workplace violence. Workplace violence procedures instruct how to enact that policy.

A workplace violence policy:

- states the overall approach to preventing violent incidents
- indicates the direction and support of senior management
- clearly outlines the responsibilities of employers, supervisors, and workers
- identifies the nature and extent of workers’ risks of injury from violence

Workplace violence procedures:

- include written instructions detailing the violence prevention procedures to be followed by workers and supervisors
- explain the work environment arrangements implemented to prevent incidents of violence
- provide direction to workers outlining procedures for reporting incidents

## Really!?!

66% of violent workplace incidents are committed by someone known to the victim.

Source: OHS Insider

## INSTANCES WHERE WORKPLACE VIOLENCE MAY OCCUR

As you read in Chapter 8, some workplaces are more susceptible to workplace violence than others. Some examples of workplaces with a potential high exposure to workplace violence are:

- liquor stores
- gasoline service stations
- jewellery stores
- convenience stores
- restaurants and bars
- taxis

Workplace violence extends beyond physical acts. Two components of workplace violence often overlooked are threatening statements and behaviour. Threatening statements can be communicated verbally or in writing. Figure 13-3 provides examples of workplace violence.

Physical Acts	Threatening Statements	Behaviour
Examples include: <ul style="list-style-type: none"><li>• punches</li><li>• kicks</li><li>• bites</li><li>• the use of a weapon</li></ul>	Examples include: <ul style="list-style-type: none"><li>• “If you don’t give me the money I will hurt you.”</li><li>• “If you don’t hurry up you will regret it”</li></ul>	Examples include: <ul style="list-style-type: none"><li>• the demeanor of a known patient or customer is agitated</li><li>• a person pacing a waiting room of a hospital and talking to themselves</li></ul>

**Figure 13-3** | Can you identify one additional example for inclusion in each category?

## QUICK CHECK

1. Where would you locate regulations that address violence in the workplace?
2. Outline the essential components of a workplace violence policy and procedures.
3. How are words and behaviors a form of violence?

## Hazard Recognition, Evaluation, and Control

Once the hazards of working alone and workplace violence have been identified the next step is to conduct a risk assessment. As you have learned, a risk assessment is an analysis of the workplace that identifies activities, procedures, or situations that may cause harm to a worker.



Service NL has published *Working Alone Safely Guidelines for Employers and Employees* which identifies points to consider in risk assessment. These include:

1. Length of time the worker will be working alone:
  - What is a reasonable length of time for the worker to be alone?
  - Is it reasonable for the worker to be alone at all?
  - How long will the worker be alone to finish the job?
  - Is it legal for the worker to be alone while doing certain activities? (For example: Newfoundland & Labrador and possibly other jurisdictions restrict working alone in confined space or during lock-out/tag-out operations).
  - What time of the day will the worker be alone?
2. Communication:
  - What forms of communication are available?
  - Is it necessary to “see” the work, or is voice communication adequate?
  - Will emergency communication systems work properly in all situations?
  - If the communication systems are located in a vehicle, do you need alternate arrangements to cover the worker when away from the vehicle?
3. Location of the work:
  - Is the work in a remote or isolated location? (Remember, a remote location does not have to be far away. Storage rooms that are rarely used can be considered remote or isolated.)
  - Is transportation necessary to get there? What kind of transportation is needed?
  - Is the vehicle equipped with emergency supplies such as food, drinking water, and a first aid kit?
  - Will the worker need to carry some or all of the emergency supplies with him/her when leaving the vehicle?
  - What are the consequences if the vehicle breaks down?
  - Will the worker have to leave the vehicle for long periods of time?
  - Does the worker need training to be able to use the first aid equipment?
4. Type or nature of work:
  - Is there adequate training and education provided for the worker to be able to work alone safely?
  - If personal protective equipment is required, is it available, is it in good working order, and has the worker been trained in its use, care, and storage?
  - What machinery, tools, or equipment will be used?
  - Is there a high risk activity involved?

- Is fatigue likely to be a factor?
  - Are there extremes of temperature?
  - Is there risk of an animal attack, or poisoning/allergic reaction from insect/animal bites?
  - If the worker is working inside a locked building, such as a night cleaner in a secure office building, how will emergency services be able to get in?
  - Does the work involve working with money or other valuables?
  - Does the work involve seizing property or goods (such as repossession, recovering stolen property)?
5. Characteristics of the individual who is working alone:
- Are there pre-existing medical conditions that may increase the risk?
  - Does the worker have adequate levels of experience and training, such as first aid, communication systems repair, vehicle breakdowns, relevant administrative procedures and/or outdoor survival?

A number of questions may be asked to assess risks related to working alone and workplace violence. For example:

- Have previous incidents occurred at this location? How many?
- Were the police called?
- Were weapons used?
- Were there physical injuries? How serious were they?
- Have verbal assaults occurred?

Once hazards have been identified and the risk assessment is completed, controls must be put in place to protect workers. Examples of working alone controls include:

- check-in procedures
- buzzer locks for entry into stores
- barriers between workers and patients/customers
- GPS systems installed in vehicles
- camera systems
- alarms or silent alarms to notify security

Employers establish controls to protect their workers from workplace violence through workplace design, administrative controls and work practices. These three protection methods can help reduce the risk of injury and help workers feel safe in their workplace. The Canadian Centre for Occupational Health and Safety provides the following examples of how employers can protect workers.



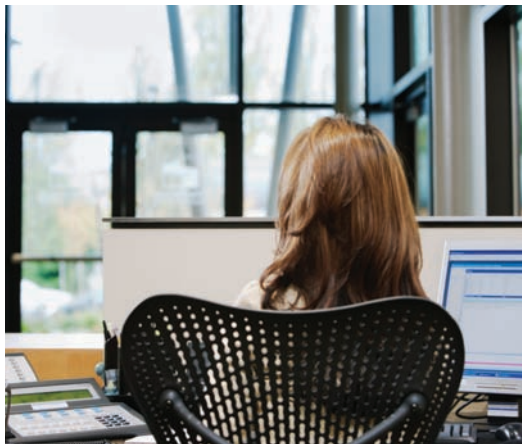
## THINK ABOUT IT...

**Where have you seen examples of violence protection controls in your school or your community?**

### WORKPLACE DESIGN

Workplace design considers factors such as workplace lay-out, use of signs, locks, or physical barriers and lighting. For example:

- positioning the reception area, sales or service counter so that it is visible to other workers or members of the public
- positioning office furniture so that workers are closer to a door or exit than clients
- installing physical barriers such as pass-through windows or bullet-proof enclosures
- minimizing the number of entrances to the workplace
- using coded cards or keys to control access to the building or certain areas within the building
- provide adequate exterior lighting around the workplace and especially near entrances



**Figure 13-4** | How do each of the above situations reflect safety controls?

## Workplace Violence—A Victim’s Account

Beverley Vey works at a St. John’s pharmacy. She has over 3 000 different customers and fills over 100 prescriptions per day. Her customers are diverse and might include infants two or three weeks old to senior citizens in their eighties. The prescriptions she fills could be for cancer patients, patients with high blood pressure, or those suffering from mental health illness. Beverly Vey has been held up at gunpoint twice, and has also encountered several break and enters at her pharmacy.

### Incident #1

The first time she was held up at gunpoint, the assailant came into the store seemingly out of nowhere. It was a beautiful day and there were lots of people coming and going. The assailant made it abundantly clear that he didn’t want any money. He instead demanded she give him all of her narcotics.

With his intentions made clear he started to get agitated. Ms. Vey attempted to talk to him calmly, suggesting that he reconsider committing a serious robbery. She told the robber to just walk away and she would forget the episode and promised not to report the incident. Unfortunately this made him even more irritated. It was then she realized a customer could walk through the door and potentially be hurt.

She complied with her assailant—gave him the narcotics and he promptly left the store. Before the assailant left her parking lot, Ms. Vey managed to get his license plate number, the make and model of the vehicle he was driving and immediately called the Royal Newfoundland Constabulary (RNC).

The RNC arrived within two minutes and determined the vehicle in question was stolen and could not trace it to the robber. Fortunately a tip called in to Newfoundland and Labrador Crime Stoppers saw the robber arrested, tried, convicted, and sent to jail.

## Incident #2

It was late evening the second time Ms. Vey was robbed. She was getting ready to close the store and was chatting with the cleaner. As she walked towards the door, two masked men burst into the store—one holding a gym bag and the other a sawed off shotgun.

One of the intruders pushed her and the cleaner into a corner and held them at gunpoint. The other intruder went to the safe and asked her to open it. Once the safe was opened, they cleaned out the narcotic cupboard, and as quickly as they arrived they both quickly departed.

## New Security Measures

Following the second robbery, new security features were implemented at the pharmacy, including better surveillance cameras, a door access lock and buzzer and new signage that alerted people of the enhanced security profile. Ms. Vey also installed new alarms that alert police. She also ensures she has regular contact with friends so her daily activities are monitored by third parties.

Everyone should do a hazard and risk assessment of the place they are working in,” she says. “This includes a review of the ‘what ifs’, and all points of access to the work space.



**Figure 13-5** | An environment that attracts drug-related crime means safety and security measures are a must, and stories like Ms. Vey’s must be told to create greater awareness.



**Figure 13-6** | How can signage work to deter workplace violence?

## ADMINISTRATIVE CONTROLS

Administrative controls are decisions employers can make about how they do business. For example, certain administrative controls can reduce the risks involved in handling cash. Some examples of safe handling of cash include:

- keeping cash register funds to a minimum and posting signs to notify the public
- using electronic payment systems to reduce the amount of cash available
- varying the time of day funds are emptied from a cash register
- installing and using a locked drop-safe
- arranging for regular cash collection by a licensed security firm

## WORK PRACTICES

Work practices include all the things workers do while on the job. People who work away from a traditional office setting, for example wildlife officers or home care providers, can adopt work practices that will reduce their risk. For example:

- preparing a daily work plan, so that others know where and when you are expected
- identifying a designated contact at the office and a back-up contact
- keeping your designated contact informed of your location and adhering to an established call-in schedule
- not entering any situation or location where you feel threatened or unsafe

## QUICK CHECK

1. Identify three categories of controls established to prevent violence in the workplace.
2. What controls are in place in your school to prevent violence?
3. What control measures would be effective for workers who must meet with people outside of their work location?



 **SPREAD THE WORD**

With a partner, select one of the locations you discussed at the beginning of the chapter. Create a case study or mock scenario to illustrate an example from your list. Present this scenario to the class for their input into prevention strategies that could be established to prevent such a scenario from occurring in the future.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** at the beginning of the chapter (page 227), recalling your initial response. After reading the chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE****Workplace Violence—It's NOT Part of the Job**

Identify a local business or industry, or another of interest to you. What risk factors related to workplace violence may be present in this workplace? What measures might be taken to secure the health and safety of workers in this setting?

Through internet research and/or interviews with the employer, identify strategies already in place to protect workers and any additional recommendations you might suggest. Your challenge is to create an orientation brochure or video aimed at workers new to the business or industry to raise awareness of workplace violence.

 **DIG DEEPER**

The emotional impact of workplace violence can be devastating and long term. Research the symptoms and treatment for post-traumatic stress disorder. Create a briefing note that would be appropriate to share with employers to increase awareness.

# WHMIS

The term WHMIS stands for **W**orkplace **H**azardous **M**aterials **I**nformation **S**ystem. It is a comprehensive system to share information on the safe use of hazardous materials in Canadian workplaces. Information is provided by means of product labels, safety data sheets (SDSs), and worker education programs.

WHMIS addresses workers' right to know about risks that may be encountered while handling hazardous products. By understanding the nature of the hazard associated with a particular chemical, workers are better able to protect themselves from exposure.

## LEARNING GOALS

This chapter will enable you to:

- discuss the importance of WHMIS
- explain the major components of WHMIS
- identify WHMIS classes of hazardous products
- identify legislative requirements pertaining to hazardous products
- explore worker education and training related to hazardous products

## SPREAD THE WORD

Recall from Chapter 5, how your school is a workplace as well as a learning environment. WHMIS legislation must be taken into account here just as in every other workplace.

What hazardous products might be present in your school? Consider the various sections of the building and the classrooms it contains. With a partner, brainstorm the possibilities and create a joint list of your top ten items.

## WHAT WOULD YOU DO?

Jane works as a dishwasher in a busy restaurant. She normally works the morning shift. Just as she is leaving to go home one day, her supervisor tells her that the dishwasher on the next shift had just called in sick. The supervisor asks if Jane can go home, get some rest, and come back to work at 8:00 pm and work until 10:00 pm. Jane doesn't really want to do it because she is tired from her regular shift. At the same time, she doesn't want to disappoint her supervisor because she knows she is in a bind.

Jane returns in the evening and the dishes are piled high. The shift ends up being busy as a tour bus going through town and carrying 50 people stopped for supper. At closing time she finally has all the

dishes, pots and pans done. She sits down to chat with the cook for a little break before leaving for the evening. The cook is just as tired as Jane is and asks if she can help him clean the stove tops, grills, and ovens for the next day. He reaches for a plastic bottle under the sink and gives her a pair of gloves to get started. She asks him what the product is she is using because it does not have any labels. He tells her it is fine—they use it all the time, it's just a degreaser.

**What would YOU Do?**



**Figure 14-1** | How is fatigue an additional hazard in any job?

## CHAPTER CHALLENGE PREVIEW

As a class, brainstorm a list of products used in your home or school that may pose health and safety hazards when handled incorrectly. Now group the items on your list into categories of your choosing. You could group by the type of product, the type of hazard they represent, where they are found, or how they might be handled.

After returning home for the day, see if you can find additional examples to add to the list. How could you tell from looking at the product that it may be hazardous?

## What is WHMIS?

Exposure to hazardous products can cause, or contribute to, many serious health effects. These may include effects on the nervous system, kidney or lung damage, sterility, cancer, burns, and rashes. Other hazardous products are safety hazards and can cause fires or explosions. WHMIS was created in response to Canadian workers' right to know about the health and safety hazards that may be associated with the materials they use at work. WHMIS was developed by representatives from government, industry, and labour.

### LEGISLATION

Originally WHMIS became law through a series of complementary federal, provincial, and territorial legislation. This series of legislation came into effect on October 31, 1988. The information requirements of WHMIS legislation were incorporated into the Hazardous Products Act (HPA), the Hazardous Materials Information Review Act (HMIRA), and associated regulations. These applied to all jurisdictions in Canada.

On June 19, 2014, permission was given for the Hazardous Products Act to be amended to incorporate the **Globally Harmonized System** (GHS)—an international classification system for workplace chemicals.

On February 11, 2015 the Controlled Products Regulations (CPR) and the Ingredients Disclosure List were replaced with the Hazardous Products Regulations (HPR). This modified WHMIS is referred to as **WHMIS 2015**. The previous WHMIS is now known as **WHMIS 1988**.

WHMIS 2015 includes the following federal legislation:

- *Hazardous Products Act* (HPA)
- Hazardous Products Regulations (HPR)
- *Hazardous Materials Information Review Act* (HMIRA)

The transition to WHMIS 2015 began in February 2015. Full implementation is expected by December 1, 2018. This will allow time for all stakeholders including government, suppliers, distributors, employers, and workers to make the necessary changes to their WHMIS programs. This transition period will also permit time for employers and workers to become more aware of the changes to WHMIS. During the transition period there may be times when both WHMIS 1988 and WHMIS 2015 will be used.



### THINK ABOUT IT...

**Consider each stakeholder group. Why would the transition process take years?**

Phases	Timing	Suppliers		Employers <sup>1</sup>
		Manufacturers and Importers	Distributors	
Phase 1	To May 31, 2017	WHMIS 1988 or 2015	WHMIS 1988 or WHMIS 2015	Consult Federal/Provincial/Territorial OH&S Regulator
Phase 2	From June 1, 2017 to May 31, 2018	WHMIS 2015	WHMIS 1988 or WHMIS 2015	WHMIS 1988 or WHMIS 2015
Phase 3	From June 1, 2018 to November 30, 2018	WHMIS 2015	WHMIS 2015	WHMIS 1988 or WHMIS 2015
Completion	December 1, 2018	WHMIS 2015	WHMIS 2015	WHMIS 2015

<sup>1</sup> Consult appropriate Federal/Provincial/Territorial OH&S Regulator to confirm requirements and transition timing.

**Figure 14-2** | Health Canada is the government body responsible for making the required changes to the WHMIS related laws. Health Canada outlined the transition period to WHMIS 2015.

WHMIS follows two types of legislation:

1. Federal legislation deals with the sale and importation of hazardous materials.
2. Provincial legislation covers the use, handling and storage of these materials.

Federal WHMIS legislation was changed on February 11, 2015 with the introduction of the HPR. The provincial WHMIS Regulations are anticipated to change as well. At the time of writing this resource, there are some unknowns with respect to WHMIS legislation specific to the province of Newfoundland and Labrador.

The occupational health and safety components of WHMIS that apply to federal employees and others covered by the *Canada Labour Code (CLC)* are specified in the CLC and the Canada Occupational Health and Safety Regulations (Part X). It is enforced by Labour Program, Employment and Skills Development Canada for federally regulated workplaces. The CLC and associated Regulations will be changed to incorporate WHMIS 2015.

Provincially-regulated workplaces follow the Newfoundland and Labrador WHMIS Regulations. These Regulations are enforced by the Occupational Health and Safety Division, Service NL. Again it is anticipated the WHMIS Regulations for Newfoundland and Labrador will be changed to incorporate WHMIS 2015.

## GLOBALLY HARMONIZED SYSTEM (GHS)

Many of the changes to the legislation are due to the adoption of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). GHS communicates health and safety information on labels and safety data sheets (SDSs). The goal of the GHS is that the same set of rules for classifying hazards, the same format and content for labels, and SDSs will be adopted and used around the world. An international team of hazard communication experts developed GHS. The benefits of all countries using GHS will be:

- increased ease of international trade and sale of hazardous products
- better and consistent risk communication of hazardous products for employers and workers

## ROLES AND RESPONSIBILITIES IN WHMIS

As with all other aspects of occupational health and safety, everyone has a role to play in WHMIS.

Role	Responsibilities
Government	<ul style="list-style-type: none"><li>• ensure compliance with WHMIS legislation through workplace inspections</li></ul>
Supplier/ Manufacturer	<ul style="list-style-type: none"><li>• classify hazardous products</li><li>• provide supplier labels with their products</li><li>• provide safety data sheets for their products</li></ul>
Employer	<ul style="list-style-type: none"><li>• maintain an inventory of all hazardous materials present in the workplace</li><li>• properly label all hazardous products in the workplace</li><li>• ensure all SDSs for hazardous products found in a workplace are readily available and accessible</li><li>• develop and implement a worker WHMIS education and training program</li><li>• ensure appropriate control measures are in place to protect the health and safety of workers</li></ul>
Worker	<ul style="list-style-type: none"><li>• participate in the WHMIS program including education and training sessions</li><li>• use controls put in place when working with hazardous products</li><li>• report any hazards or concerns with a hazardous product including notifying the employer if a label becomes illegible, is damaged, or is missing</li></ul>

**Figure 14-3** | Does one group carry more responsibility than another in WHMIS? Explain your answer.

## QUICK CHECK

1. Describe the importance of WHMIS.
2. What changed from WHMIS 1988 to WHMIS 2015?
3. How are stakeholder roles in WHMIS similar to those in other areas of occupational health and safety?

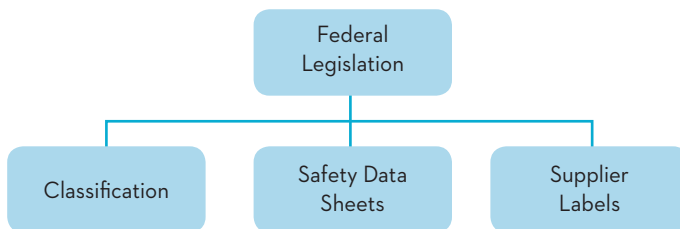


# Major Components of WHMIS

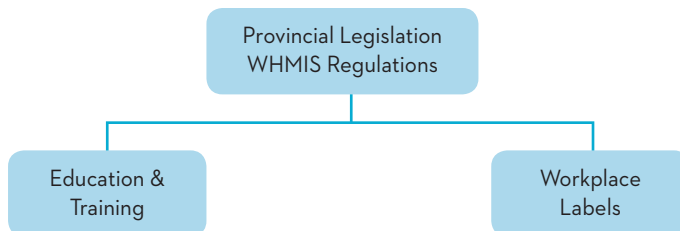
The Workplace Hazardous Materials Information System (WHMIS) takes a multi-faceted approach to its goal of sharing information about handling hazardous products. The main components of WHMIS are:

- hazard identification and product classification
- labeling
- safety data sheets
- worker training and education

Federal and provincial legislation support different aspects of WHMIS.



**Figure 14-4** | Federal legislation impacts manufacturers and suppliers of hazardous products.



**Figure 14-5** | Provincial legislation impacts the workplace/employer.

## CLASSIFICATION OF HAZARDOUS PRODUCTS

WHMIS legislation applies to hazardous products, which are used, stored, and handled at any workplace. A **hazardous product** is any hazardous substance or material, which meets or exceeds the criteria for inclusion in one or more of the WHMIS hazard classes.

WHMIS 2015 applies to two major groups of hazards:

1. Physical hazards group: based on the physical or chemical properties of the product such as flammability, reactivity, or corrosivity to metals
2. Health hazards group: based on the ability of the product to cause a health effect such as eye irritation, respiratory sensitization or **carcinogenicity**

**carcinogenicity**

the ability to cause cancer

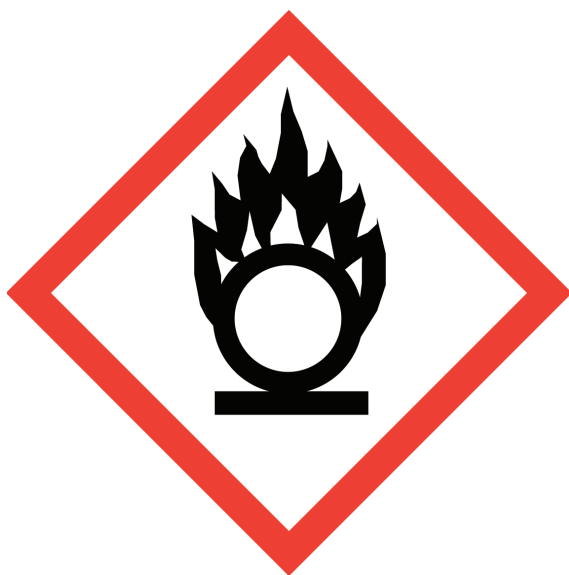


GHS also defines an Environmental Hazards group. This group (and its classes) was not adopted in WHMIS 2015. However, you may see the environmental classes listed on labels and SDSs. Including information about environmental hazards is permitted by WHMIS 2015.

**Figure 14-6** | In what workplaces might you expect to see biohazardous products being used?

## Physical Hazards Group

Hazard Class	Effects
<ol style="list-style-type: none"> <li>1. Flammable gases</li> <li>2. Flammable aerosols</li> <li>3. Flammable liquids</li> <li>4. Flammable solids</li> </ol>	These four classes cover products that have the ability to ignite (catch fire) easily. The main hazards are fire or explosion.
<ol style="list-style-type: none"> <li>5. Oxidizing gases</li> <li>6. Oxidizing liquids</li> <li>7. Oxidizing solids</li> </ol>	These three classes cover oxidizers, which may cause or intensify a fire or cause a fire explosion.
<ol style="list-style-type: none"> <li>8. Gases under pressure</li> </ol>	This class includes compressed gases, liquefied gases, dissolved gases, and refrigerated liquefied gases. They are hazardous because of the high pressure inside the cylinder or container. The cylinder or container may explode if heated.
<ol style="list-style-type: none"> <li>9. Self-reactive substances and mixtures</li> </ol>	These products may react on their own to cause a fire or explosion, or may cause a fire or explosion if heated.
<ol style="list-style-type: none"> <li>10. Substances and mixtures which, in contact with water, emit flammable gases</li> </ol>	These products react with water to release flammable gases. In some cases, the flammable gases may ignite very quickly (spontaneously).
<ol style="list-style-type: none"> <li>11. Pyrophoric gases</li> <li>12. Pyrophoric liquids</li> <li>13. Pyrophoric solids</li> </ol>	These products can catch fire very quickly if exposed to air.



**Figure 14-7** | The flame over a circle represents an oxidizer. What workplaces/products would you associate with this pictogram?

Hazard Class	Effects
14. Self-heating substances and mixtures	These products may catch fire if exposed to air. These products differ from pyrophoric liquids or solids in that they will ignite only after a longer period of time or when in large amounts.
15. Organic peroxides	These products may cause a fire or explosion if heated.
16. Corrosive to metals	These products may be corrosive (chemically damage or destroy) to metals.
17. Combustible dust	This class is used to warn of products that are finely divided solid particles. If dispersed in air, the particles may catch fire or explode if ignited.
18. Simple asphyxiants	These products are gases that may displace oxygen in air and cause rapid suffocation.
19. Physical hazards not otherwise classified	This class is meant to cover any physical hazards that are not covered in any other physical hazard class.

**Figure 14-8** | Why do you think the 19th class exists?

## Health Hazards Group

Hazard Class	Effects
1. 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.
2. Skin corrosion/irritation	These products can cause severe skin burns (e.g., corrosion) and cause skin irritation.
3. Serious eye damage/eye irritation	This class covers products that cause serious eye damage (e.g., corrosion) and products that cause eye irritation.
4. Respiratory or skin sensitization	A respiratory sensitizer is a product that may cause allergy or asthma symptoms. A skin sensitizer may cause an allergic reaction on the skin.
5. Germ cell mutagenicity	This hazard class includes products that may cause or are suspected of causing genetic defects (permanent changes/mutations to body cells that can be passed on to future generations).
6. Carcinogenicity	This hazard class includes products that cause or are suspected of causing cancer.
7. Reproductive toxicity	This hazard class includes products that may damage or are suspected of damaging fertility or the unborn child.
8. Specific target organ toxicity—single exposure	This hazard class covers products that cause or may cause damage to organs (e.g., liver, kidneys, or blood) following a single exposure. This class also includes a category for products that cause respiratory irritation or drowsiness or dizziness.
9. Specific target organ toxicity—repeated exposure	This hazard class covers products that cause or may cause damage to organs (e.g., liver, kidneys, or blood) following prolonged or repeated exposure.
12. Aspiration hazard	This hazard class is for products that may be fatal if they are swallowed and enter the airways.
11. Biohazardous infectious materials	These materials are microorganisms, or proteins that cause or is a probable cause of infection, with or without toxicity, in humans or animals.
12. Health hazards not otherwise classified	This class covers products that are not included in any other health hazard class.

**Figure 14-9** | If such hazards exist in the workplace, why do we use such products?

Debate the answer with your classmates.

## Hazard Categories

Each hazard class contains at least one category. Each hazard category is assigned a number (e.g., 1, 2, etc.) The category tells you about the severity of the hazard. Category 1 is always the greatest level of hazard—that is, the most hazardous within that class.

## WHMIS 2015 Pictograms

Pictograms are graphic images that immediately show the user of a hazardous product what type of hazard is present. With a quick glance you can see, for example, that the product is flammable, or may be a health hazard.

## LABELING

Labeling is another means of communicating important information about the use of hazardous products. There are both supplier and workplace labeling systems.

**WHMIS Pictograms**  
Workplace Hazardous Materials Information System  
2015

Hazard Class	Hazard Category	Pictogram Description
Flammable Self-Reactives Pyrophoric Self-Heating In Contact with Water, Emits Flammable Gases Organic Peroxide	Flame	Flame
Explosive* Self-Reactives (severe) Organic Peroxide (severe)	Explosive Bomb	Explosion
Gas Under Pressure	Gas Cylinder	Gas Cylinder
Serious Eye Damage Skin Corrosion Corrosive to Metals	Corrosion	Corrosion
Irritation (skin or eyes) Skin Sensitization Acute Toxicity (harmful) Specific Target Organ Toxicity (drowsiness or dizziness, or respiratory irritation) Hazardous to the Ozone Layer*	Exclamation Mark	Exclamation Mark
Aquatic Toxicity*	Environment	Environment
Acute Toxicity (fatal or toxic)	Skull and Crossbones	Skull and Crossbones
Biohazardous Infectious Materials	Biohazardous	Biohazardous
Carcinogenicity Respiratory Sensitization Reproductive Toxicity Specific Target Organ Toxicity Germ Cell Mutagenicity Aspiration Hazard	Health Hazard	Health Hazard
Physical Hazards Not Otherwise Classified Health Hazards Not Otherwise Classified	A GHS pictogram appropriate for the hazard	A GHS pictogram appropriate for the hazard

NOTE: No pictogram is assigned to some hazard classes e.g., Combustible Dusts and Simple Asphyxiants, and some less severe hazard categories.  
\*Not required by WHMIS, but may be used.

CCOHS.ca 1-800-668-4284 WHMIS.org

Figure 14-10  
WHMIS 2015  
Pictograms

## Supplier Labels

A supplier label appears on a hazardous product to communicate the hazard(s) of the substance and to provide precautionary information. The supplier/manufacturer of the product is required by law to affix this label on all hazardous products prior to distribution. Supplier labels must be written in English and French. They may be bilingual (as one label), or available as two labels (one each in English and French).

### Supplier Label Requirements

Product identifier	Chemical name
Initial supplier identifier	Name, address, and telephone number of the Canadian manufacturer or importer
Pictogram(s)	Hazard symbol within a red diamond shape
Signal word	A word used to alert the reader to a potential hazard and to indicate the severity of the hazard  (There are only two signal words used: <i>Danger</i> or <i>Warning</i> . <i>Danger</i> is used for high risk hazards, while <i>Warning</i> is used for less severe hazards. Some hazard classes or categories do not have a signal word assigned to them.)
Hazard statement(s)	Standardized phrases which describe the nature of the hazard posed by a product
Precautionary statement(s)	Standardized phrases that describe measures to be taken to minimize or prevent adverse effects
Supplemental label information	May include information about precautionary actions, hazards not yet included in the GHS, physical state, or route of exposure

**Figure 14-11** Supplier labels must communicate very specific information about the hazardous material.

## Workplace Labels

WHMIS regulations prescribe the labels or other identifiers which must be used on containers of hazardous products. At the time of writing this resource, neither the Newfoundland and Labrador Regulations nor the CLC had been changed to reflect any new requirements for workplace labels. Therefore, this information is a reflection of WHMIS 1988.

WHMIS workplace labels are required when:

- a hazardous product is delivered to the workplace in bulk and a supplier label is not available
- a hazardous product is transferred to a smaller portable container for use in the workplace, unless the product is used immediately
- the supplier label on a container of a hazardous product becomes unreadable, damaged, or detached, and a replacement supplier label is not available



# Product K1 / Produit K1



## Danger

Fatal if swallowed.  
Causes skin irritation.

### Precautions:

Wear protective gloves.  
Wash hands thoroughly after handling.  
Do not eat, drink or smoke when using this product.

Store locked up.  
Dispose of contents/containers in accordance with local regulations.

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.

## Danger

Mortel en cas d'ingestion.  
Provoque une irritation cutanée.

### Conseils:

Porter des gants de protection.  
Se laver les mains soigneusement après manipulation.  
Ne pas manger, boire ou fumer en manipulant ce produit.

Garder sous clef.  
Éliminer le contenu/récipient conformément aux règlements locaux en vigueur.

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.

NL Co., 123 Water Street, Ourtown, NL, A0R 8T8 (709) 123-4567

**Figure 14-12** | How does this example meet the requirements for a supplier label?

Workplace labels must contain the following information:

- product identifier (name)
- safe handling procedures
- reference to Safety Data Sheets

## SAFETY DATA SHEET (SDS)

Safety Data Sheets are technical and legal documents required for every hazardous product. They must be available in English and the major language of the workplace.

SDSs must be made available by the supplier to the employer/workers who are exposed to the product.

Safety Data Sheets must contain:

1. Product identification
2. Hazard identification
3. Composition/information on ingredients
4. First-aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other pertinent information

## WORKER EDUCATION AND TRAINING

Education and training under WHMIS can be thought of as two separate functions.

1. Education—refers to the instruction of workers in general information such as how WHMIS works and the hazards of hazardous products
2. Training—refers to the instruction in site-specific information such as work and emergency procedures

Both education and training are critical to understanding the hazards that may be present at a workplace. As required by the legislation, an employer must inform workers about all hazard information known about hazardous products they may encounter in the workplace.

Each occupational health and safety jurisdiction has specific WHMIS education and training requirements. All Canadian jurisdictions require that employers develop, implement, and maintain a worker education program that will enable workers to work safely with hazardous products. Instruction is required on how to read labels and SDSs, information on how products may affect the worker's health and safety as well as training in safe work procedures and what controls are in place for the workers' protection. The employer must provide all hazard information either from suppliers, or information of which the employer is aware of. This duty is largely accomplished through WHMIS education and training programs offered on a regular basis.

### It's the Law...



Workers who work with hazardous products must be informed about the hazards associated with the hazardous products.

## QUICK CHECK

1. List the major components of WHMIS.
2. Explain the purpose of workplace and supplier labels.
3. Outline the WHMIS requirements for worker education and training.

 **SPREAD THE WORD**

Consider a job that you have held or that might be held by young workers. Identify at least three hazardous products that might be associated with that job.

Create a Hazard Alert that sends a message of safety to students who might take similar jobs. Your alert may take the form of a written bulletin, a poster or a video blog. It should contain the following:

- the job title
- brief description of the job
- hazardous products that may be found on the job
- tips for safe work practices

 **WHAT WOULD YOU DO NOW?**

Review **What Would YOU Do?** at the beginning of the chapter (page 241). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Working with a partner, your challenge will be to complete a WHMIS scavenger hunt. Refer back to Figures 14-8 and 14-9 as references.

1. Identify at least one example from your home, school, or using the internet that reflects each WHMIS class of hazardous products (physical and health).
2. Create a game either electronically or on paper that tests the player's knowledge of WHMIS pictograms—for example, matching a WHMIS pictogram with the appropriate example.

 **DIG DEEPER**

Research to determine what, if any, WHMIS updates might have taken place since this textbook was written. Design a small poster insert for your textbook to communicate these updates for students taking the course next year.

If there have been no updates, create your own version of the current poster noting that the information is up to date as of the current school year. Place your insert inside the textbook for students to use next year.

# Fire Protection

Work-related fires have devastating results. Potential loss of life and severe injury along with damage to property and the environment make fire prevention and protection everyone's responsibility.

Hazard recognition, evaluation, and control strategies pose unique considerations within the context of fire. An understanding of the nature of fire and its characteristics can lead to effective prevention, early detection, and control that may be life-saving choices.

## LEARNING GOALS

This chapter will enable you to:

- explore the employer's responsibilities in workplace fire prevention
- describe several methods of fire prevention
- outline the four components of the fire tetrahedron
- identify four ways fires are controlled
- differentiate between fire classifications
- describe the proper use of a portable fire extinguisher
- list the types of fire protection systems

## SPREAD THE WORD

Statistics show that, on average, fire kills eight people each week in Canada. And, according to Fire Prevention Canada, residential fires account for 73% of these fatalities.

Fire Prevention Week occurs annually in Canada and the United States. Each year's campaign centres on a particular theme. Consider the 2015 logo below. What elements contribute to the effectiveness of the message?



**Figure 15-1** | What is the theme of the 2015 campaign?

## WHAT WOULD YOU DO?

Carly works summers at her family's restaurant on the west coast. It's a busy time of year and she helps out wherever she can. Some days she works in the kitchen while other days are spent serving customers outside on their ocean front patio.

On a particularly busy day, Carly is outside when she hears a shout from the kitchen. She rushes inside to see flames covering the stove top. The cook has jumped back out of the way. Luckily he seems uninjured but stands immobile with fear. Carly knows she only has moments to react.

**What would YOU do?**



**Figure 15-2** | What do you think might be the cause of the fire?

## CHAPTER CHALLENGE PREVIEW



**Figure 15-3** | Safety inspectors looking at the remains of a fire at a building supply site.

The most devastating impacts of fire are loss of life and serious injury. Loss of property and business can also be devastating—not just to the affected workplace but to the community at large.

With a partner, brainstorm the implications of workplace fires to the communities in which they are located. Then, to extend your thinking, research examples of workplace fires in Newfoundland and Labrador.

## Fire Prevention

### flammable

materials that catch fire easily, burn rapidly, and give off intense heat

### combustible

materials that will burn under ordinary circumstances because of an outside source such as a match or friction

The potentially catastrophic impact of fire makes fire prevention a critical element of an occupational health and safety program. All workplace parties have a role to play to ensure the safety of people, property, and the environment.



### THINK ABOUT IT...

**How would you apply the steps in hazard recognition, evaluation, and control to fire prevention?**

Practice good housekeeping	<ul style="list-style-type: none"><li>• keep work areas free of clutter such as empty boxes and paper</li><li>• wipe up <b>flammable</b> liquid spills immediately</li><li>• clean up sawdust, wood chips, and debris on a regular basis</li><li>• keep fire doors, stairways, aisles, and exits clear</li><li>• put <b>combustible</b> waste such as wood shavings and oil soaked rags in proper containers and empty them daily</li><li>• never use alcohol or gasoline as a cleaning agent—vapours can be ignited by just a spark</li><li>• store flammable liquids in proper containers away from dust and heat</li><li>• extinguish cigarettes in appropriate containers and obey all “No Smoking” signs</li></ul>
Avoid electrical hazards	<ul style="list-style-type: none"><li>• don’t overload circuits—wires can heat up and cause fires</li><li>• do NOT use defective cords such as those with frayed or broken wires</li><li>• regularly inspect electrical equipment for things such as exposed/cracked wires, overheating motors, faulty switches, or moving parts that have jammed</li><li>• never use a tool/extension cord if the grounding plug has been removed</li><li>• never install a fuse rated higher than specified for the circuit</li></ul>
Be careful handling flammable, combustible and explosive materials that can trigger a fire	<ul style="list-style-type: none"><li>• keep flammable, combustible, and <b>explosive</b> materials away from open flame</li><li>• never refuel an engine while it is running or when it is hot</li><li>• always clean up spills immediately</li><li>• if you get oil/solvent on your clothes, change immediately and place soiled clothes in a proper receptacle</li><li>• be sure all flammable, combustible, and explosive containers are clearly and correctly labeled</li><li>• properly dispose of empty containers that held flammable and combustible liquids</li><li>• always store flammable materials in approved containers</li><li>• look out for possible ignition sources: flame, heat, static electricity, sparks, smoking, welding, furnaces, lamps, heating elements, electrical switches</li></ul>

**Figure 15-4** | Whether in the home, the workplace, or throughout the community, there are best practices in fire prevention.



## QUICK CHECK

1. Identify steps you could take to apply fire prevention strategies in your home.
2. What fire prevention strategies are in place in your school?
3. What is your local emergency number in case of fire?

### explosive

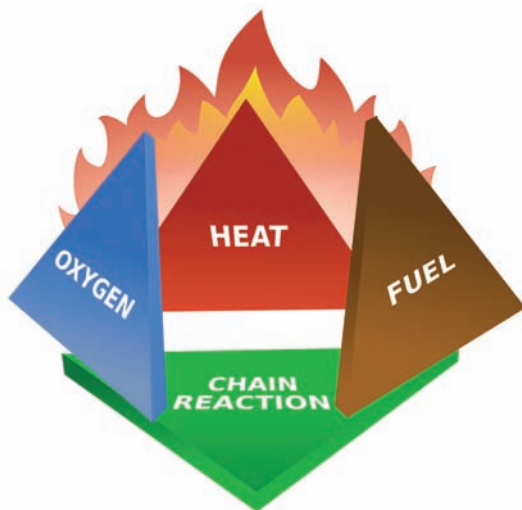
materials that can be made to explode such as dynamite, nitroglycerin, blasting caps, metal powders, plastic powders, even dust

## The Nature of Fire

Understanding how a fire starts contributes to effective prevention and, when necessary, the application of effective control and extinguishing strategies.

A fire starts when a flammable or combustible material combines with an oxidizer, such as oxygen, in an environment where a heat source is present. A fire will continue as long as this fuel, heat, and oxygen are present. These three components are frequently referred to as the fire triangle. When all three components are present, a chemical chain reaction is created which is called the fire tetrahedron.

All four components must be present for fire to occur. Removing any one of these ingredients from this mix will result in the fire going out.



**Figure 15-5** | The fire tetrahedron is a geometric representation of the four components necessary for fire to occur.

When the process of mixing these components is accelerated, an explosion might occur. An **explosion** is defined as a rapid release of high-pressure gas into the environment (i.e., when the gases produced exceed the pressure capacity of the container, an explosion may occur).

Consider, for example, how firecrackers create explosions. The fuse burns in the centre of a firecracker. The powder surrounding it ignites and the heat produces vapours. The paper wrapped around the firecracker cannot contain the expanding gases and the firecracker explodes.



**Figure 15-6** | What precautions would you apply to the safe use of firecrackers?

## HEAT TRANSFER

Fire generates heat. Excess heat (above what is needed to sustain the fire) is transferred to objects in three ways: conduction, radiation, and convection. Heat always flows from higher temperatures to lower temperatures, unless an outside force is applied. See Figure 15-8 below.



**Figure 15-7** | How are different forms of heat transfer present in a campfire?

Method of Transfer	Description	Example
Conduction	The passage of heat energy through or within a material because of direct contact	A burning wastebasket heats a nearby couch, which ignites and heats the drapes hanging behind, until they too burst into flames.
Radiation	Heat traveling via electromagnetic waves, without objects or gases carrying it along—radiated heat goes out in all directions, unnoticed until it strikes an object	Burning buildings radiate heat to surrounding structures, sometimes even passing through glass windows and igniting objects inside.
Convection	The flow of fluid or gas from hot areas to cooler areas—the heated air is less dense, and rises, while cooler air descends	A heater inside a hot air balloon heats the air and so the air moves upward. This causes the balloon to rise because the hot air gets trapped inside. When the pilot wants to descend, he or she releases some of the hot air. Cool air takes its place, causing the balloon to lower.

**Figure 15-8** | How does understanding the type of heat transfer impact fire prevention strategies?

## SPONTANEOUS COMBUSTION






**Spontaneous combustion** occurs when a material ignites as a result of self heating. Consider organic compounds that decompose and release methane gas, an excellent fuel. In a forest, the concentrations of decomposing matter are relatively minimal and both the gas and the heat generally vent naturally. But a pile of oil soaked rags in a closed container can be a greater risk. Porous fibres of rags expose oil to oxygen. When temperature rises, the oil will vaporize and fire will result.



**Figure 15-9** | What precautions should you take in the process of gathering yard waste?

## CLASSIFICATION OF FIRES

Fires are classified according to the types of objects being burned. This, in turn, impacts how fires may be controlled.

Classification	Description	Control
	Ordinary materials such as wood, paper, cardboard, and most plastics	The quenching and cooling effects of water are most important in extinguishing these fires. Water is to be used on class A fires ONLY!
	Flammable or combustible gases and liquids such as gasoline, kerosene, propane, grease, paint, paint thinner	Use dry chemicals, carbon dioxide or foam on such fires.
	Energized electrical equipment such as appliances, power tools, computers	Use dry chemicals or carbon dioxide.
	Combustible metals such as titanium, magnesium, sodium, potassium	Use specialized techniques, extinguishing agents and equipment.
	Fires in cooking appliances that involve combustible cooking materials such as vegetable or animal oils and fats.	Control is wet chemical (potassium acetate, citrate or carbonate). Typically found in restaurants and cafeteria kitchens

**Figure 15-10** | Identify an example of a workplace where each fire classification might apply.

## QUICK CHECK

1. Identify the four components of the fire tetrahedron.
2. Differentiate between conduction, radiation, and convection.
3. How are fires classified? Provide an example within each classification.
4. Identify workplaces where fire hazards might be a high risk.

# Controlling Fire

A quick response is critical in the case of fire. Being able to respond quickly and correctly may save lives and minimize damage to property and the environment.

## METHODS OF CONTROL

Understanding the nature of fire and the fire tetrahedron helps identify ways that fire can be controlled or extinguished. The fire tetrahedron can be controlled in the following ways:

- by cooling burning materials
- by removing oxygen from the fire
- by removing fuel
- by interrupting the chain reaction in a fire



## THINK ABOUT IT...

You may have heard the term “stop, drop and roll” in the event of a clothing fire. Why is this effective?



**Figure 15-11** | What fire control strategies would be effective in this situation? Which strategies would NOT be effective?



Where a fire alarm system is not installed, it is the responsibility of the building owner/operator to ensure written fire emergency procedures are implemented and practiced.

## Fire Protection Systems and Equipment

Fire protection systems include equipment, devices, and services that detect a fire, activate an alarm, control, or extinguish flames, and manage the smoke and by-products of a fire. Essentially, fire protection systems prevent or mitigate the adverse effects of fire and provide protection for occupants under adverse conditions.

Systems may work independently or in combination and include:

1. Fire alarm systems (fire notification)
2. Automatic sprinkler systems (fire suppression)

### FIRE ALARM SYSTEMS

Fire alarm systems play an important role in providing early detection and notification of a fire to building occupants. Some examples of fire alarm or notification systems are:

1. Human observers—with no automatic fire alarm system, they alert occupants of the building (e.g., Yell “FIRE!”)
2. Conventional fire alarm systems—components are wired to the same cable that is connected to an alarm control panel
3. Addressable fire alarm systems—components have unique and individual identifiers or addresses

When one of the components is activated through the detection of fire, a signal will be displayed on the control panel. These systems are inexpensive and work well in small facilities.

When one of the system’s components is initiated, it displays a signal on the alarm control panel which pinpoints the address of the device that has been activated. Large facilities are typically equipped with these systems because knowing the device’s address can save time in searching for the component that produced the signal. It helps to pinpoint the exact location of the fire so that fire suppression may be activated.

### FIRE SUPPRESSION SYSTEMS

Fire suppression systems refer to equipment, devices, and features that provide an active method for controlling the effects of fire. Fire suppression systems are specific to the hazards and risks of the organization, therefore may be designed for the specific needs of a building and occupants. They include automatic and manual systems, and each serves a different purpose in the control and extinguishing of fires.

### Important

Buildings should be equipped with a fire alarm signalling system that clearly communicates to all where the fire is located and summons appropriate firefighting units. Whenever an alarm is sounded, all workers must know what the sound means and how to respond immediately.





**Figure 15-12** | Does your community have legislation in place regarding fire hydrants?

Automatic fire suppression includes sprinkler systems, manual fire suppression systems including standpipes and portable fire suppression systems.

Fire suppression systems can be further delineated to water-based systems, and fixed and special fire extinguishing systems.

Sprinkler and standpipe systems are considered water-based fire protection systems. They include but are not limited to sprinklers, standpipe and fire hose systems; fixed water spray, private fire hydrants, water mist, and foam water.

Fixed and special fire extinguishing systems include carbon dioxide, dry chemical, wet chemical or clean agent that fill protected areas with the extinguishing agent upon detection of a fire. These systems are common in areas housing valuable or critical equipment such as data processing rooms, telecommunication switches, and process control rooms. This system protects equipment; promptly extinguishing a fire when it starts, and alerting occupants of the fire.

Portable fire extinguishers are classified as A, B, C, D, K, or a combination depending on the type of the fire they are designed to extinguish. Portable fire extinguishers must be:

- approved by a recognized testing laboratory
- clearly marked as the class and type of fire

## ? Really!?!

Dry chemical extinguishers have an advantage over CO<sub>2</sub> extinguishers since they leave a non-flammable substance on the extinguished material, reducing the likelihood of re-ignition.

## ! Important

Never use water to extinguish class C fires, you will be at risk of electrical shock.

## Really!?!



Special wet chemicals must be installed in restaurants that use deep fat fryers. This is because water is not used to fight fat fires. These fires are Class K fires that require a wet chemical such as potassium acetate, citrate or carbonate.



**Figure 15-13** | Research to find out how firefighters control the health and safety hazards they face in their work.

- located in accessible areas
- inspected on a regular basis by a competent inspector

Refer to Figure 15-10 to review fire classifications and classes of fire extinguishers.

### How to Use a Fire Extinguisher

The acronym **PASS** is a simple reminder for the safe use of a portable fire extinguisher.

1. Pull the pin
2. Aim the extinguisher at the base of the flame
3. Squeeze the trigger while holding the extinguisher upright
4. Sweep the extinguisher from side to side, covering the base of the fire with the extinguishing agent

**Figure 15-14** | How would you decide where, in your home, is the best place to store a fire extinguisher?



## Inspecting Portable Fire Extinguishers

It is important to conduct frequent inspections of all fire extinguishers as part of the fire safety program. Fire extinguishers must be inspected at least once a month, and more often where needed. Inspections are visual checks to determine that:

- the extinguisher is well supported (i.e., hangers are fastened solidly)
- it is accessible (i.e., it can be easily reached)
- location signs are clear
- class markings are clear
- operating instructions are clear
- it is in working condition
  - discharge opening is clear
  - it is fully charged
  - it has not been tampered with
  - it is not damaged
  - hydrostatic testing has been done
  - the ring pin is in place
  - the seal is intact

It is important to be trained in how to use a fire extinguisher. Complete the following steps before using a fire extinguisher:

- call the fire department
- alert others to the presence of fire by using fire alarm methods
- start evacuation of the workplace
- determine if it is the proper extinguisher for the type of fire

Remember, never turn your back to a fire. And always identify a clear escape route.

### QUICK CHECK

1. Distinguish between the two types of fire protection systems.
2. Explain why it is critical to know the type of fire you are trying to suppress before you make use of a fire extinguisher.
3. What are the four steps for safe use of a fire extinguisher?

### Important

Even though a fire extinguisher can extinguish a fire, it will likely empty within seven to 14 seconds (depending on size). It can provide initial protection and possibly an escape route. If a fire is small and in its early stages the proper use of a portable fire extinguisher could eliminate the fire.

## The Journey Forward—Burn Survivor Opens His Eyes to a New Day

When Pat Stamp looks out his window in the community of St. Vincent's, he feels peace and tranquility. This is his safe haven, far removed from April 8, 2006, when a workplace accident changed his life forever.

Stamp, a welder, and Wayne Dalton, a tanker deckhand, were performing welding repairs in a cargo tank of a shuttle tanker when an explosive vapour mixture was ignited. “When we entered the tank that morning, there was a smell of fumes, even though it had been cleaned,” recalls Stamp. “That wasn’t unusual, because when you’re working with oil, there’s no way to get rid of all the smell, no matter how well you clean.”

When they reached the bottom of the tank, some 60 feet down, there was a lot of sludge near the stairs and Stamp was glad he chose to wear protective rubber boots instead of his regular work boots, and disposable coveralls over his regular coveralls. “We then got our equipment and a fire hose dropped down and walked across the tank to the spot where a bracket had to be repaired. I spread a fire blanket on the floor, knelt down and cleaned the bracket before starting to weld.”

When Stamp struck the arc, he recalls feeling a warm breeze blow across his throat.

Stamp saw a mirage of heat circling the tank. “That’s a heat wave,” I shouted to Wayne, “we’ve got to get out!”

Stamp says it took him a while to convince Dalton, and by the time he did, the oily sludge in a nearby drain had ignited. Stamp finally got his friend to follow. “Halfway up I fell down and Wayne passed me. It was very dark and hot. There were lots of pipes and we were scuffing our feet along.”

When Stamp reached the escape ladder, there was no sign of Dalton. He had already climbed up a distance. In the intense heat, Stamp took a deep breath, closed his eyes, and started climbing. There was no air, just extreme heat and black smoke. Stamp’s throat was burning and the fronts of his welding gloves had disintegrated.

The next thing he recalls is hearing Dalton say, “I’m up too far”. While trying to get out of the tank, Dalton had bypassed a landing to cross over to another ladder that led to the escape hatch. Stamp was standing on the landing. He called out for Dalton to climb back down and follow him. The overwhelming heat was whistling so loud it sounded like jet engines.



The disposable coveralls Stamp was wearing over his regular welding coveralls had disintegrated and he could feel his flesh burning. When he reached the escape hatch opening, Stamp bumped his shoulders and head, and his body became stuck at his rib cage. “My clothing was hooked on something and to this day, I don’t know on what.”

Stamp screamed for help to a group of men standing on the deck and Dalton shouted that he was going to go back down. “Those were the last words I heard him say.” Using his elbows and arms, Stamp took a deep breath, and with every ounce of energy he had left, pushed himself out of the escape hatch and on to the deck. Behind him burst a flame that shot up into the sky. Stamp began rolling on the deck. “People were telling me my clothes weren’t on fire, but I kept rolling.” When he realized they were right, Stamp stood up and shouted, “Get Wayne, he’s right behind me!” Dalton’s body was recovered by shore-based volunteer firefighters later that afternoon. He had died of smoke inhalation.

Stamp was placed in a drug-induced coma for seven weeks. He underwent several medical procedures, including incisions in his arms to help with circulation, skin grafting of his hands and arms, and debridement of his facial burns, a process used to clean dead and contaminated material, to aid in healing, increase the tissue’s ability to resist infection, and decrease inflammation. Overall, some 35 to 40 per cent of his body was burned. When Stamp took the deep breath while climbing up the inside of the tank, he had burned 50 per cent of his lungs.

For Stamp, the road to recovery has been long. Not only has he dealt with physical healing, he’s also endured constant nightmares, and very painful self-esteem issues. His face bears permanent scars. Stamp found solace in the Phoenix Society, an organization which helps burn survivors and their families cope with and overcome the unimaginable and difficult challenges they encounter following a burn injury. Stamp attended a Phoenix Society conference in New York City where he gained the confidence to stand before a microphone and tell his story to an audience of 900 people. “It was like a ton of bricks was lifted off my shoulders. I didn’t feel trapped and I knew I wasn’t alone.”

Stamp accepts that he will never work again, and says, “I lost a lot that awful day—a friend, a livelihood, and myself. “I am a different person today, but I am alive and thankful I can open my eyes to a new day.”



**Figure 15-15** | What messages do you take from Pat’s journey?

## Important

Any person with a disability must be assigned a person to guide them safely out of the building in the event that evacuation is necessary.

# Emergency Response Plans

As you learned in Chapter 8, having an emergency response plan in place is critical. It enables all responders to act quickly and effectively to protect life, property, and the environment. In the context of fire prevention, emergency response plans are commonly referred to as emergency evacuation and fire safety plans. Whether at home, school, or in the workplace, plans should be written, up to date, and ensure that:

- all primary and secondary escape routes with maps and instructions are posted
- stairways are not blocked or locked
- evacuation procedures are in place
- fire drills are conducted regularly to identify problems before a fire occurs

## Evacuation Procedures

Evacuation procedures in the event of fire are a critical element of emergency evacuation and fire safety plans. Once a fire has been detected, workers must:

- proceed calmly and quickly to the primary escape exit; if unavailable, go to the secondary escape exit
- never use an elevator
- keep low to the ground to avoid smoke and toxic gases
- if possible, cover their nose and mouth with a damp cloth to help breathe
- close doors and windows, if last to leave (do not lock them)
- once outside, report to designated mustering area and remain there until the all-clear is given by an emergency responder

## QUICK CHECK

1. List the critical elements of an emergency response plan in case of fire.
2. Create a mnemonic device such as an acronym to help you remember safe evacuation procedures.



 **SPREAD THE WORD**

Visit the National Fire Protection Association and Fire Prevention Canada websites to learn more about public awareness campaigns.

Identify this year's Fire Prevention Week campaign theme. As a class, develop a public awareness campaign through posters, public service announcements, or video messaging that can be shared with local businesses.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 255). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Research an example of a workplace fire that occurred in the province. Use this example as a case study to consider the following questions:

- What happened?
- What caused the fire?
- Could anything have been done differently in terms of prevention or control?
- How did the fire impact the workers, the workplace, and the community?
- Are there lessons to be learned as a result of this fire?

 **DIG DEEPER**

Prescribed burning is the controlled burning of forests, grasslands or other habitats to improve the quality of the forest and reduce the potential for wildfires. This is an important resource conservation activity used by Parks Canada to protect and preserve the forests in national parks. Successful prescribed burns have been carried out across Canada, including in Newfoundland and Labrador.

Dig deeper into the practice of prescribed burning. Where in the province has it been used? How does it work? What safety measures are put in place during a prescribed burn?

## Electrical Safety

Have you ever received an electric shock? How or when did it happen? What did it feel like? What hazards do you think of when you hear the word electricity?

Incidents resulting from electrical hazards are preventable. Workers should clearly understand the need to follow safe work practices and procedures when working with electrical equipment. Workers should ensure that electrical equipment and components are used only in the manner they are meant to be used and not used in a way that has not been recommended by the manufacturers. This chapter introduces important aspects of electrical safety—sources of electrical hazards and important steps that can be taken to prevent injury and death.

### LEARNING GOALS

This chapter will enable you to:

- explain common electrical terms
- identify several common sources of electrical hazards
- examine several types of injuries associated with unprotected exposure to electricity
- investigate controls that are used to eliminate or minimize risk to workers
- explain the necessity for electrical inspections

### SPREAD THE WORD

Electricity is so much a part of our daily lives yet we seldom give it much thought. Think back to yesterday. Create an “electricity record” to identify any time you used or encountered something powered by electricity. Your journal should have three columns: time of day, location, and what you used that is powered by electricity.

Add as many rows as you need to reflect your list.

Time	Location	What you used that is powered by electricity

## WHAT WOULD YOU DO?

Sam and Cathy have summer jobs working with a local house painting company. The company consists of two supervisors and five two-person crews. It is the supervisor's job to visit each new job site to assess the work required, identify any hazards that might be present on the job site, conduct the risk assessment to apply suitable controls, and to brief each crew before they get started.

One morning, Sam and Cathy arrive at a new job site. It is a three-storey house in an old neighbourhood. They wait for their supervisor to arrive and provide a briefing, but he is clearly running late. After an hour,

Sam decides to get started on the job. He knows it has to be finished today and doesn't want to "waste" any more time. He shouts for Cathy to bring the ladder around the back. Cathy grabs the ladder and carries it around the house, fighting through a tangle of tree branches and cables overhanging between the road and the side of the house. It's tough to maneuver so Cathy calls for Sam's help with the ladder. Sam turns the corner and sees the mess of wires and branches.

**What would YOU do?**



**Figure 16-1** | What additional safety hazards might be involved in painting an old house?

## CHAPTER CHALLENGE PREVIEW

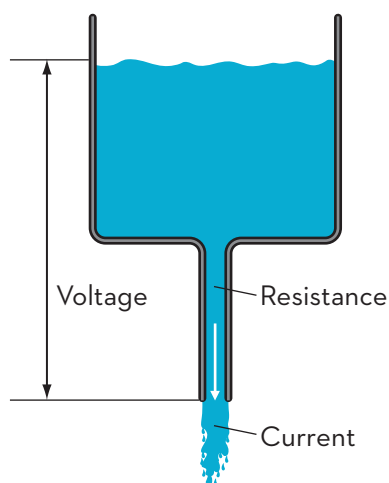
Test your electrical knowledge. With a partner, brainstorm as many words as you can think of related to electricity and electrical safety. Combine your list with another set of partners to create a common word list.

As a small group, research a definition for each word on your list. Create a series of flash cards that include a set of words and a set of definitions. Swap cards with another small group to have them match your words and definitions in as little time as possible.

As a class, create an electricity word wall including the words generated on your lists.

## The Nature of Electricity

Understanding the nature of electricity is the first step in the prevention of injuries as a result of failing to properly control electrical hazards. Electricity is the movement of electrons from one point to another and, as they move, they give up some of their energy. That energy is what powers electrical devices. Some energy moves in a controlled manner. This is known as **current electricity**. Other electricity jumps from one area to another in a sudden discharge. This is known as **static electricity** because it does not move until it is discharged.



**Figure 16-2** | With a partner, use this diagram to explain verbally how electricity can be compared to water flowing through a pipe.

### CURRENT ELECTRICITY

An **electrical current** is the flow of electricity around a circuit. It is measured in amperes (amps). To get an electrical current to flow requires a power source and a conductor. **Conductors** are materials such as copper wires that allow electricity to flow easily. These conductors are generally housed in a plastic or rubber wrapping. This wrapping is called an **insulator**—it keeps the electricity contained. **Voltage** measures the strength or power of an electric current. **Resistance** refers to how much the material in the circuit can slow down the flow of electricity.

Electricity flowing through a current is like water flowing through a pipe. For example:

- Current may be compared to the total volume of water flowing past a certain point in a given length of time.
- Voltage may be compared to the pressure in the water pipe.
- Resistance may be compared to a blockage in the water pipe.



### STATIC ELECTRICITY

Static electricity occurs as the result of an imbalance of electrical charges on or within a surface. Materials are made of atoms which generally have a balance of positive (protons) and negative charges (electrons). When the surfaces make contact and pull away, electrons may sometimes move from one object to another and energy is discharged.

**Figure 16-3** | Lightning is a form of static electricity.

## TYPES OF ELECTRICAL INJURIES

Serious injuries or fatalities may result from failing to recognize electrical hazards, evaluate risks, and apply the most appropriate controls to protect workers. Workers are injured when they become a part of the electrical current, or the path of least resistance.

Factors that contribute to electrical injuries include:

- the type of current: alternating current (AC) or direct current (DC)
- the amount of current flow through the body
- the length of time the current is in the body
- the path of the current through the body
- the body's resistance to the current

There are four types of injuries that may result from contact with an electrical current. They include:

1. Electrocutation—results in death
2. Electric shock—occurs when an electrical current passes through the body
3. Burns—result from an **arc flash** or a **flash burn** from the heat generated by an arc flash or burning materials, and high voltage contact
4. Falls—when a worker receives an electrical shock, the muscles contract and can cause the worker to lose his/her balance and fall (called a startle reaction)



**Figure 16-4** | This worker is cutting metal with a grinder. What industries can you think of where electrical burns may be possible?

## ? Really!?!

Wetness, thickness, and cleanliness of the skin affects the human body's resistance to electrical current.

### **arc flash**

an undesired electric discharge that travels through the air between conductors or from a conductor to a ground

### **flash burn**

a burn caused by sudden intense heat

### **alternating current**

the flow of electric charge periodically reverses direction

### **direct current**

the flow of electric charge is only in one direction

According to Newfoundland Power, electrocution kills an average of 25 workers in Canada per year.

## INTERNAL AND EXTERNAL INJURIES

Electrical injuries can be characterized as internal or external. Internal injuries are those that affect organs and tissues inside the body. When electricity flows through the body, it can affect the electrical signals between the brain and the muscles. This misfiring of signals may result in, but is not limited to:

- haemorrhages, destruction of tissues, nerves, and muscles
- muscle spasms
- muscle contraction of the heart
- ventricular fibrillation
- temporary paralysis of the nerve centre
- contraction of chest muscles leading to breathing problems which may lead to death from asphyxiation
- internal burns

External injuries may include:

- skin and eye injuries from burns
- potential blindness from the intense light of arc flashes
- burns from electrical flashes spread over large areas
- injuries from falls
- ruptured ear drums resulting from the pressure of arc blasts

## QUICK CHECK

1. Differentiate between an electrical current and static electricity.
2. Identify four types of electrical injuries.
3. Research to identify an example of a worker who was injured from exposure to an unprotected electrical current. What was the injury and how did it happen? Share your findings with the class.

## Sources of Electrical Hazards

The hazard recognition, evaluation, and control process helps employers and workers identify sources of electrical hazards specific to their workplace so they may be controlled. The following are sources of electrical hazards that may exist in the workplace:

- improper grounding of electrical equipment

Electrical tools and equipment must be grounded. **Grounding** provides a way for an unwanted electrical current to be dissipated into the ground instead of going through a worker.



- exposure of wires or electrical parts

Exposed wires and electrical parts are commonly seen when covers are removed from breaker panels or electrical boxes.

- circuit overload
- damaged electrical tools and equipment
- wet environment and conditions

Wet work environments, high-humidity conditions, perspiration, and wet clothing are conditions to avoid when working with electricity. These conditions increase the workers' risk of becoming a part of the electrical current's path of least resistance and the risk of electrical shock and electrocution are increased.

- overhead and underground power lines

Power lines present hazards to workers who work outdoors and around high-voltage overhead or underground power lines.

- improper or inadequate wiring

Electrical hazards from inadequate or improper wiring are created when:

- the electrical wire gauge is too small for the current it is carrying
- grounds are improperly connected
- the connection of hot and neutral wires in electrical receptacles have been reversed, also known as reverse polarity

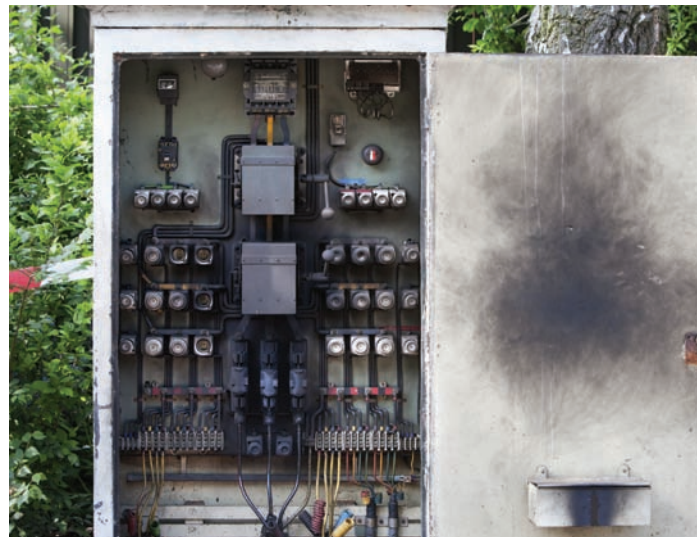
- insulation failure or defective insulation

Insulation protects workers from electrical hazards by providing a non-conductive barrier between the worker and the equipment. Insulation failures may be caused by the work environment through:

- direct sunlight
- electrical sparks or arcs
- repeated exposure to high temperatures
- abrasive surfaces which erode insulation
- animals (rodents and insects) chewing on insulation material
- moisture and humidity absorbed by insulation material
- wear and tear

- using ladders that are made of conductive materials (such as aluminum)

Always use ladders made of wood or other non-conductive materials (e.g., fiberglass) when working with or near electricity or power lines.



**Figure 16-5** | The result of overloaded circuits may be heat or electrical arcing. Electrical arcing is an electric current, often strong, brief, and luminous, in which electrons jump across a gap.



**Figure 16-6** | Damaged tools and equipment may pose hazards to workers through inadequate grounding or insulation.

### flash point

the lowest temperature at which a liquid gives off enough vapour to form a flammable air-vapour mixture near its surface

- flammable and combustible liquids

Flammable and combustible liquids such as fuels and petroleum solvents may introduce static electricity hazards depending on the potential of the substance to generate static electricity, how easily it conducts electricity, and the **flash point**.

Some causes of static electricity hazards include:

- friction of two or more materials to create heat that has the potential for ignition in flammable and combustible atmospheres including:
  - \* rubbing a non-conductive material over a stationary surface such as scuffing shoes on nylon wool carpet
  - \* liquids being pumped, poured, shaken, stirred or flowed from and through pipes
  - \* moving large sheets of plastic
  - \* conveyor belts rubbing materials being transported

## QUICK CHECK

1. Identify five common sources of electrical hazards.
2. Research to identify three examples of work environments where electrical hazards may be present.

## Controlling Electrical Hazards

Once identified, the first line of defence is to remove or eliminate the electrical hazard from the workplace. An electrical hazard can be removed by putting protective measures in place at the source including **de-energizing** or bringing electrical equipment to zero energy. The hazard can also be removed along the path by placing insulation or barriers between the worker and the hazard. Additional engineering, administrative, and personal protective equipment controls may be employed to control electrical hazards. The following are safe practices to employ on and off job sites:

1. Use the proper electrical equipment and wiring for the job.

Electrical equipment is designed and built for a specific purpose and it should be used only for the purpose it was intended. Ensure to use the right size wiring for the amount of current expected to be carried in a circuit and ensure that extension cords are compatible with the amount of current.

2. Ensure proper installation of electrical equipment and wiring.

Manufacturer specifications must be followed for the correct installation of electrical equipment. Electrical equipment should not be installed in

locations where explosive materials, flammable gases or vapours, combustible dusts, or ignitable fibres are present or likely to be present.

3. Follow proper operation procedures for tools, wiring and electrical equipment.

Manufacturer specifications must be followed for the correct operation of electrical equipment.

4. Ground and bond where required.

Tools that are fitted with a three wire cord have a grounding conductor as one wire and two wires carrying the current. This allows the unwanted current to follow the grounding path as opposed to going through a person.

Grounding and bonding are often performed together. Bonding is done by connecting one metal container to the other with a special metal bonding strap or wire. Bonding and grounding ensures that electrical parts are connected to form an uninterrupted and stable path to the ground.

A ground fault circuit interrupter, or GFCI, is an inexpensive electrical safety device that can protect you from a serious electric shock. Keep in mind that a GFCI does not replace fuses and circuit breakers. You may be familiar with the bathroom and outside outlets in your home—outlets with an illuminated power switch. These outlets are designed to trip once a short circuit is initiated and this prevents injury. GFCIs are typically used where electrical devices may come into contact with moisture such as outside or in bathrooms.

5. Use overcurrent protection devices.

These protection devices will interrupt the current flow when it exceeds the capacity of the conductor.

- The correct fuse type and fuse size should be used to prevent overheated wiring or equipment. Before replacing fuses, the voltage should be turned off.
- Circuit breakers are used in high voltage circuits with large current capacities.



**Figure 16-8** | How is a surge protector an effective safety device for your computer?



Never use a three-prong plug with the ground plug broken off.



**Figure 16-7** | The GFCI is designed to sense current leaks large enough to cause serious personal injury. They operate on line-to-ground fault currents.

6. Use double-insulated tools and equipment.

Double-insulated tools protect the worker as the wires inside the device provide an insulating barrier with no metal part exposed.

7. Insulate live wires with plastic or rubber.

This ensures that workers are not exposed to live circuits. It also serves to protect wires from damage and environmental conditions.



**Figure 16-9**

What examples of insulation do you see in this image?

8. De-energize and isolate equipment.

De-energization of equipment means to disconnect and isolate all energy sources in tools, equipment, or machinery to ensure that it cannot reenergize to harm workers. Boxes, screens, barriers, and covers are types of isolation methods to keep workers separated from live electrical parts.

9. Use power line controls.

Workers who operate boom trucks, mobile cranes or other similar equipment must receive Power Line Hazards Certification training from a WorkplaceNL approved training provider before operating this equipment. When working near power lines, a minimum distance of 5.5 metres must be maintained if written clearance is not available. Call the power utility for your area before you dig to ensure you do not make contact with overhead or underground power lines. Only use ladders and scaffolds made of non-conductive material.

10. Use appropriate PPE.

All PPE that is used must be non-conductive, non-sparking and heat resistant and designed to be used when working with electricity. Ensure the PPE identified through the risk assessment is right for the worker and the job. Legislative requirements and manufacturer guidelines must be followed to ensure additional hazards are not introduced to the workplace and job task.

## Do:

- Follow standards and manufacturer guidelines at all times.
- Inspect tools, cords, and plugs for damage before each use.
- Use only cords or equipment that are rated for the level of amperage or wattage being used.
- Ensure receptacle boxes are made of non-conductive materials.
- Know where breaker panels and fuse boxes are located.
- Label breakers and fuses.
- Install electrical equipment in controlled areas where only authorized persons have access. Only trained personnel with knowledge of electricity should install, test, or repair electrical equipment.
- Ensure switches have approved voltage and ampere ratings, compatible with their intended use.

## Don't:

- Don't use damaged equipment.
- Don't use nails or staples to keep power cords in place. They can damage the cords and create fire and shock hazards.
- Don't use outlets or cords that have exposed wiring, have been repaired or damaged.
- Don't block access to breaker panels and fuse boxes.
- Don't clean tools with flammable or toxic solvents.
- Don't carry tools and equipment by power cord.
- Don't use light duty household cords in workplaces.
- Don't tie cords in knots.

**Figure 16-10** | Additional Do's and Don'ts of Electrical Safety. Which safeguards would apply at home?

## LOCK-OUT/TAG-OUT (LOTO) PROCEDURES

A common method of de-energization is **lock-out/tag-out (LOTO)**. Lock-out procedures protect workers by ensuring that workers place personal locks on all energy sources to completely isolate or turn off all energy sources on tools, equipment, or machinery.

LOTO procedures are referenced in the Occupational Health and Safety Regulations.

Employers must develop LOTO procedures for workers to follow. These procedures should be specific to the systems at the workplace. Workers must be trained in these procedures and the proper use of LOTO devices and equipment.



**Figure 16-11** | Why must key locks, rather than combination or other types, be used in LOTO situations?



At a minimum, LOTO must comply with legislative requirements as follows:

- When LOTO is required, energy sources must be secured in a safe position using the personal locks of each individual worker assigned to work on the system.
- Personal locks are marked and tagged to identify the worker using it, the equipment being locked out and the date the lock was applied.
- Procedures must be put in place for shift or worker changes that includes the transfer of locked-out energy isolating devices between outgoing and incoming workers.
- Workers must verify all energy sources are locked out before starting work.
- Workers must remove their personal locks when finished work.
- Locks are to be removed only by the workers who installed them.
- Workers must keep personal lock keys in their immediate control throughout the duration of work.
- Group lock out procedures are developed and written for large numbers of workers who are working on machinery or equipment at the same time. This procedure is posted at the place where the system is used.

### It's the Law...



Newfoundland and Labrador has codes and regulations that guide the work of electricians. Information about provincial regulations may be found at Service NL.

## ELECTRICAL INSPECTIONS AND MAINTENANCE

Electrical inspections must be carried out by properly trained and certified electricians. Qualified electrical inspectors are available across Newfoundland and Labrador. These inspectors are responsible for ensuring that all electrical work is undertaken by certified electricians and meets Canadian and provincial codes and regulations. Permits must be obtained to undertake electrical work.

## QUICK CHECK

1. Identify 10 control measures for electrical hazards and classify them as being an engineering control, administrative control, or PPE.
2. Explain the necessity for electrical inspections.
3. Define LOTO and describe its importance as a control measure.
4. Refer to the example you identified in question 3 on page 274. Can you identify any controls that might have prevented the incident?



## Working around Power Lines

You now have determined that electrical injuries can be prevented. Working around power lines poses unique electrical hazards that must be considered.

### POWER LINE HAZARDS

Overhead power lines are not insulated with a protective outer covering. If you touch them, or even come close enough to them, with a ladder, boom truck, crane, or any other piece of equipment, this could cause the electricity to be directed to the ground through the equipment and you, causing serious injury or death.

If you see a downed power line, stay back 30 meters and contact Newfoundland Power or NL Hydro immediately. Stay in the area and warn others to stay clear until help arrives.

### CONTROLLING POWER LINE HAZARDS

It is critical to carefully plan your work to prevent contact with overhead and underground power lines. Call Newfoundland Power or NL Hydro to make arrangements to have the power lines de-energized, barricaded, or moved from the work site if required. If you plan to dig, or use drilling or trenching equipment, call before you start. The following engineering, administrative, and PPE controls contribute to staying safe while working around power lines:

- Special permits are required from the electrical utility when working within 5.5 meters of energized power lines. Once the power utility receives a call requesting a special permit, a supervisor in the area will visit and assess the suitability of the work site. They measure the distance of the power lines to the ground and examine the equipment that will be used to determine if it can be used safely. It is important to allow time for this work site visit to be completed and the necessary permits issued before starting planned work near power lines.
- Review the locations and potential hazards of overhead power lines and underground cables with everyone on the work site. Ensure that everyone is aware of the dangers of coming into contact with electrical equipment. Specific requirements for maintaining clearances and providing worker training are covered under Occupational Health and Safety Regulations.



If you see downed power lines, contact Newfoundland Power at 1-800-474-5711 or NL Hydro at 1-888-737-1296 immediately.



It is a requirement under the law to ensure safety clearance permits are in place before starting any job near power lines.

## Important

If your equipment has made contact with a power line while you are in or on it, remain in or on the equipment, warn others to stay away, and call for help.

- Many power line contacts are made by heavy construction equipment such as boom trucks, excavators, and dump trucks. This type of machinery is at extremely high risk of making contact with power lines. Operators of equipment that have the capability of contacting overhead or underground power lines, such as a mobile crane, boom truck, or other similar equipment must attend a WorkplaceNL approved Power Line Hazards Certification Training course.
- All PPE that is used must be non-conductive, non-sparking, and heat/flame resistant, and designed to be used when working with electricity. Ensure the PPE identified through the risk assessment is right for the worker and the job.



**Figure 16-12** | What safety measures should these tree trimmers take before beginning work in this area?

## QUICK CHECK

1. How do power lines pose a unique hazard to workers and members of the community?
2. What should your response be if you find a downed power line?
3. Identify three control measures that apply to working near power lines.

 **SPREAD THE WORD**

Revisit your electricity record. Add two more columns to your record:

1. Did you see anything dangerous? If yes, what?
2. What can be done to fix the problem?

Revisit the items you previously identified and complete your electricity record. Use your record as a basis for an Electrical Safety at Home checklist that can be shared with family and friends.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 271). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Return to your original small groups in which you identified electrical terms. Identify three items from the chapter that you didn't know previously. Identify three areas you would like to learn more about. Create three interview questions that you would ask a local electrician or someone else who works with electricity as part of their occupation.

Invite someone with training and expertise in working around electricity to visit your class to share their expertise and to answer your questions. Each group will pose at least one of their questions to the guest expert.

 **DIG DEEPER**

Newfoundland Power, as an organization, plays many roles including raising public awareness with respect to electrical safety. Conduct research to identify current initiatives they have in place. Develop your own electrical safety campaign poster targeted toward a specific community group (e.g., small children, teenagers, households).

# Machine Safeguarding

How many workplaces can you identify that use tools, machinery, and equipment as part of the job? Now consider the hazards that might be present in such environments. These hazards must be controlled to keep workers safe.

Employers must ensure that all machinery and equipment is capable of safely performing the job it is intended to do. As in other workplaces, a hierarchy of controls may be established to identify and apply safeguards that are available to employers and workers.

## LEARNING GOALS

This chapter will enable you to:

- describe common mechanical hazards and mechanical injuries
- examine standard safe operating procedures for workplace machinery
- examine the requirements for safeguarding
- investigate several types of safeguards and devices

## SPREAD THE WORD

Young workers are more likely than other workers to be hurt or killed on the job—that’s what the statistics say. Many young workers are particularly at risk using machinery and equipment where severe injuries and fatalities take a tragic toll. In creating the LifeQuilt, designer Laurie Swim, the quilters, and the families of the young workers not only honour and remember their loved ones, but through raising awareness they try to prevent the same loss to other families.



**Figure 17-1** | The LifeQuilt was completed and first unveiled on National Day of Mourning, April 28, 2003.

## WHAT WOULD YOU DO?

Lois works in a local ice cream factory. Trying all the new flavours makes up for the hard work that goes into producing the creamy treats. For example, ice cream mixers need to be constantly cleaned to avoid contamination. The manager usually does this but today she must leave to pick up some new flavouring supplies. She instructs Lois to clean the machine, cautioning her to ensure the machine is turned off before she starts.

Lois looks for the power switch but doesn't see one. Neither does she see an electrical outlet nearby. Lois looks down at the cables connected to the floor pedals that operate the machine. "That should do it," she thinks. Lois nudges the pedals out of the way with her foot and prepares to start cleaning.

**What would YOU do?**



**Figure 17-2** | What health and safety hazards might be associated with this ice cream mixer?

## CHAPTER CHALLENGE PREVIEW

What machinery and equipment do you use in your daily life—working in the kitchen, attending to outdoor chores, or perhaps servicing your vehicle? Identify three machines or pieces of equipment and consider the following questions:

- Are there risks involved in using this machinery or equipment?
- What precautions do you take in using this machinery or equipment?
- Where could you find information about safety measures related to this machinery or equipment?



# Health and Safety Hazards of Machinery and Equipment

Workplace hazard recognition, evaluation, and control activities identify the health and safety hazards associated with tools, machinery, and equipment being used by workers. Every tool and machine requires an individual assessment and work activity analysis. When conducting the assessment, an employer looks at the tools, machines, equipment, work tasks, and environment. This assessment provides the employer with information to design safeguarding systems and controls.

## MECHANICAL SAFETY HAZARDS

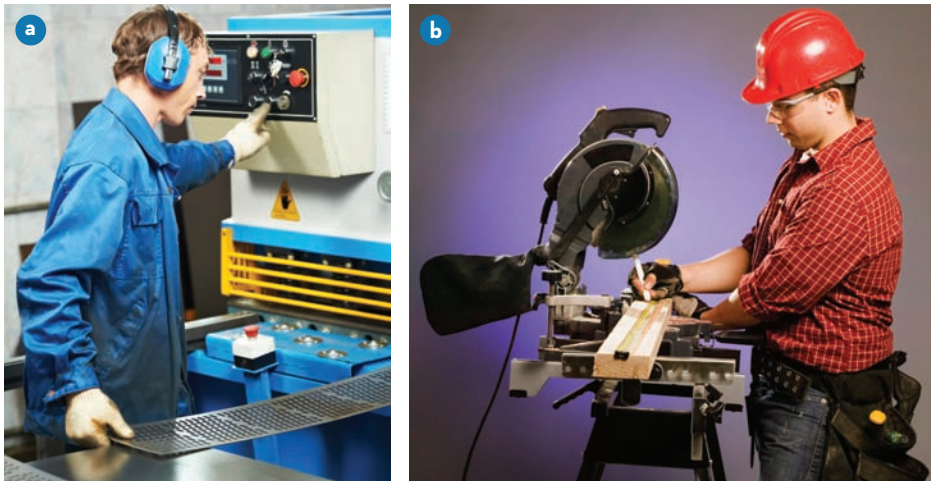
**Mechanical safety hazards** are generally associated with the way that machinery and equipment moves and operates. The movement of machines may involve rotating parts, sliding or reciprocating parts, or rupturing or fragmenting parts. These movements result in:

- **cutting**—an action of machinery and equipment that cuts materials being used
- **punching**—quick and forceful movements of machinery required for stamping or blanking (using die-cuts) metal or other materials
- **shearing**—mechanical action of cutting or trimming metal or other material with a knife or slide
- **nip points**—hazardous areas created by two or more mechanical parts rotating in opposite directions

Machine Movement	Characteristics	Action
1. Rotating parts	<ul style="list-style-type: none"> <li>• a single part spins and creates an entanglement or snagging hazard</li> <li>• when two parts are spinning, nip points are created where fingers and clothing may get caught</li> <li>• examples include feed belts and pulley-type machinery, shafts, or couplings</li> </ul>	cutting punching shearing bending
2. Sliding or reciprocating parts	<ul style="list-style-type: none"> <li>• back-and-forth, up-and-down motion</li> <li>• examples include dies in punch presses where shearing and crushing hazards are created</li> </ul>	cutting punching shearing bending
3. Rupturing or fragmenting	<ul style="list-style-type: none"> <li>• can cause impact injuries</li> <li>• examples include abrasive wheels</li> </ul>	cutting punching shearing bending

**Figure 17-3** | Mechanical injuries generally reflect the type of movement actions of the machinery.



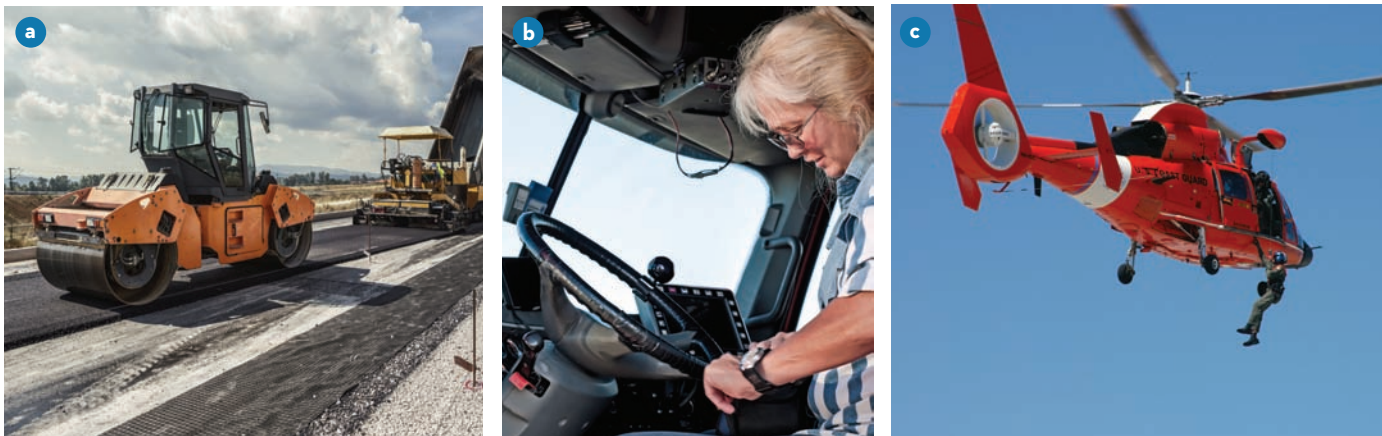


**Figure 17-4** | How might the equipment being used in these images be hazardous: a) a worker operating a guillotine shears machine to cut metal b) a worker using a mitre saw?

## HEALTH HAZARDS RELATED TO MACHINERY

Workers must also be protected from health hazards when working with machinery and equipment. Health hazards that go uncontrolled may increase workers' risk of developing occupational diseases associated with the following:

- chemicals
- atmospheric contaminants
- heat
- noise
- vibration
- radiation
- biohazards
- musculoskeletal injuries (MSI)



**Figure 17-5** | What occupational health hazards might be associated with equipment used in: a) road paving b) truck driving c) search and rescue?

## QUICK CHECK

Really!?!



Speed is not an indicator of safety. For example, a slowly rotating drive shaft is driven with enormous torque and may have a protruding key that could easily snag a worker's clothing. Despite its slow speed, this shaft could easily cause serious injury.

1. Describe four common mechanical hazards and identify an example of each one.
2. Explain, using three examples, how machines may pose health hazards to workers.
3. Identify an example of a machine that might pose both health and safety hazards.

## Machine Safeguarding

**Safeguarding** is defined as methods that are used to protect workers from health and safety hazards while operating machinery and equipment. In short, every part, function, or process of machinery that could cause injury to workers must be secured to prevent accidental contact with dangerous parts.



### THINK ABOUT IT...

**Do machines themselves pose hazards?**

### SAFE WORK PRACTICES AND PROCEDURES

Safe work practices and procedures must be developed for workers when operating machinery and equipment. This includes the operating controls where the following rules apply:

1. Starting and stopping controls must be within reach of workers.
2. Controls and switches must be clearly identified with functions noted.
3. Controls and switches must be positioned, designed and shielded to prevent accidental start-up.
4. Two-handed controls which are installed to work together simultaneously require both controls to be released before another machine cycle can be started.
5. All control systems must meet the specific requirements of legislation.



**Figure 17-6** | How do the controls pictured here reflect safe work procedures?

Employers are also required to protect workers from:

- hazardous contact with power transmission parts
- access to hazardous **point of operation** work areas
- falling, spraying, projecting, or ejecting materials during the manufacturing process

## SAFEGUARDING REQUIREMENTS

Employers are required to choose machinery and equipment according to Occupational Health and Safety (OH&S) legislation, CSA Group (CSA) standards, and manufacturer specifications. Hazard recognition, evaluation, and control activities must be conducted to determine the most effective means of protecting workers from the actions and movements of machinery and any other health and safety hazards they may be exposed to during operation.

Safeguarding devices can be used separately or in combination and include:

- physical barrier guards
- safeguarding devices
- awareness devices
- education and training
- safe work practices and procedures
- personal protective equipment (PPE)
- location of hazardous work areas and parts

When selecting safeguards, employers must consider the compatibility of safeguards and the operation of machinery and equipment. This means that safeguards that are used must not create additional hazards or interfere with the safe operation of the machine. In addition, worker's actions, behaviours, and job tasks are of primary importance when designing safeguards.

Safeguards are required to have the following characteristics. They must:

- be secure and durable
- protect against falling objects
- not create another hazard
- not create any interference
- allow for safe maintenance

Upon recognition of hazards and evaluation of risk, controls are put in place to either eliminate the hazard or minimize the risk to workers. CSA standard Z432-04 *Safeguarding of Machinery* outlines the hierarchy of five safeguarding controls.

### point of operation

area on a machine where material is positioned for processing and where work is performed



**Figure 17-7** | What type of safeguarding device is represented in this image?

### interlocks

a type of machine guard that prevents access to dangerous parts of machinery by shutting down the machine when the guard is not in place or disengaged

### pinch point

any place where a body part can be caught between two or more moving mechanical parts (gears, pressure rollers, chains, sprockets)

### presence-sensing devices

sensing devices that produce signals and stop the hazardous machine movement when something enters a danger zone

### physical barrier guards


a physical barrier that prevents access to a machine or equipment hazard (also called a machine guard)

### two-hand controls

a safeguarding device that requires both hands to control the equipment in order for it to operate which prevents them from entering a danger zone

## 1. Elimination or Substitution

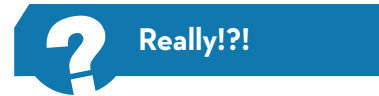
The most effective method, and the first option, is to completely remove or relocate the hazard of contact with dangerous parts of equipment by modifying and automating work processes.

Effectiveness	Controls	Examples
<b>Most Effective</b>  <b>Least Effective</b>	1. Elimination or Substitution	<ul style="list-style-type: none"><li>• eliminate human interaction in the process</li><li>• modify the machinery to eliminate <b>pinch points</b>, sharp edges, and shear points</li><li>• automate loading/unloading and feeding of material into the machine</li></ul>
	2. Engineering Controls (Safeguarding Technology)	<ul style="list-style-type: none"><li>• <b>physical barrier guards</b></li><li>• <b>interlocks</b></li><li>• <b>presence-sensing devices</b></li><li>• <b>two-hand controls</b></li></ul>
	3. Awareness Devices	<ul style="list-style-type: none"><li>• lights, beacons, and strobes</li><li>• computer alerts and warnings</li><li>• signs</li><li>• restricted space marked on floor with paint or tape</li><li>• beepers and horns on machinery</li><li>• warning labels on equipment</li></ul>
	4. Training and Procedures	<ul style="list-style-type: none"><li>• safe work practices and procedures</li><li>• inspections of safety equipment</li><li>• training sessions</li><li>• lockout/tagout (LOTO) procedures</li></ul>
	5. Personal Protective Equipment	<ul style="list-style-type: none"><li>• eye protection</li><li>• hearing protection</li><li>• face shields</li><li>• hand protection</li><li>• respirators</li></ul>

**Figure 17-8** | Identify the administrative controls related to use of machinery and equipment.

## 2. Engineering Controls

**Physical barrier guards** are commonly known as machine guards. They provide the most effective protection for workers when elimination of the hazard is not possible. They prevent workers from reaching around, under, over, or through a guard to the hazardous area.



10% of total lost-time claims in the NL fish harvesting sector, 2010-2014, resulted from a worker being caught in or compressed by equipment or objects.

Source: WorkplaceNL

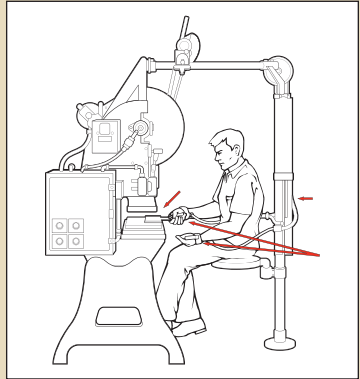
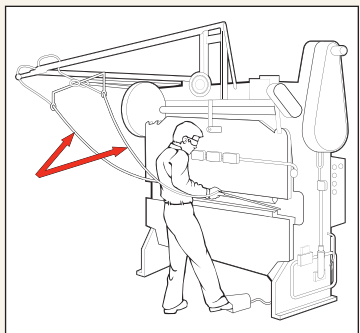
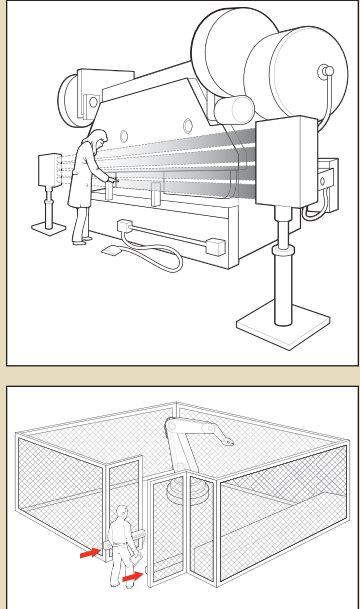
Fixed	Interlocking	Adjustable	Self-adjusting
<ul style="list-style-type: none"> <li>• first choice for engineering out the hazard</li> <li>• prevents workers from coming into direct contact with the hazardous part or area</li> <li>• a permanent part of machinery that completely encloses the hazardous area or part</li> <li>• made of sheet metal, screen, wire, bars or plastic</li> </ul>	<ul style="list-style-type: none"> <li>• prevents access to dangerous parts of machinery by shutting down the machine when the guard is not in place or disengaged</li> <li>• start-up of machinery will not happen until the guard is in place</li> <li>• using LOTO procedures, safe access is allowed to the machine for removing jams or conducting routine maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• guards may be adjusted or moved for different production needs</li> <li>• can be designed to suit many different applications and sizes of materials</li> <li>• once adjusted, can remain FIXED in place</li> </ul>	<ul style="list-style-type: none"> <li>• guards that move according to the size of material that is being fed into the point of operation</li> <li>• moves only when materials enter the machine's point of operation</li> <li>• when not in use, guard rests in its original position</li> <li>• can be purchased "off the shelf"</li> </ul>

NOTE: Fixed guards are not permitted to be modified for easy removal without using tools.

**Figure 17-9** | Is one type of guard more effective than another? Explain your answer.

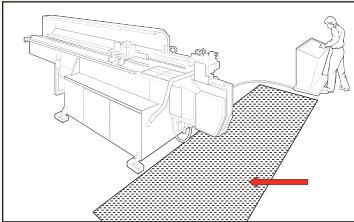
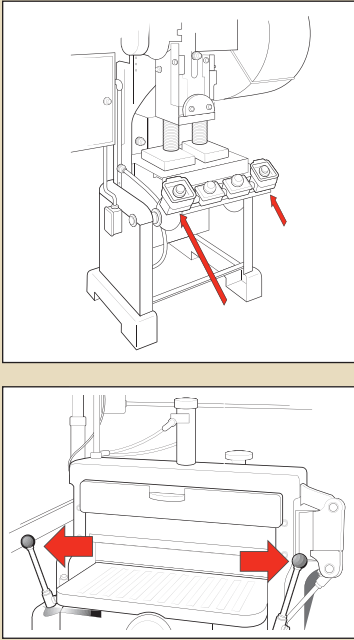
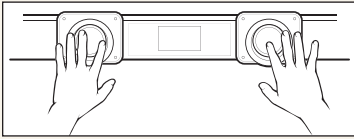
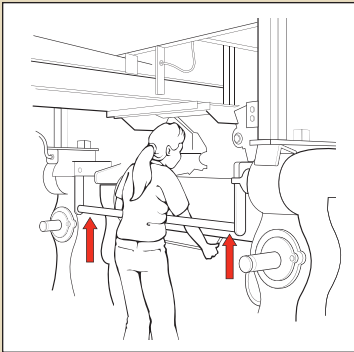


Safeguarding devices can be used when physical barriers are not practical for the job task. There are many types of safeguarding devices available to workers that offer a high level of protection when used properly.

Device	How It Works	
Pullback Devices	Cords connected to workers' wrists pull hands back when hands enter point of operation.	
Restraint Devices	Cords connected to workers' wrists and an anchor point keep workers' hands away from the point of operation. They can also include body belts and lanyards that prevent workers from reaching into a danger zone.	
Presence-sensing Devices	Devices will stop the operation of machinery when the sensors have been activated (e.g., light curtains and other <b>photoelectric sensors</b> )	

**photoelectric sensors** devices that release harmless infrared light beams that, when blocked or crossed by workers or materials, will immediately shut down the machine



<p>Presence-sensing or Pressure-sensitive Mats</p>	<p>Devices will stop the operation of machinery when a pre-determined weight is applied to the mat.</p>	 <p>A line drawing of a large industrial machine with a long, textured mat extending from its front. A person is standing at the end of the mat. A red arrow points to the mat.</p>
<p>Two-hand control</p>	<p>Both hands are required to control the equipment in order for it to operate.</p>	 <p>Two line drawings. The top one shows a machine with two hand levers on the front, each with a red arrow pointing to it. The bottom one shows a machine with two hand levers on the sides, each with a red arrow pointing to it.</p>
<p>Two-hand trips</p>	<p>Both hands are required to be removed from the danger zone in order for machinery to operate.</p>	 <p>A line drawing showing two hands, one on the left and one on the right, each with a red arrow pointing to a circular button or sensor on a horizontal bar.</p>
<p>Emergency stopping devices</p>	<p>The machine will shut-down if all or part of the worker's body enters the danger zone (e.g., <b>crash bar or belly bar</b>)</p>	 <p>A line drawing of a person standing in front of a large machine. A horizontal bar is positioned in front of the person's torso. Two red arrows point upwards from the bar towards the person's body.</p>

**crash or belly bar**  
 emergency trip wires  
 or emergency contact  
 bars designed as part of  
 machinery and equipment  
 that when contacted, it  
 will immediately shut-  
 down system

**Figure 17-10** | What administrative controls would support the effectiveness of these safeguarding devices? (Images courtesy of WorkSafeBC)

## Spreading the Message of Safety

“The day that changes your life forever starts out just like any other...  
”—a lesson Candace Carnahan learned the hard way.

Candace was working as a summer student at a paper mill when she took a step that set her life in an entirely different direction. Candace took a commonly used shortcut, a shortcut she had been taking since beginning her employment at the mill, but on August 11, 1999, she put her foot down at exactly the wrong place, at exactly the wrong time. The result? A devastating workplace incident in which she lost her lower left leg at the vulnerable age of 21. It was an incident that might also have taken her life, but most important to Carnahan—it was preventable.

“Sometimes, the first step in not getting hurt is simply knowing that you CAN be,” Carnahan states. “If it could happen to me, it could happen to you—but it doesn’t have to.” Carnahan believes that ALL workplace injuries are preventable.

Candace often shares the message with the young workers she speaks to on an international basis that “you can argue with your parents, with your siblings, and your friends, however, arguing with a machine is a losing battle.” Candace never could have imagined that her foot could get caught in a space so small, and because “everyone else was doing it,” also didn’t take the time to consider the consequences of her actions. She recalls her mother telling her that “just because everyone else was doing something, didn’t mean she should too,” and smiles, thinking about how her mom was right about a lot of things she didn’t give her credit for. She encourages young workers to take a leading role in their own health and safety—making the point that placing blame, pointing fingers, or simply stating that “you didn’t know” won’t make your limb grow back, nor will it bring back someone you love.

Carnahan had no idea when she began employment as a young worker that people were losing their lives on the job. Contrary to popular belief, “what you don’t know CAN hurt you”—another lesson learned the hard way.

Acknowledging that it can be intimidating and difficult to speak up as a young worker, Candace reminds her audiences that the alternative can be much more painful, and in some cases even fatal. “When you SEE SOMETHING, you need to SAY SOMETHING”, a mantra that follows Candace around the globe, energizing and encouraging workers of all ages to make safety their number one priority by speaking up when they see something they know is unsafe.

“You never know what the one thing is you might do or say that will save a life, or change it forever”, says Candace. Just because you walk by an unsafe situation that isn’t in your work area, or involving strangers, doesn’t mean it isn’t your responsibility.

When a workplace injury occurs, everyone is affected, which is why Carnahan strongly believes that it’s also everyone’s responsibility to prevent it. “While we have progressed to a point where occupational health and safety is being discussed at a younger age, and workplace injuries and fatalities are on the decline, we still have a long way to go.” Carnahan believes that until we get to zero incidents each and every one of us can, and need to, be doing more to get there. Candace challenges people to do “one thing safer.” She believes that changing small behaviours on a day to day basis is what will result in big changes for a life time.

Carnahan has shared her message with over 300 000 people worldwide, and continues to expand her message to audiences across the globe. She is featured in awareness campaigns across North America, Australia, and Europe.



**Figure 17-11** Use the Internet to research more about Candace and her work.

### **captive key systems**

use a series of keys or locks to start or shut-down a hazardous operation

### **hold-to-run controls**

requires machine operators to constantly keep controls activated in order to work

## **Important**

Safeguarding is not a substitution for LOTO. LOTO procedures protect workers when machinery and equipment is shut down or de-energized and isolated for maintenance purposes. Safeguarding protects workers while operating the machinery and equipment.

Other safeguarding measures include limiting the machine movement to a safe range or speed, locating the worker in a safe place before the machine can be started, **hold-to-run controls** and **captive key systems**.

### **3. Awareness devices**

**Awareness devices** warn workers with sounds, contacts, and visuals of potential and real hazards. There are various types of awareness devices that include:

- barriers that allow workers access to the hazardous areas of the machinery, but the barriers will come into contact with workers getting too close to the danger zone
- audible and visual signals on machinery and equipment when getting too close to the danger zone
- signs and warning labels posted in the hazardous work area

### **4. Training and Procedures**

Education and training programs are used in combination with other controls to ensure workers understand the proper use and application of safeguarding devices. Safe work practices and procedures must be developed for any work that is done around hazardous work areas, machinery, or equipment.

### **5. Personal protective equipment (PPE)**

PPE may have to be used when safeguards do not provide effective protection against hazards. Note: PPE is not to be used as a primary method of control.

## **QUICK CHECK**

1. Explain, using examples, the requirements for machine safeguarding.
2. Explain how the hierarchy of controls is reflected in machine safeguarding.
3. Locate images of different types of safeguards. Create a display to identify the type of safeguard and explain its use.

 **SPREAD THE WORD**

Visit the *LifeQuilt* website to learn more about their mission. What impressions do you take from the site? Create a “message to self” sharing your impressions. On the site is a place where people can post their promise to work safely. Post your own promise as means to express what you have learned.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 285). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Think back to the beginning of the chapter where you considered machinery and equipment that you use in daily life. Many people take household safety for granted—using the same machines time and again without thinking about *how* they are using them.

As a class or in small groups, you will prepare a “Household Safety Guide” that will remind people about the safe use of machinery and equipment in the home. Each group will select a particular area of a household such as the kitchen or garage, or create groups based on specific tasks such as cooking, cleaning, yard or vehicle maintenance. The group will then be responsible for:

- a) identifying tools, machinery, or equipment generally used in that part of the household
- b) identifying hazards related to household machinery or equipment related to that area
- c) recommending controls for the safe use of that machine/equipment
- d) presenting your findings in a manner that can be easily available and understood by someone outside the class.

 **DIG DEEPER**

Select a specific workplace or industry of interest to you. Research to determine how machine safeguarding applies within the workplace or industry.

- What machines are in use within that setting?
- What safeguards are in place?
- How effective are they and can you improve their effectiveness?

# Confined Space Entry

A confined space is any area that is not designed for continuous human occupancy. It has limited points of entry and exit and may have issues with ventilation. Many hazards can be associated with confined spaces including electrical hazards, oxygen deficiency, oxygen enrichment, falling from an elevation, fire, and chemical burns.

Many fatal and serious injuries occur each year due to hazards associated with confined spaces. Confined spaces can be found in almost all industries including agricultural silos, pipelines, hydro vaults, sewers and other underground tunnels, storage vats, and shipping containers. Having a plan to work safely in a confined space is critical to preventing worker injuries and fatalities.

## LEARNING GOALS

This chapter will enable you to:

- describe confined spaces
- identify the health and safety hazards of confined spaces
- summarize the control methods used when working in confined spaces
- explore the roles and responsibilities of workplace parties for confined space entry—employer, entry supervisor, attendant, entrant, and the emergency response team
- name the key components of a confined space rescue plan

## SPREAD THE WORD

The hazards of confined spaces are present throughout our communities. Have you ever come across a coastal cave, abandoned well, or a culvert pipe? These are just several examples of confined spaces in your community.



**Figure 18-1** | As a class, brainstorm other instances where confined spaces could exist in your community.





## WHAT WOULD YOU DO?

Ryan works for a construction company that specializes in landscaping. They've spent the entire summer working on a small industrial complex. The landscaping includes a large plastic-lined pond. The water level in the pond is controlled by opening and closing a gate valve which is located at the bottom of a four metre deep utility hole. The diameter of the utility hole is approximately one metre.

It's the last day on the job site and everyone is tidying up the site for the grand opening. Ryan is working near the pond when he hears the site supervisor instruct a worker to climb down the utility hole and close the gate valve so that they can fill the pond. Not long after, Ryan hears the supervisor yell down to the worker then sees him enter the space as well.

Ryan rushes over to the entrance to the hole. He looks down and sees both men collapsed at the bottom of the ladder. He knows he has to act fast.

**What would YOU do?**



**Figure 18-2** | What additional hazards could be present at this worksite?

## CHAPTER CHALLENGE PREVIEW

We often think of confined spaces as they relate to workspaces with silos, tanks, pipelines, and boilers. What other workplaces come to mind when you hear the term confined space?



**Figure 18-3** | How might confined space entry present hazards to workers  
a) performing a house inspection  
b) performing sewer maintenance

## egress

the way a worker exits a confined space

# Confined Spaces

A **confined space** is defined by Occupational Health and Safety (OH&S) Regulations as an enclosed or partially enclosed space that:

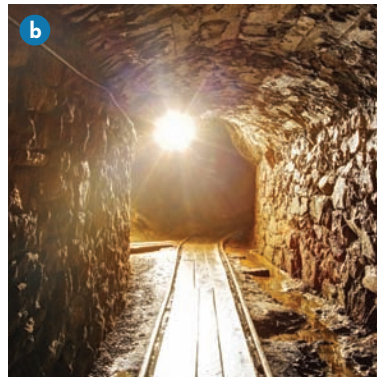
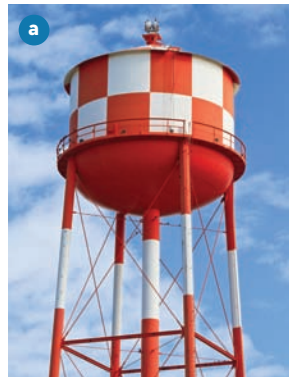
- is not designed or intended for human occupancy except for the purpose of performing work
- has restricted means of access and **egress** AND
- may become hazardous to a person entering it as a result of
  - its design, construction, location or atmosphere
  - the materials or substances in it
  - or any other conditions relating to it

A confined space does not necessarily mean a small enclosed space. It could be rather large such as a ship's hold, a large fuel tank, or a pit. Examples of confined spaces include:

- |           |                  |                                     |
|-----------|------------------|-------------------------------------|
| • bins    | • ditches        | • crawl spaces                      |
| • hoppers | • pipes          | • drop ceilings                     |
| • vats    | • pits           | • septic tanks                      |
| • boilers | • holds of ships | • underground utility tunnels/pipes |
| • silos   | • sewers         |                                     |
| • tunnels | • attics         |                                     |
| • tankers | • furnaces       |                                     |

Common work activities requiring confined space entry (CSE) include, but are not limited to:

- performing maintenance work
- conducting periodic cleaning of a vessel/space
- checking for blocked flow in the lines leading into a vessel/space
- completing electrical or water hook up
- performing a rescue of other workers in the confined space



**Figure 18-4** | What type of work might be related to each of these workspaces? What hazards might be associated with such work?

## QUICK CHECK

1. Describe what is meant by a confined space.
2. Identify three examples of confined spaces you see in your daily life.
3. Identify three jobs that deal regularly with confined spaces.

## Roles and Responsibilities in Confined Space Entry

It is the employer's responsibility to perform a survey or assessment in the workplace to determine whether it contains a confined space. This assessment is part of a confined space entry (CSE) program which provides direction to workers in how the employer will keep them safe and healthy while working in the confined space. Any employer who has identified confined spaces in the workplace should develop and implement a confined space entry program to prevent injuries and deaths.



### THINK ABOUT IT...

**How would you expect the roles and responsibilities in confined space entry to be similar to or different from those in other workspaces?**

All workplace parties have a role to play in working safely in confined spaces. If a confined space is present, the employer must ensure a worker does not enter until an assessment of the hazards specific to that confined space is completed. This assessment of the confined space will determine who will be involved in the CSE. At a minimum, a CSE team is made up of a CSE supervisor, attendant, entrant and CSE rescue team.

### EMPLOYER

The employer has responsibilities in CSE. The employer should:

- conduct a survey of the workplace to determine whether it contains a confined space
- develop a CSE program when confined spaces have been identified
- ensure workers do not enter any confined spaces until assessments have been completed for each space and signage has been posted
- ensure assessments are conducted by a person with adequate knowledge, training and experience in doing confined space assessments



### It's the Law...

OH&S Regulations state that anyone who works in a confined space must be trained by a WorkplaceNL approved CSE Certification Training Provider.

- put controls in place
- post a written CSE work permit
- write roles and responsibilities for the CSE team in doing their job in confined spaces
- train all workers in their assigned roles
- write safe work practices and procedures
- write rescue procedures for each confined space as part of the emergency preparedness and response plan
- provide the required tools, machinery, and equipment including PPE
- evaluate the CSE program every three years

## Really!?!

Statistics suggest that about 50% of deaths in confined spaces resulted from oxygen deficiency and that no atmospheric testing was done in those cases.

Source: HRSDC

Before and during the entry, after an interruption in work, and throughout the entry, the employer should also:

- isolate and de-energize all sources of energy
- complete and record atmospheric testing to determine if harmful vapours, gasses, fumes, mists, dusts or explosive substances exist
- complete and record the oxygen level to ensure it is between 20-22%
- ensure space is continuously ventilated, when appropriate
- remove any liquid or free-flowing solid that could drown or entrap a person
- erect barriers to prevent un-authorized persons from entering

## CSE SUPERVISOR

A supervisor is a person authorized or designated by an employer to exercise direction and control over workers of the employer. When working in confined spaces, the supervisor on-site may take the role of CSE supervisor or they may appoint another individual who is trained, competent and qualified to be the CSE supervisor. The CSE Supervisor is responsible for ensuring that:

- only competent and trained workers enter and work in the confined space
- the CSE team members are knowledgeable and trained in:
  - safe work practices and procedures
  - PPE and necessary equipment required to do the job in the space
  - control methods (e.g., lock-out/tag-out (LOTO), ventilation, etc.)
  - rescue procedures
- PPE is worn and used as it should be
- pre-use inspections of all equipment is completed and the equipment is working properly

- pre-entry atmospheric testing is done and safe levels are monitored and maintained
- the CSE work permit is completed and signed-off
- rescue procedures are in place and CSE team is trained
- only authorized people are allowed to enter or be near the confined space

## ATTENDANT

The **attendant** is the worker who is designated by the employer to remain outside each confined space to monitor the health and safety of the **entrants** (those inside the space). They may provide assistance to the entrants, but are never to enter the space. In addition, they must not leave the area until all entrants have left the space or another attendant is in place. The attendant's responsibilities in CSE include:

- knowledge of and training in:
  - the existing hazards and potential hazards of confined spaces
  - the proper use, inspection and limitations of equipment, including PPE and other control methods
  - recognizing signs and symptoms of illness, injuries and hazard exposures
  - the duties of an attendant
- verifying and maintaining communication with the entrant
- reviewing and understanding the CSE work permit
- keeping track of entrants by maintaining a log of names and times of those who enter and exit
- monitoring conditions or changes in the atmosphere, equipment, or environment that could harm the health and safety of entrants
- following the emergency preparedness and response plan and rescue procedures by
  - notifying the entrants of emergencies
  - activating the emergency response plan
  - assisting with or performing non-entry rescue
- preventing un-authorized people from entering the space

## ENTRANT

The entrants are the workers who are entering and working in the space. The entrant's responsibilities in CSE include:

- knowledge and training in:
  - the existing hazards and potential hazards of confined spaces
  - the proper use, inspection and limitations of equipment, including PPE and other control methods
  - the use and inspection of monitoring devices such as gas monitors

- the work procedures and the work activity to be performed in the space
- recognizing signs and symptoms of illness, injuries and hazard exposures
- reviewing and understanding the CSE work permit
- verifying and maintaining communication with the attendant
- staying out of a confined space that does not have a CSE work permit
- following rescue procedures by notifying the attendant of emergencies or changes in the atmosphere, and immediately leaving the confined space if unacceptable conditions occur or if directed by the attendant

## CSE RESCUE TEAM

The CSE rescue team is put together by the employer as part of the overall emergency preparedness and response program. The **CSE rescue team** responds, takes action, and coordinates the rescue of workers during a confined space emergency. The CSE rescue team's responsibilities in CSE include:

- knowledge of and training in:
  - the employer's CSE rescue plan
  - the CSE rescue and retrieval systems that will be used in the rescue
  - hazard recognition, elimination and other control methods
  - legislation specific to rescue and related OH&S Regulations and industry standards
  - any PPE that is used in rescue
  - existing and potential atmospheric conditions and what to do in immediately dangerous to life and health (IDLH) conditions
- taking control of the emergency response plan and activating rescue procedures
- rescuing entrants when they are not able to rescue themselves
- using retrieval systems to get the injured workers out of the space
- administering first aid
- participating in regular drills
- inspecting CSE rescue equipment according to manufacturer's specifications prior to each use

## QUICK CHECK

1. Describe the role of the attendant in confined space entry.
2. Describe the role of the CSE rescue team.
3. How do roles and responsibilities in confined space entry reflect the internal responsibility system discussed in chapter 2?



# Health and Safety Hazards of Confined Spaces

Every confined space poses different risks that would not be as hazardous if the work was being done in a regular work area. Confined spaces may pose both health and safety hazards. It is vital that all health and safety hazards are identified and controls are put in place to prevent serious incidents.



## THINK ABOUT IT...

**How might hazards related to confined spaces be unique compared with those in other workspaces?**

### HEALTH HAZARDS

#### Atmospheric Hazards

**Atmospheric hazards** impact air quality and can pose immediate threats to workers who are exposed. There are four types of atmospheric hazards including:

##### 1. Oxygen (O<sub>2</sub>) Deficiency

**Oxygen deficiency** means there is not enough oxygen in the air to support breathing. A worker is at risk of asphyxiation or suffocation due to low oxygen levels in the breathing air. An atmosphere is considered to be O<sub>2</sub> deficient when the levels of O<sub>2</sub> are less than 20%. Some natural processes or work activities reduce the levels of O<sub>2</sub>. Examples include:

- decaying or rotting of organic matter such as waste, leaves, and vegetables
- the presence of gases which displace O<sub>2</sub> such as propane or acetylene often used in welding
- materials in the space absorbing O<sub>2</sub> through chemical reactions such as rusting and burning

##### 2. Oxygen (O<sub>2</sub>) Enrichment

**Oxygen enrichment** means there is too much oxygen in the air. A confined space with too much O<sub>2</sub> can create explosive or **flammable** atmospheres. Sources of O<sub>2</sub> enrichment include:

- improper blanking of O<sub>2</sub> lines
- leaking fuel lines
- gas welding equipment
- ventilating with O<sub>2</sub> instead of ventilating with air

### Important

A space is always considered hazardous by workers until demonstrated to be otherwise.

### flammable

materials that catch fire easily, burn rapidly, and give off intense heat

**immediately dangerous to life and health (IDLH)**

the concentration of airborne contaminants that threatens harm to workers and is likely to cause death, acute or delayed health effects, or prevent escape from such an environment

**3. Explosive or Flammable Atmospheres**

Oxygen is an **oxidizing** material which means it initiates or promotes combustion in other materials, causing fire. The acceptable range for O<sub>2</sub> in an area is 20-22%. Explosions or fires can occur when three elements are present in the space:

- oxygen—especially at levels greater than 23%
- fuel—such as flammable liquids, gases, vapours, and combustible dusts
- an ignition source—from work processes such as welding, static electricity, chemical reactions, lighting, and sparks from tools and equipment

When working in flammable or explosive atmospheres, there are legislative requirements for employers and workers to follow. These can be found in Section 515 of the Occupational Health and Safety Regulations.

**4. Toxic Atmospheres**

**Toxic** refers to the ability of a substance to cause harmful acute or chronic health effects. Toxic atmospheres are often caused by chemical reactions, leaking toxic substances, and bacterial action or decay. Toxic substances can be in the form of gases, vapours and fumes.

Concentrations of toxic substances are measured in air with specialized equipment. They must be maintained at acceptable levels in accordance with threshold limit values (TLV) established by The American Conference of Governmental Industrial Hygienists (ACGIH). Some substances may become **immediately dangerous to life and health (IDLH)** if present at specific concentrations. It is critical that concentrations of toxic substances are measured and reviewed to determine safe levels for workers.



**Figure 18-5** Dust explosions may occur in grain silos. Dust can arise from activities such as transporting the grains and filling the silos.

**Chemical Hazards**

Atmospheric hazards are the result of oxygen deficiency/enrichment, flammable and explosive atmospheres, and toxic substances. Chemicals are one manner in which atmospheres inside and outside confined spaces become hazardous. Chemical hazards that are commonly found in confined spaces may include:

- solvents
- acids
- gases
- vapours
- smoke
- dusts
- fumes
- mists

Extra care and caution must be taken when working with any kind of chemical in confined spaces.



**Figure 18-6** | Without proper controls, coal dust can create explosions in enclosed areas.

### Physical Hazards

Physical hazards that may be found in confined spaces include:

- noise
- ionizing radiation from radioactive sources
- non-ionizing radiation from UV light given off by welding arc
- inadequate lighting
- vibrations from equipment and tools being used in the space
- extreme temperatures



**Figure 18-7** | What hazards must be controlled for this welder on board a ship?

### Biological Hazards

Biological hazards exist where living organisms and micro-organisms can cause adverse health effects in humans including fecal matter and sludge, viruses, bacteria, parasites, fungi, moulds, animals (e.g., insects and rodents), and sharp objects (e.g., needles).



In the past, canaries were carried in mines by miners to determine the levels of carbon monoxide (CO). Canaries react quickly to CO, and upon breathing it in, they would fall off their perches. This meant the deadly gas was present and they would immediately leave the mine. Miners now use gas monitors to allow them to measure the amount of toxic substances present.



## THINK ABOUT IT...

**What would be some musculoskeletal injuries that could occur when working in confined spaces?**

### Ergonomic Hazards

The shape of confined spaces and the restricted movement of workers can make work challenging from an ergonomic perspective. Awkward and fixed postures for long periods of time, repetition of work tasks, kneeling, bending, twisting, lifting and lowering/carrying of weight are some of the work positions and activities that workers find themselves in. This is due in part to:

- small entrances/exits
- low ceilings
- out-of-the-ordinary and physical obstacles
- sharp and pointy edges
- uneven floors, bases or surfaces
- long and narrow hallways or entries/exits
- vertical drops or rises
- sloped sections and work areas



**Figure 18-8** | How would these work situations pose ergonomic hazards for these workers: a) insulation installer b) geologist c) marine archaeologist exploring an underwater wreck.

## SAFETY HAZARDS

### Electrical Hazards

Electrical hazards are introduced into confined spaces through:

- lighting
- static electricity
- extension cords
- live wires
- sparking tools
- welding cables

Injuries occur through electrical shock, electrical arc, or as secondary injuries such as burns, internal injuries, etc.



## Energy Hazards

Energy hazards are introduced to workplaces through any tools, equipment and machinery that provide power for doing the work. Examples include rotating or moving equipment such as augers, drive shafts, agitators, motors and moving belts.

## Floor Surface Hazards

Workers are at risk for slips, trips, and falls if floor surfaces of confined spaces are slippery, sloped or uneven, or otherwise hazardous as a result of poor housekeeping and inadequate lighting.

## Entrapment/Engulfment Hazards

**Entrapment** refers to the potential for a person to become trapped or suffocated in a confined space due to the inside shape of the space. **Engulfment** occurs when liquids or solids free-flow through the space, enclosing workers and preventing their escape.

Entrapment and engulfment are serious safety hazards when working in confined spaces. Death may occur as the result of drowning or suffocation. Work activities/areas of higher risk include:

- storage bins with fine substances or liquids
- grain silos
- trenching and/or excavations
- salt sheds
- sewers/water pipes

## Visibility Hazards

Confined spaces may present challenges with visibility due to inadequate lighting. Layout and poor design of the confined space, and fog/mist due to work processes are some factors that lead to poor visibility. Lack of natural and/or artificial lighting may also contribute to poor visibility.

## Traffic Hazards

Moving vehicles, heavy equipment and pedestrians can be hazardous to workers in confined spaces, or especially when access/egress occurs in high traffic areas.

## Access and Egress Hazards

Access refers to the way a worker enters or goes into a confined space. Egress refers to the way a worker leaves or goes out of a confined space. Openings that are small and narrow are hard to get in and out of for workers. Carrying equipment such as a welding machine into the space can make access/egress even more challenging.



**Figure 18-9** | What unique hazards would be present for the workers involved in sanding our roads each winter?



**Figure 18-10** | What health and safety hazards would be related to workers who must access storm drains?

### Temperature Hazards

Surfaces (e.g., walls, ceiling, or pipes) of the confined space may be extremely hot resulting in burns if touched. Steam from work processes can also pose a safety hazard.

### Fall Hazards

Falls from heights or into openings of confined spaces pose a hazard for workers. Access and egress points are sometimes located at heights or they may have angled openings that pose a challenge. Work inside such a space requires the use of fall protection equipment.

### Other Safety Hazards

Confined spaces present unique conditions that can be impacted by:

- phobias
- fatigue
- medical conditions
- mental and physical state (e.g., impairment and intoxication)
- untrained rescuers

## QUICK CHECK

1. Identify three health hazards and describe how each applies to confined spaces.
2. Identify three safety hazards and describe how each applies to confined spaces.
3. Why might confined spaces pose challenges to those workers who have medical conditions?

## Health and Safety Control Measures

Once hazards have been identified in the confined space and risks assessed, the next step is to take precautions or put controls in place to keep workers safe while in that space. Remember to consider the hierarchy of controls as discussed in Chapter 5 when considering which controls to put in place. The following are some controls methods:

- education and training
- safe work practices and procedures
- signage
- atmospheric testing
- CSE work permit system
- cleaning



- **purging**—the introduction of a substance such as air, steam, water, or inert gas into a confined space to displace or remove contaminants to an acceptable atmospheric level
- **inerting**—a special type of purging and ventilation that introduces an inert (un-reactive) gas such as nitrogen into a confined space to displace oxygen and contaminants such as flammable gases, thus removing the hazard of explosion or fire
- isolation and de-energization
- **ventilation**—the process of continuously moving fresh air into a confined space in order to lower the levels of contaminants (e.g., gases, vapours, mist, fumes, or dust) below hazardous levels
- **shoring**—inserting supports for trench walls during trenching and excavation work activities to prevent their collapse and entrapping workers
- PPE and respiratory protection equipment
- lighting
- communication systems
- other energy controls (e.g., **non-sparking** and explosion-proof tools, ground fault circuit interrupters (GFCI), **grounded** and **double-insulated tools**)

#### **non-sparking**

tools that are commonly made with non-steel materials such as brass, copper, or bronze

#### **grounded**

an electrical plug that has three wire cords with a grounding conductor

#### **double-insulated tool**

the wire inside the tool or device is insulated

## QUICK CHECK

1. Categorize each of the control measures related to confined spaces according to the hierarchy of controls.
2. Identify three terms from the list of controls that were previously unfamiliar to you. Research to determine what they mean and identify a related example from a specific industry or workplace.

## Confined Space Rescue

Workers must not enter or remain in the confined space unless they are certain that an effective rescue can be carried out should something go wrong. A trained and equipped confined space entry (CSE) rescue team must be available to respond to an emergency in a confined space. This team may consist of company personnel, or it may be contracted to an outside agency. The team must be able to respond quickly and have knowledge of the potential hazards of the specific space.

Employers must develop emergency rescue procedures for work in and around confined spaces. Workers must be trained in these procedures which includes being able to immediately evacuate the confined space.



### Really!?!

Statistics show that up to 60% of confined space fatalities are not the initial victim but the rescuers who tried to save them.

## Colin LeGrow—Technical Rope & Rescue

Colin LeGrow is a highly trained rope rescue technician and an experienced instructor in a number of safety disciplines including confined space entry and rescue, fall protection, and high angle rescue. He is a SPRAT (Society of Professional Rope Access Technicians) Certified Level 3 Rope Access Supervisor. Specifically focusing on confined space and work-at-height challenges, he consults and trains across North America.

Colin owns and operates Technical Rope & Rescue Inc. (TRR). TRR offers applied safety and emergency response solutions for clients who are exposed to risky situations such as working at heights, entering confined spaces, and handling hazardous materials. TRR offers specialized safety training, emergency response, field safety services, and rope access solutions. The company is proud to have worked with some of the largest mining operations, fall protection equipment manufacturers, oil and gas producers, municipalities, and power generators in Canada.

### Colin, what sparked your interest in your chosen field of work?

When I was about 18, I joined the Rovers Ground Search & Rescue Team—a volunteer organization that assists the Royal Newfoundland Constabulary in locating missing persons. There, we started training in high angle rescue and helicopter rescue. I also had a passion for SCUBA diving, and worked at a scuba and outdoor adventure company straight out of high school.

I realized that the skills I was learning were transferrable into the industrial setting. In many ways, keeping ourselves safe while night diving on a ship wreck was not too unlike the requirements for helping workers stay safe inside confined spaces. Preventing a fall over a cliff during a hike or ground search was similar to preventing a fall while on the job. Work at the scuba/adventure company evolved into industry and the company began doing industrial rope access, a technique that allowed skilled trade employees to safely access work at height using ropes. During and after my university education, I continued learning about rescue, working at height and confined spaces. I started to thread together knowledge in emergency response/rescue, rope access/work at height, and scuba/confined space. Over time, that turned into a career with my own company, TRR, where I'm very thankful to now work with a full team of outstanding professionals with similar interests.

## What types of confined space entry environments have you encountered in NL?

Our team has completed work in many confined spaces such as penstocks and turbines at hydro power plants, barges, wind turbines, offshore oil production facilities, ships' cargo holds, storage tanks, and sewage treatment plants.

## Do any of your confined space entry experiences stand out to you as being particularly challenging?

Every confined space experience is a new one and carries its own unique challenges. Even if it is the same confined space there may be new hazards presented based on the work being conducted. It is very important to complete a pre-job hazard assessment prior to starting any confined space work.

When I first entered the field I did find it challenging to address my concerns with some supervisors. I was the new guy—sometimes people listened and sometimes they didn't. There were also times I knew job safety could be better but lacked the means to do anything about it. I worked with a lot of fantastic people, but changing their minds on safety concerns as a young person entering the industry was certainly my biggest challenge. Thankfully things have gotten a lot better. I would suggest that young people speak up and offer new perspectives and senior staff should always listen to young workers for feedback. Experience is valuable and so are new ideas on how to do a job safely.

## What message would members of your rescue teams share with the general public regarding hazards connected to confined space entry?

Every confined space job is unique; every confined space has a different set of hazards. Some of the main hazards include a low oxygen atmosphere, the previous contents of the space, potential for entrapment, and potential for moving machinery. Complete a thorough hazard assessment prior to entering a confined space, make sure you are protected sufficiently from those hazards prior to entry, make sure you have your own way out and trained responders are available to assist you out in case of an emergency.



**Figure 18-11** | Says Colin, “Confined space work may have the potential to kill you—you must make sure it doesn’t.”



**Figure 18-12** | Workers should never enter a confined space to retrieve a victim unless they are properly fitted with the necessary equipment AND are a trained member of the rescue team.

An employer is required to conduct an emergency plan risk assessment and write rescue and evacuation procedures when workers are working in confined spaces or where there is a risk of entrapment.

The CSE rescue plan will address the following:

- roles and responsibilities of the CSE rescue team
- methods of communication
- first aid and medical equipment
- emergency rescue options and rescue procedures
- schedules for mock-drills and practice

The four types of rescue are:

1. Self-rescue—the entrant is physically and mentally able to rescue themselves unassisted.
2. External rescue—the external rescuer uses an external retrieval system to rescue the entrant.
3. Entry rescue—the entrant is not able to self-rescue and an external rescue is not possible so the rescuer enters the confined space to remove the entrant.
4. IDLH entry rescue—the entrant is exposed to dangerous atmospheres or conditions and has to be removed as soon as safely possible.

When workers are entering confined spaces in which a harmful atmosphere exists, the potential for the atmosphere to become hazardous exists or there is a risk of entrapment, the employer must ensure the following:

- workers are wearing the appropriate retrieval equipment that keeps them in a position to be rescued
- lifelines are attached to the retrieval equipment which is tended to at all times by a person who is equipped and capable of doing a rescue

## QUICK CHECK

1. Why is a rescue plan such a critical element related to confined space entry?
2. Identify the five key components of a confined space rescue plan.
3. How would hazards related to a specific confined space impact a rescue plan?

 **SPREAD THE WORD**

Recall your list of confined spaces found throughout local communities. Young children often share a sense of adventure exploring their local communities. Unusual or unfamiliar sites such as those you identified often catch their interest which can put them at risk of serious incidents.

As a class, create a public safety campaign that can be shared with your local elementary school classes. You might consider a series of posters that can be displayed in classrooms or corridors, a series of audio messages that can be played during morning announcements, or a series of skits/plays that can be presented during an assembly.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 299). After reading this chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Working in a small group, select an industry of interest where confined space entry would be involved. Research and present your findings including:

1. A description of the industry and why confined space entry is involved
2. The health and safety hazards specific to your example
3. The controls that have been established to protect workers
4. Any incidents that have required confined space rescue

 **DIG DEEPER**

Research an individual with first-hand experience in confined space entry. It could be an employer, someone who has been an attendant or entrant, or someone who specializes in confine space rescue. Conduct an electronic or in-person interview to identify how this person came to work in this field, the hazards he or she contends with, and any messages he or she would share with the class regarding working in this field.

# Hearing Conservation

We are exposed, on a daily basis, to a variety of sounds and noises that have the potential to damage our hearing. Chronic exposure to high levels of noise can damage the delicate structures inside the ear. This process is gradual and often goes undetected until significant hearing loss has occurred.

Noise in the workplace is a potential hazard in many occupations and industries, particularly in construction, fish harvesting, manufacturing, and forestry. Every year workers are diagnosed with noise-induced hearing loss that may have developed gradually over time, or as the result of loud impact or impulsive noise.

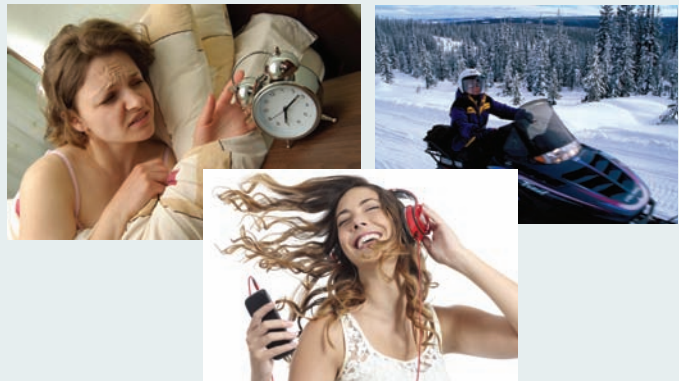
## LEARNING GOALS

This chapter will enable you to:

- examine specific hazards associated with noise
- discuss the signs and symptoms of hearing loss
- investigate factors that affect the degree of hearing loss
- explore the employer's responsibilities regarding hearing conservation in the workplace
- list the components of a hearing conservation program
- describe how noise assessments are carried out
- examine several noise control strategies

## SPREAD THE WORD

How much noise is too much noise? What noises do you hear in the course of a day? In the course of a week?



In small groups, brainstorm a list of frequently heard noises. Create a chart that categorizes them in terms of loudness (too loud, really loud, not so loud) and frequency (hourly, daily, weekly). What observations or conclusions might you draw as a result of your findings?



## WHAT WOULD YOU DO?

Ryan just signed on as an apprentice carpenter working with a construction crew on a new housing development. He is kept busy on the job site assisting where necessary with the build. Some days he feels that it's hard to keep up with the team and that he is always rushing around.

On this particular morning, Ryan is on his way across the job site to pick up some supplies. He passes by George who is using a circular saw to cut lumber for decks. George calls Ryan to give him a hand holding the lumber, so he can speed up the cutting process. Ryan pauses for moment...he is wearing his hard hat and work boots but has left his ear plugs back in the truck. But, then again, George is not wearing his ear plugs.

**What would YOU do?**



**Figure 19-1** | What hazard controls are utilized in this scene? Is anything missing?

## CHAPTER CHALLENGE PREVIEW

According to the U.S. Environmental Protection Agency, the following are some of the loudest professions exposing workers to hazardous noise levels at work:

1. Firefighters
2. Military personnel
3. Disc jockeys
4. Subway workers
5. Construction workers
6. Musicians
7. Farm workers
8. Industrial arts teachers
9. Highway workers
10. Computer operators
11. Landscapers
12. Factory workers
13. Cab, truck and bus operators

Do any professions on the list surprise you? Do you think the same results would be found in Canada? Would noise hazards impact your choice of career?

Noise may negatively affect pregnant workers, increasing stress on both the mother and baby.

Excessive noise may also potentially impair the unborn baby's hearing.

Source: Laurentian University

## Noise Hazards and Health Effects

Actions such as hammering, clapping your hands, or playing an instrument, cause disturbance of the surrounding air. This disturbance or sound energy is transmitted in the form of waves through the air until it reaches the eardrum and the sensation of **sound** is produced.

**Noise** is defined as any unwanted sound. It may impact a worker's health as well as a worker's safety. For example, if workers are not able to hear warning alarms, devices, or signals, or are not able to communicate with co-workers, the risk of an incident occurring may increase.

The most obvious health risk related to noise hazards is loss of hearing, which is permanent, irreversible, and will continue to worsen if the worker remains exposed to noise without appropriate controls. Noise may also lead to **tinnitus**—a ringing, clicking, hissing, buzzing, or roaring in the ears. Tinnitus may be in one ear or both; it may be continuous, intermittent, loud, or soft, and it may change from time to time.

However, there are also non-auditory health effects that may develop. For example, exposure to high noise levels may increase blood pressure and cause a disruption to sleep schedules. Finally, the social and emotional implications of hearing loss are numerous. Hearing loss may result in restrictions in social activities, the inability to communicate with family and friends, difficulty being in a crowded room such as at a restaurant, listening to music, or attending a live concert. These social and emotional impacts can lead to increased frustration and a feeling of isolation.

### NOISE-INDUCED HEARING LOSS

The onset of hearing damage due to noise happens so slowly that most people are not aware they are losing their hearing. Hearing loss usually occurs before most people notice there is a problem. This is unfortunate because **noise-induced hearing loss** is preventable if controls are implemented when noise is recognized.

There are warning signs that hearing loss has occurred:

- trouble understanding what others are saying, especially in a crowded room
- speech or other sounds are muffled
- loud ringing in the ears
- difficulty hearing soft sounds such as the ticking of a watch
- difficulty hearing high-pitched sounds
- other people complaining about the volume of the TV or radio

#### noise-induced hearing loss

a permanent hearing impairment resulting from prolonged exposure to high levels of noise

## FACTORS AFFECTING THE DEGREE OF HEARING LOSS

A number of factors should be considered in determining how much hearing loss may occur:

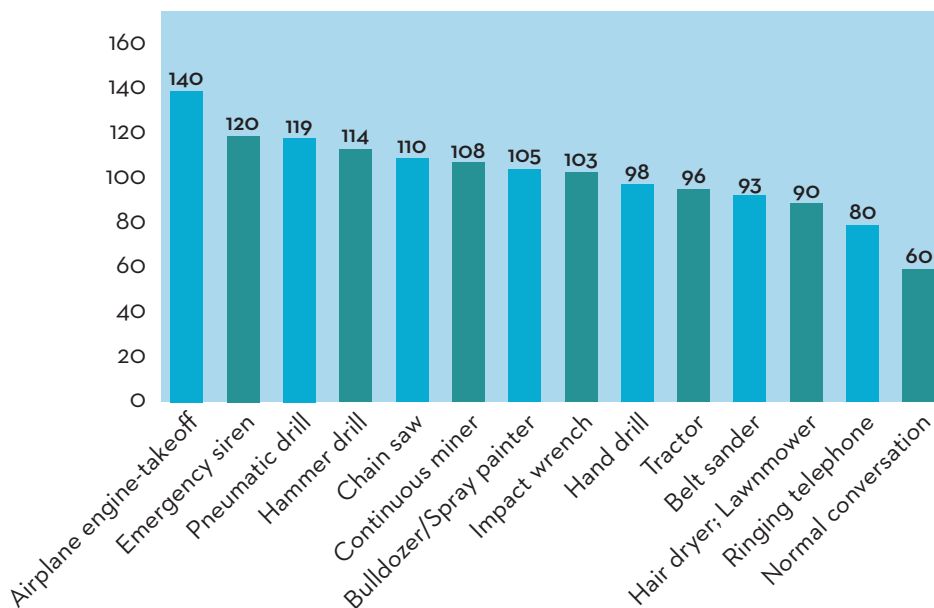
- intensity of the noise (loudness)
- type of noise (high or low frequency)
- duration of exposure each day (worker's schedule per day)
- the total work duration (years of employment)

Not all people respond to noise in the same way and it can affect people's hearing differently. When determining how much noise is too much, it is necessary to take noise measurements. The unit for measuring the loudness of sound is called the **decibel** (dB). The following are some points of reference:

- The **threshold of hearing** is the sound level at which the human ear can first detect the sensation of sound. 0dB is the softest sound that a person with normal hearing can detect.
- The threshold limit value (in accordance with the ACGIH in 2015) for noise is 85dB. This means the average healthy adult can be exposed to levels less than 85dB for an average of eight hours per day, 40 hours per week without experiencing any health effects. However, this is only a guideline. There may be some workers who are exposed to less than 85dB but may experience hearing loss.
- The **threshold of pain** is the sound level where the first signs of pain are experienced. This level is usually between 120—130 dB, however, tolerance among individuals may vary.



As a general rule, if you are not able to speak to another person an arm's length away (approximately one metre) without raising your voice, noise may be an issue.



**Figure 19-2** Selected noises measured in decibels.

(Source: WorkSafeBC)



**Figure 19-3** | How might a busy airport pose noise hazards for workers AND visitors?

Consider other factors that may affect the degree of hearing loss such as:

- individual susceptibility
- the age of the worker
- previous hearing loss/ear disease
- the environment in which the noise is produced (e.g., the surroundings have sound absorbent or reflective characteristics)
- the distance from the source
- the position of the ear relative to the source of the sound energy
- effectiveness of personal protective equipment

Exposure to noise outside of the workplace may also contribute to noise-induced hearing loss. Many social activities and hobbies involve exposure to noise such as listening to or playing music, hunting, or using a chainsaw.



### THINK ABOUT IT...

**What impact, if any, do you think using personal music devices has on our hearing?**



**Figure 19-4** | WorkSafeBC reports that band teachers may have a daily exposure of 90dB and physical education teachers may have a daily exposure of 87dB. Does either surprise you? Why or why not?

## QUICK CHECK

1. How does noise-induced hearing loss differ from other types of hearing loss?
2. What signs/symptoms might lead you to suspect someone is suffering from hearing loss?
3. What factors affect the degree of hearing loss?

## Evaluation of Noise Levels

It is the employer's responsibility to recognize noise as a potential health hazard and determine which workers may be over-exposed. The Occupational Health and Safety Regulations and the ACGIH (2015) specify the requirements for the permissible level for noise:

- daily average exposure for an 8 hour work shift, 40 hour work week must not exceed 85 decibels (dB)
- if the work shift is longer than 8 hours, the exposure limit must be adequately adjusted
- no exposure above 140dB is permitted

In order to determine if noise is a potential issue in the workplace, a noise assessment must be conducted. Noise assessments may be conducted in-house if there are adequately trained, knowledgeable and competent personnel on site, or through the use of a private consultant who can measure the noise levels.

### NOISE ASSESSMENTS

There are various types of assessments that may be conducted in workplaces. Normally a preliminary noise survey is conducted to determine if noise is a potential issue throughout the workplace. Sometimes, noise may just be an issue in one area of the workplace. Following a preliminary noise survey, a more in-depth noise assessment may be conducted. This detailed survey would identify all workers who may be over-exposed to noise.

#### Preliminary Noise Survey

The **preliminary noise survey** has many benefits and is usually the first type of noise assessment that is conducted. This survey identifies areas where potential noise problems exist and provides a noise map of the workplace. Preliminary noise surveys are conducted:

- when workers experience ringing in the ears or have difficulty hearing speech after being exposed to high noise levels during their work-shift



#### It's the Law...

The OH&S laws of every province and territory require employers to protect workers from exposure to excessive noise in the workplace.



- where it is difficult to communicate in normal conversation
- to determine the effectiveness of noise control measures
- when it is recognized other similar workplaces have a noise issue

### Detailed Noise Survey

**Detailed noise surveys** are conducted in locations where the preliminary study indicates high noise levels exist and workers are potentially over-exposed to noise. The purpose of a detailed noise survey is to:

- obtain specific information on the noise levels at each worker's work station
- determine a worker's full shift average exposure
- determine workers' risk of developing noise-induced health effects
- develop guidelines for establishing engineering or administrative controls
- define areas where hearing protection will be required if noise cannot be reduced by other means

During a detailed noise survey, information must be obtained on the following:

- noise levels in each work area
- source of the noise (equipment or process)
- how many workers are exposed
- duration of exposure
- controls that are currently in place (e.g., engineering, administrative and PPE)

## SOUND MEASURING INSTRUMENTS

The noise measurements should be representative of the worker's exposure and the noise survey should also represent a typical day at the work site. This will ensure that judgments consider the worker's risk of developing noise-related diseases and ensure the appropriate controls are implemented. Consideration should be given to the sampling plan before conducting the noise assessment to ensure it is effective and good reliable results can be obtained.

Noise/sound measurements may be taken in two ways:

- instantaneous or spot measurements identify the areas where noise may be a concern
- full-shift noise dosimetry measures the worker's personal noise exposure during the entire shift

Recall from Chapter 10 that two instruments used to measure sound/noise are the sound level meter and a noise dosimeter. The sound level



meter is a basic instrument used to measure sound levels. It can be fixed in one location or hand-held. A noise dosimeter records the noise levels to which the worker is exposed during the work-shift and provides a calculation of the worker's average daily noise exposure.

## QUICK CHECK

1. Identify two different noise assessments and when each would be used.
2. What are instantaneous noise measurements?
3. Identify two different sound measuring instruments and how they would be used.

## Noise Control Strategies

As you learned in Chapter 5, there are various ways to control hazards in the workplace. The first step should be to attempt to reduce the noise levels below the acceptable limits or try to eliminate the noise exposure. However, this may not always be possible.

When it is not possible to eliminate noise other controls must be considered. The hierarchy of controls is the place to start.

1. Engineering controls
  - isolate the noise (e.g., build an enclosure around noise generating equipment)
  - use sound barriers
  - use damping techniques, install materials to absorb the noise, or insulate rooms
  - purchase tools and machinery that generate lower noise levels
  - operate equipment at a lower speed and try to reduce vibration
  - perform regular maintenance on tools and equipment (e.g., balance rotating parts that can produce higher noise levels when not maintained)
  - increase the distance between the noise source and the worker
2. Administrative controls
  - adjust workers' schedules to minimize exposure to noise (e.g., include rotation of workers or limit the time workers spend in the noisy environment)
  - schedule machine-operating times when a minimum number of workers are present
  - develop a written hearing conservation program including audiometric testing of workers

Custom earplugs for musicians have a special filter that lets the listener hear music at a safe level without sacrificing quality. Instead of cutting out the high frequencies, musician's plugs attenuate all the frequencies evenly in relation to his or her hearing.

### 3. Personal protective equipment (PPE)

- only to be used as a last resort after other controls have been considered
- signage must be posted stating a noise hazard exists and PPE is required
- examples include earplugs, earmuffs, and custom moulded earplugs
- may be used in conjunction with other controls to reduce the noise exposure
- may sometimes be used as a temporary measure until more permanent solutions are implemented

## QUICK CHECK

1. Identify three workplaces where you would expect noise hazards to be an issue. What controls would you implement in these workplaces?
2. Considering the hierarchy of controls, what can you do within your school environment to protect yourself from noise hazards?

## Hearing Conservation Programs

A **hearing conservation program** is a written document that aims to protect workers from the negative health effects of noise exposure. If noise has been identified as exceeding the permissible level, the employer must develop a program to address workers' protection from noise exposure.

An effective hearing conservation program contains the following as a minimum requirement:

- noise survey of the workplace
- noise controls including elimination, substitution, engineering and administrative controls, and PPE
- selection, use, care and maintenance of PPE
- education and training for all workers who are overexposed to noise
- annual hearing testing for overexposed workers
- program evaluation conducted on a regular basis

## EDUCATION AND TRAINING

All workers who are over-exposed to noise should receive education and training to ensure they are aware of the hearing conservation program, the health hazards related to noise, the noise levels in the workplace and the controls that are implemented to protect their hearing. If PPE is used, workers must receive education and training on the selection, fitting, use, care and maintenance of the hearing protection. Such education and training is normally conducted at the same time as the annual hearing testing. It is also important that the OH&S committee/WH&S representative/ WH&S designate participate in this training since they are involved with promotion of the hearing conservation program.

All workers who are over-exposed to noise must have their hearing tested on an annual basis or as recommended by an audiologist or occupational physician. A hearing test must be completed within three months of employment in a job where a worker is exposed to noise above the permissible levels. The benefit of regular hearing testing is that any hearing loss can be detected early and actions can be taken to prevent further hearing damage.

Good record keeping is an important part of the hearing conservation program. Noise exposure measurements must be kept for a specified period of time, and records of audiometric test results must be maintained for the duration of the worker's employment. Since workers may change jobs throughout their working career, it is beneficial for workers to keep a record of their noise exposure. When leaving a job, a worker may request a record of noise exposure during their time of employment.

## QUICK CHECK

1. List the components of a hearing conservation program.
2. Who, other than the employer, would participate in the development of a hearing conservation program?



**Figure 19-5** | Kathy Peck, Executive Director and Co-founder of H.E.A.R.

## H.E.A.R.—HEARING EDUCATION AND AWARENESS FOR ROCKERS

It's no secret that today's society exposes us all to a lot of noise. Exposure to excessively loud levels of noise can't always be avoided, but we can do things to prevent damage to our ears. Recent studies have shown an increased incidence of hearing loss among grade school students and musicians.

**H.E.A.R. Hearing Education and Awareness for Rockers** is a non-profit organization dedicated to raising awareness of the real dangers of repeated exposure to excessive noise levels from music which can lead to permanent, and sometimes debilitating, hearing loss and tinnitus. Damage from loud sound can occur from playing music, attending concerts, dance clubs, using stereo earphones, playing amplified systems too loudly, or other noisy activities. Through education awareness and grassroots outreach advocacy, H.E.A.R. supports musicians, DJs, sound engineers, music fans (especially teens) and anyone needing help with their hearing.

H.E.A.R. co-founder, Kathy Peck, is a former bass player and singer for the San Francisco rock band The Contractions. Kathy suffered hearing damage while playing a set at the Oakland Coliseum in 1984. Repeated exposure to excessive noise caused a ringing sensation in her ears called tinnitus, and decreased her ability to hear. Though a professional and personal setback, the injury provided the incentive for Kathy to throw her energies in a new direction. Kathy joined forces with physician Flash Gordon and launched H.E.A.R. in 1988. In 1989, founding donor Pete Townshend of the Who helped H.E.A.R. to launch the first music hearing conservation campaigns in worldwide media.

H.E.A.R. continues to be recognized around the world for its efforts to educate the public on the dangers of excessive noise, and to provide hearing protection for musicians and music fans. As a voice of concern between music and medical communities, H.E.A.R. is determined to make its message heard. Public service announcements, "Listen Smart" programs for students and educators, and "Save Your Ears for Music," are just several of their campaigns to promote awareness of hearing damage.

H.E.A.R. wants you to enjoy the music for a long, long time. Research their website to learn more about their work.

 **SPREAD THE WORD**

Create a noise hazard alert infographic.

1. Return to the list of frequently heard noises you generated at the beginning of the chapter. Research approximate decibel levels associated with each noise and add this information to your chart.
2. Colour code each noise (red = hazardous, yellow = potentially hazardous, green = not hazardous) according to the risk you feel it might pose to your hearing.
3. Identify controls you could put in place for any items that are hazardous or potentially hazardous.

Complete your infographic with additional information, statistics or images that would enhance this message of safety.

 **WHAT WOULD YOU DO NOW?**

Review the **What Would YOU Do?** feature at the beginning of the chapter (page 317). After reading the chapter, would your answer change? Why or why not?

 **CHAPTER CHALLENGE**

Your challenge is to contribute to a class list of industry noise profiles. Decide, as a class, the format of your profiles—print, visual, electronic. Individually or in small groups:

1. Select one of the industries identified at the beginning of the chapter as having high risk of exposure to hazardous noise levels.
2. Research to identify the
  - sources of noise to which workers would be exposed
  - level of noise to which workers would be exposed
  - duration of exposure
  - controls that are currently in place
3. Present your findings to the rest of the class.

 **DIG DEEPER**

Research H.E.A.R. to learn more about their work. Evaluate the effectiveness of their awareness strategies as related to young music fans. What else might they do to raise awareness about hearing loss prevention?

# Outdoor Safety

Whether at work or play, staying safe in the outdoors requires specific knowledge and skills including specialized safety procedures. Weather and wind patterns, uneven and rocky terrain, unexpected injuries, and equipment failure can change a beautiful day in the outdoors into a critical situation that requires quick thinking and skill.

Many occupations in Newfoundland and Labrador require working in the outdoors—some in isolation or in the wilderness without immediate assistance to emergency services. Working on or above water, whether frozen or not, is a common occurrence for workers such as fish harvesters, fishery officers, ferry workers, and bridge construction crews. Working outdoors on the land is a common occurrence for workers such as surveyors, geologists, and park wardens.

## LEARNING GOALS

This chapter will enable you to:

- examine the hazards of outdoor activities
- explore various methods for controlling hazards during outdoor activities
- examine safety issues related to water safety, boating safety, ice safety, and all-terrain vehicle safety

## SPREAD THE WORD

“ATV—It’s Not Child’s Play” is a tag line for an ATV Safety campaign by Service NL, developed in consultation and cooperation with the Royal Canadian Mounted Police and the Royal Newfoundland Constabulary.

What do you think is the message behind the tag line? Why do you think it was chosen?

Research the campaign on the Service NL website. Evaluate its overall effectiveness for a youth audience.



## WHAT WOULD YOU DO?

Henry is spending his winter break visiting family on the northeast coast. He enjoys winter camping with his cousins and traveling everywhere on the snowmobile he keeps at their place.

He arrives late Friday afternoon in time to see his cousins preparing to head out for an evening ride. They encourage him to drop his bags and go with them. He objects, saying that he needs to unpack his gear and check out his machine again. After all, he hasn't ridden it in a year!

"Don't worry about it," they say, "that jacket will be warm enough. It's not that cold and we won't be out late. You likely still have enough gas from last year and between all of the machines we have enough to get out and back."

Henry is still unsure. It will soon be dark. He is also tired and hungry from his trip.

**What would YOU do?**



**Figure 20-1** | What unique safety hazards would apply to snowmobiling?

## CHAPTER CHALLENGE PREVIEW

Identify five jobs that require workers to spend significant amounts of time in the outdoors. Select one job from your list. What elements of that job might be a) gratifying and b) challenging? What special training do you think is required for the job?

## Outdoor Health and Safety Hazards

There are many health and safety hazards associated with working outdoors. Before outdoor work activities begin, employers are required to conduct assessments to recognize hazards and plan for their elimination or minimization. Employers are required to notify workers of hazards they may face while working outdoors. In addition, they must provide and ensure that workers use equipment, tools, devices, and machinery in the manner in which they were instructed. Safe work practices and procedures and emergency response plans developed by the employer are two control measures that may be put in place.

Planning outdoor activities for pleasure should be no different than planning for work outdoors. The first step is to be prepared. Making a trip plan, being properly trained, and taking the essentials are three key elements. Knowing your body's physical limits to ensure you do not become fatigued and exhausted is also very important to keep yourself safe in the outdoors.

### OUTDOOR HEALTH AND SAFETY HAZARDS

General health hazards associated with working outdoors include:

- chemical hazards associated with fluids and gasoline for tools, equipment and machinery
- biological hazards such as insects, bacteria, fungi, parasites, animal bites, and unsafe drinking water
- physical hazards such as noise, temperature extremes, radiation from the sun, vibration, and pressure from tool and equipment usage
- ergonomic hazards from prolonged and awkward postures in work activities
- **woods shock** (i.e., psychological distress associated with being lost)
- emergencies arising from medical conditions such as diabetes or heart disease

General safety hazards associated with working outdoors include:

- energy hazards associated with tools, machinery, and equipment
- handling, moving, and storing materials and supplies on-site
- uneven terrain, drops, and holes in the ground
- wind, rain, and snow creating slip and fall incidents
- extreme weather such as blizzards, hurricanes, and lightning
- wildlife
- forest fires and the use of ignition sources

## CONTROL MEASURES

Proper trip planning, knowledge of and training in safe practices and procedures, and having the right equipment on hand all serve as control measures to minimize the risk of incidents resulting from work or play in the outdoors.

If travel is involved in outdoor work or recreation, trip planning is critical. Leave the trip plan with a responsible adult or your employer and ensure they understand the contents and their responsibilities in the plan. The following measures can mitigate the risks resulting from outdoor hazards:

- avoid travelling alone—use the buddy system
- plan your route—use a trip plan
- let people know where you are going, who you are going with, and when you expect to return
- become knowledgeable about the terrain and environment
- check the weather forecast and keep in mind that weather, wind, and temperature can change quickly
- choose proper clothing and footwear to suit the terrain and weather

Obtain proper training to gain the knowledge and skills required to stay safe in the outdoor environment:

- learn to recognize and avoid poisonous plants such as stinging nettle, wild calla, giant hogweed, and cow parsnip
- complete first aid training
- know what to do in the event of an emergency in the particular area you will be working or exploring
- have emergency and first aid supplies on-hand
- check all equipment before you leave—make sure it is working properly and you know how to use it



**Figure 20-2** | Always confirm cellular service and satellite coverage—some areas have pockets of no service due to physical obstacles.



**Figure 20-3** | Giant hogweed is a relatively new and invasive plant species across Canada including Newfoundland and Labrador. The clear sap from its stem and leaves can burn skin causing blisters and scarring.



Cotton clothing is fine in hot/dry weather, but wool is best in wet/cool weather. When cotton jeans become soaked, they actually speed up the loss of body heat.

Finally, take the essentials identified in the trip plan and know how to use all the equipment associated with outdoor activities. The essentials include:

- a flashlight, spare batteries, and bulb
- a fire making kit—waterproof matches or lighter, fire starter, or candle
- a signaling device—a whistle for use anytime and/or a mirror for use on sunny days
- extra food and water—1 litre of water per person is recommended
- extra clothing—rain and wind protection, a hat, or handkerchief which can be used as a hat, sling, or bandage
- navigation and communication aids—maps, compass, GPS, charts, cellular phone, satellite phone, hand-held radio with a fully charged battery
- a first aid kit
- an emergency shelter—orange tarp or blanket that can also be used as a signaling device
- a pocket knife
- sun protection—glasses, sunscreen, and hat



**Figure 20-4** | The black bear population in Newfoundland and Labrador is estimated to be around 6000 to 10 000 bears.

### Bear Safety

Black bears are native to Newfoundland and Labrador. They are found throughout the province. Black bears in the wild are usually most active around dawn and dusk.

Before venturing into bear country, learn everything you can about bears to avoid encounters. Black bears have a natural fear of people except when they feel threatened or sense food. The best strategy is to avoid encounters. Stay away from all bears, especially a mother and her cubs. Adopting the following safety precautions can further prevent dangerous encounters.

While traveling:

- make noise as you walk in the bush to advertise your presence
- avoid wearing scented products such as deodorants or cosmetics
- learn to recognize and avoid bear signs (e.g., tracks, scat, diggings, bear habitat)



At your campsite:

- never store food in a tent
- do not cook or eat in or near a tent (even clothes worn while cooking will absorb food odours and should be changed and stored away from tents)
- store and carry food and garbage in air tight containers (special bear-resistant canisters are available)
- do not bury garbage
- hang food packs and toothpaste out of reach of bears—four metres from the ground and at least two metres away from the trunk if using a tree

If you do encounter a bear, freeze and don't look at it. Talk in a quiet, calm, monotone voice. If the bear doesn't leave, continue to talk quietly and slowly back away, avoiding abrupt movements and eye contact.

## BASIC RULES OF SURVIVAL

If you find yourself lost in the woods, there are a number of measures you can take to increase your chance of survival. The following covers only the basics of outdoor survival. Ensure to get additional education and training specific to the activity you are participating in, including responding to emergencies.

1. Don't panic. Fear is a natural reaction, but it must be controlled. Accept the reality of your situation and concentrate on how to put yourself in a better position. Do something positive to give yourself the confidence necessary for survival.
2. Avoid fatigue. Slow down. Exertion uses up calories and creates perspiration which, in turn, will make you more susceptible to hypothermia.
3. Stay where you are. Find a tree and stay put. The best tree to choose is an evergreen with branches to provide shelter and protection from wind and adverse weather.
4. Shelter can be found in caves and fallen trees. If possible, stay visible so searchers can find you. Stay warm and dry. Use brush or green tree branches to block wind and repel water. If there is snow, build a snow shelter.



### Really!?!

“Footprint” members of your party before you leave for a trip. Place a sheet of tinfoil on soft material (towel) and each person should step, with shoes on, on the tinfoil. Name the footprints. This will help searchers track you, should you become lost.

**Figure 20-5** | Tree branches can be used to give warmth and shelter.

## Really!?!

The universal sign for help is a “pattern of three” for whatever you are choosing to use for signaling. For example:

- three whistle blasts
- three shouts
- three fires

5. Use your whistle. Three blasts of your whistle indicates a distress call. Avoid yelling as it depletes your energy. Mirrors, knives, watches, and sunglasses may be used to make reflections that can be seen by overhead aircraft. These techniques require practical knowledge so practice at home to create reflections on nearby objects.
6. Answer the calls of searchers when they yell for you.
7. Water is more important than food for survival. Dehydration can cause fatigue and hypothermia. Ensure to keep extra water with you. Water from lakes, streams, plants, and melted snow or ice should be purified either by boiling for two minutes or using a purification drop or tablet.
8. Fire is one of the best survival tools. It keeps you warm, dries clothes, and signals for help. Matches should be kept in a waterproof container. Fires can also be started with a glass bottle bottom, non-plastic eyeglasses, or a camera lens.

## QUICK CHECK

1. Identify three jobs that require outdoor work in remote areas.
  - a) For each job, identify three health or safety hazards that might be present in this field.
  - b) For each hazard, identify three related control measures.
2. Research one example of a poisonous plant found in Newfoundland and Labrador.
  - a) Where might it be found?
  - b) How can it be identified?
  - c) What are the implications of coming into contact with this plant?

## Really!?!

The highest rate of drowning water-related deaths are associated with people 18-24 years of age. 90% of these are males.

Source: Lifesaving Society

## Water Safety

Every year in Canada, people at both work and at play drown due to the hazards associated with water. According to the Lifesaving Society, drowning is the third leading cause of accidental death in Canada for people 60 years of age and under.

Occupational Health and Safety (OH&S) legislation requires employers to apply the following measures for workers who work on or above water:

- conduct a risk assessment to identify and control hazards
- create an emergency response plan
- provide a fall protection system when work is three metres or more above open water



- provide lower limit travel devices for swing stages to keep them at a safe distance from the water
- provide life jackets or personal flotation devices when there is a risk of drowning

In addition to the above, OH&S Regulations specify additional measures for diving operations.

## STAYING SAFE IN AND AROUND WATER

Staying safe in and around water happens in three stages:

1. Prepare—in advance, for your water experience
2. Stay Safe—by following safety procedures during your water activity
3. Survive—know what to do to ensure the safety and survival of yourself and others if something goes wrong

Personal factors, equipment, and the environment all have a role to play in each stage, as outlined in Figures 20-7, 20-8, and 20-9.



**Figure 20-6** | What hazard controls are in place on this offshore drilling rig?

### Prepare

Personal Factors	<ul style="list-style-type: none"> <li>• Become well informed about water safety and the activity that is taking place in the water such as swimming, boating, canoeing, and waterskiing.</li> <li>• Learn about cold water shock and hypothermia and how to avoid them. Know swimming limitations and capabilities. Prepare a plan in case there is a water emergency.</li> <li>• Know when and where it is safe to dive.</li> <li>• Bring drinking water to avoid dehydration.</li> </ul>
Equipment Factors	<ul style="list-style-type: none"> <li>• Boating equipment should be in good repair and working properly.</li> <li>• Pools should have telephone access and lifesaving equipment.</li> <li>• Have first aid kits and an Automated External Defibrillator (AED) on site, where possible, and know how to administer its use.</li> <li>• Dress appropriately and wear sun protection.</li> </ul>
Environmental Factors	<ul style="list-style-type: none"> <li>• Avoid swimming in open water with strong currents.</li> <li>• Before entering, check the depth of the water.</li> <li>• Watch for inclement weather.</li> <li>• Know local water hazards.</li> <li>• In winter, obtain ice safety reports.</li> </ul>

**Figure 20-7** | Factors related to effective preparation for being in or around water.

## Stay Safe

Personal Factors	<ul style="list-style-type: none"><li>• Use the buddy system.</li><li>• Refrain from using alcohol and drugs while in or around water.</li><li>• If you do not know the depth of the water, enter feet first.</li></ul>
Equipment Factors	<ul style="list-style-type: none"><li>• Ensure safety equipment is in good repair and ready to use.</li><li>• Wear a life jacket or personal flotation device (PFD) appropriate for the water activity.</li><li>• Monitor use of buoyant toys. They might deflate suddenly or be carried by wind or waves into deep water.</li></ul>
Environmental Factors	<ul style="list-style-type: none"><li>• Assess water conditions on an ongoing basis.</li><li>• Continually monitor weather conditions.</li><li>• Check for hidden obstacles in the water such as rocks or logs.</li><li>• Avoid water with fast currents.</li></ul>

**Figure 20-8** | Factors related to staying safe in and around water.

## Survive

Personal Factors	<ul style="list-style-type: none"><li>• Stay in a safe position when performing a reaching assist.</li><li>• If you fall into the water, use survival positions (huddle, H.E.L.P.)</li><li>• If boat capsizes, stay with the boat.</li><li>• Do not panic; stay calm.</li><li>• Follow lifeguards' instructions.</li><li>• Be able to apply first aid.</li></ul>
Equipment Factors	<ul style="list-style-type: none"><li>• Use a reaching/throwing assist.</li><li>• Wear a life jacket or PFD.</li><li>• Use sound signal device.</li><li>• Use first aid kit or AED if needed according to instructions.</li></ul>
Environmental Factors	<ul style="list-style-type: none"><li>• Find shelter from cold/sun.</li><li>• Remove known hazards such as broken glass.</li><li>• Avoid dangerous conditions such as rough waves and fast currents.</li></ul>

**Figure 20-9** | Factors related to survival in and around water.

### Important

The best way to stay safe in and around water is to get training in the activity you are participating in. Learning to swim is a good place to start.

## SAFETY PRECAUTIONS FOR SWIMMING

In open water of any form, there may be potentially dangerous conditions. Before swimming in a new area, check for hazards:

- Underwater obstacles can be large and unseen. Enter open water slowly, carefully, and feet first.
- Lake bottoms may disguise submerged tree stumps and other such hazards.

- If you get caught in weeds or kelp, avoid frantic movements and try to swim slowly and gently out of the plants.
- Be sure rafts and other floating devices are well built, solidly anchored, and in good repair.
- Avoid swimming/boating above or below a dam or near waterfalls.
- Do not swim in storms, fog, high wind, thunder, or lightning.

### Ocean Currents

Ocean currents require unique consideration in Newfoundland and Labrador where a significant proportion of workers spend time on or near the water. Shoreline, water sport and pleasure boating activities also require a knowledge of water conditions that may yield safety hazards.

- **Undertows** move down the slope of the beach, straight out and under incoming waves. Undertows can pull your feet out from under you, causing you to fall. Do not stand in breaking waves if undertow is strong.
- **Drift or side currents** move parallel to shore. Drift currents can move you rapidly away from the spot where you entered the water. If a drift current carries you parallel to shore, swim toward shore, while moving with the current.
- **Rip currents** move straight out to sea beyond breaking waves. A rip current can sometimes be spotted because it is a narrow strip of choppy, turbulent water that moves differently from the water on either side of it. It can take you in over your head and move you quite a distance. In a rip current, swim out of the current (not against it) by moving parallel to shore. Once free, turn and swim toward shore.



**Figure 20-10** | Rip currents usually occur at points of irregular beaches, and at regular intervals along straight, uninterrupted beaches.

## QUICK CHECK

1. Explain the three stages related to staying safe in and around water.
2. How do personal, equipment, and environmental factors contribute to safety in and around water?
3. How can water be a risk to even the most experienced swimmers?

A garbage bag or tarp and suitable clothes can help protect against hypothermia. Cut a hole for the face near the bottom corner of the bag. The bag helps conserve body heat and to stay dry in cool/wet weather.

## Hypothermia

**Hypothermia** refers to lower than normal body temperature and occurs when normal body temperature cannot be maintained. This can happen during any activity that occurs outdoors. People who are exhausted and dehydrated could be at an increased risk of becoming hypothermic. Hypothermia can be fatal. The following factors contribute to this condition:

- air temperature
- humidity
- wind
- skin condition (e.g., whether wet or dry)

### SYMPTOMS OF HYPOTHERMIA

A person who is developing hypothermia will show symptoms. They may:

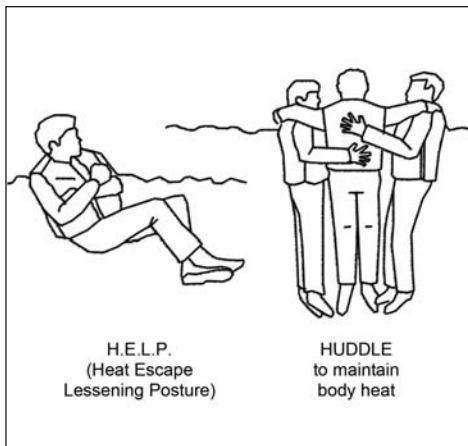
- shiver, use slurred speech and become semi-conscious
- have a weak, irregular, or no pulse
- breathe slowly
- lose control of body movements
- behave in ways that do not make sense
- act confused and/or sleepy
- stop breathing
- become unconscious

### PREVENTING HYPOTHERMIA

The key to preventing hypothermia is to keep covered, avoid overexertion, wear layers, and stay as dry as possible.

Your life jacket or PFD, depending on the type, may provide some thermal benefit in the water. Using the Heat Escape Lessening Posture (H.E.L.P.) or Huddle positions in cold water may also slow down the progress of hypothermia.

The H.E.L.P. position involves drawing the knees up to the chest, keeping the face forward and out of the water, holding the upper arms at the side, and folding the lower arms across the chest (or hugging yourself and putting your hands under your armpits).



**Figure 20-11** | We lose heat quickly through the skull, armpits, and groin area.

## COLD WATER RESCUE

If you are nearby when someone falls into cold water, the following strategies will help recovery and survival:

- Get the person out of the water as quickly as possible. Once out of the water, appropriate first aid measures must be taken and medical assistance should be sought. Call 911 or the local emergency number immediately.
- Move the person from the cold, preferably inside. If this is not possible, shelter and cover them as much as possible from the wind, snow, or rain.
- Replace wet clothing with dry clothing.
- Apply warm compresses to the center of the body—head, neck, chest, and groin only. Do not apply direct heat to the arms and legs. This may force cold blood back toward the heart, lungs, and brain, causing the core body temperature to drop.
- Give warm liquids if the person is not vomiting.
- Do not attempt to warm up the body by rubbing. If the skin is frost-bitten, this may cause damage to the tissue.

## QUICK CHECK

1. Define hypothermia.
2. Explain the impact of hypothermia on the body.
3. With a partner, brainstorm three workplace situations where hypothermia might be a risk.

## Boating Safety

Every year, serious injuries and deaths occur involving boaters who have not prepared for emergencies on the water. Guidelines for safe boating include the following:

- The boat must have the proper equipment and it must be functioning correctly and used safely.
- Boats must be licensed and registered with Transport Canada and have appropriate documentation available.
- Boat operators should file a Sail Plan (also known as a float or trip plan) with a friend, relative, or local police so that a rescue party can begin a search if the boaters do not return when planned.
- Boat operators should choose a safe place to go boating and pay close attention to the weather. They must monitor weather conditions so they will not be caught unexpectedly in a storm.
- Care must be taken when entering, exiting, or moving in a boat so it will not capsize.
- Rules of the road apply for boats as they do for cars.
- Boaters should be properly trained in boating safety including rescue procedures for boating mishaps.

### It's the Law...



Do NOT mix alcohol and boating. Drinking and driving on a boat carry the same penalties under the Criminal Code of Canada as drinking and driving a car.

### REGULATIONS GOVERNING SMALL VESSELS

Small vessel regulations require that pleasure craft be equipped with safety equipment. In Canada, the safety equipment required on board depends on the type and length of your boat. This equipment may include, and is not limited to:

- a first aid kit that meets the requirements of the small vessel regulations
- a lifejacket or PFD with a label that states it has been approved by:
  - Transport Canada
  - Canadian Coast Guard
  - Fisheries and Oceans Canada
  - any combination of the above
- reboarding device
- buoyant heaving line and/or lifebuoy



- sound signaling device
- a magnetic compass
- a radar reflector
- bailer or bilge pump
- Class 5BC or 10BC fire extinguisher if boat has an inboard motor, fuel tanks, cooking or heating appliance (liquid or gas).
- navigation lights that comply with the Collision Regulations
- watertight flashlight(s) or flares of type A, B, or C
- axes
- buckets—number and size according to type and length of boat

In addition to the safety equipment noted above, it is also important to consider the activity you will be participating in and current weather conditions and forecast. For specific safety equipment requirements regarding a boat or water craft see the small vessel regulations from Transport Canada.

## LIFE JACKETS AND PERSONAL FLOTATION DEVICES (PFDs)

There are different types of lifejackets designed for effectiveness in varying situations such as the location and circumstances of use and the age/weight of the wearer. All lifejackets used in occupational vessels:

- must be Transport Canada approved
- must be red, yellow, or orange with a whistle attached
- must fit properly

Personal flotation devices (PFDs) are approved for pleasure craft only. They come in a wider variety of types, colours, and sizes, however it is best to select a bright colour that would be more visible in the water. PFDs are also available for a range of water activities such as sail-boarding or kayaking. They offer varying degrees of thermal protection and turning capacities.

It is therefore important that you select a life jacket or PFD to reflect your individual needs. As a further safety precaution, test your flotation device in a safe situation before it is considered ready for general use.



According to the Canadian Red Cross, of the hundreds of Canadians who drown every year, over 87% were either not wearing a life jacket or PFD, or not wearing it properly.

### Safety of Life at Sea (SOLAS) Lifejackets



SOLAS lifejackets meet very high performance standards and are approved for all vessels. They:

- will turn you on your back in seconds to keep your face out of the water, even if you are unconscious
- come in two sizes: for those over 32 kg (70 lbs.) and those less than 32 kg
- are available in comfortable and compact inflatable configurations that can be automatically, manually or orally inflated
- keyhole models are available

### Standard Type Lifejackets



Standard Type lifejackets are approved for all vessels, except SOLAS designated vessels. They:

- will turn you on your back to keep your face out of the water, even if you are unconscious
- come in two sizes: for those less than 40 kg and those greater than 40 kg

### Small Vessel Lifejackets



Small Vessel lifejackets are approved for small vessels. They:

- have less flotation than Standard Type lifejackets
- will turn you on your back, but may do so more slowly
- come in two models: keyhole and vest
- come in three sizes

### Personal Flotation Devices



Personal Flotation Devices are approved for pleasure craft only. They:

- come in a variety of styles, sizes, and colours
- don't always provide the same turning capacity or thermal protection

**Figure 20-12** | Transport Canada provides detailed information to assist you in selecting appropriate lifejackets and PFDs.

## QUICK CHECK

1. What is the difference between a lifejacket and a personal flotation device?
2. What factors should be considered in selecting a type of lifejacket or personal flotation device?
3. What government agencies regulate the use of watercraft?

## Ice Safety

Employers must conduct a risk assessment when workers are required to work on ice. The ice must be able to support any load which is placed on it. Workers are also required to wear a personal flotation device when they are at risk of drowning, use PPE according to instruction, and follow safe work practices and procedures.

People also enjoy the many outdoor recreational activities that take place on ice. These include ice fishing, cross-country skiing, skating, snowmobiling, ATV riding, and snowshoeing. Precautions must be taken before any activities take place on the ice. The first step is to learn about the dangers and characteristics of ice.

Many different factors affect the thickness of ice. These include the type of water, location, time of year, and environmental factors. For example:

- The depth of water under the ice, currents, and water movement affect the freezing capacity of water.
- Salt water tends not to freeze well and fluctuations in water level can lead to freezing in one area and very little freezing in other areas.
- Any logs, rocks, or wooden wharves can absorb the sun's energy which prevents total freezing of ice in and around the area.
- Changes in air temperature also impact the thickness of ice.
- When operating vehicles on ice, the vibration that comes from the operation of that vehicle can affect the thickness of the ice.

The colour of ice may also help in determining if ice is safe for a particular activity. Clear blue ice is the strongest, white or opaque ice is half the strength of blue ice while grey ice is the most dangerous.



Grey ice indicates minimal and unsafe thickness. Stay off this type of ice!

Ice Depth	Strength Level
7 cm or less	None. STAY OFF
10 cm	Ice fishing, walking, cross country skiing
12 cm	One snowmobile or ATV
20-30 cm	One car or small pickup truck
30-38 cm	One medium truck (a pickup or van)

**Figure 20-13** | Depth is one indicator of whether ice can bear weight for various activities.



**Figure 20-14** | It is always best to check with local authorities to confirm ice thickness.



**Figure 20-15** | Why is a ladder an effective tool for assisting in ice rescue?

The safest practice to follow when working or playing on ice is to not be alone. This ensures immediate help is available if someone breaks through. However, if you are on your own and fall through the ice, the following actions are recommended by the Canadian Red Cross:

- Yell for help.
- Do not panic and try to get back out of the hole that was broken through. This area is weak and the ice will continue to break.
- Use the air trapped in your clothing to help keep afloat.
- Reach forward without pushing down on the thin ice and kick your legs to move your torso forward.
- Carefully crawl on your stomach or roll away once on thick ice. Spreading your arms and legs ensures that body weight is evenly distributed. Do not stand up!
- Keep your sight on the shoreline and move toward it.

If someone from your group falls through the ice, the following procedure is recommended by the Canadian Red Cross:

- Stay as close as possible to the shore. It is the safest way to rescue someone.
- Call or yell for help. Ask someone to call emergency responders.
- Determine whether you can rescue the person with a long stick or pole. If so, get on your stomach and extend the pole to the person.
- If someone must go onto the ice, ensure they wear a PFD and carry a long stick or pole horizontally in front of their body. Carry some kind of weighted line or pole to throw to the person in trouble.
- When near the person and the hole, lie down to ensure body weight is evenly distributed before you crawl slowly towards the hole.
- Throw the weighted line or pole towards the person and have them kick towards the rescuer.
- When solid and thick ice has been found, move the person to a safe position to await further help from emergency responders.

## QUICK CHECK

1. Why is ice depth alone not necessarily a guarantee of ice safety? What other factors must be considered?
2. Why is it important to disperse your weight when conducting a self-rescue or rescuing others who may have broken through ice?
3. With a partner, brainstorm three jobs where ice safety is a factor.

## All-Terrain Vehicle (ATV) Safety

In 2005, the government of Newfoundland and Labrador amended the *Motorized Snow Vehicles and All-Terrain Vehicles Act* and Regulations. As a result:

- children under the age of 16 are not permitted to operate an adult-size ATV
- children who are 14 or 15 years are permitted to operate a machine that is 90 cc or less with adult supervision
- children under 14 are not permitted to operate any type of ATV

Various medical groups and child safety associations applauded the legislative changes. Research has shown that children under the age of 16 years do not possess the physical size, strength, co-ordination, cognitive capacity, and motor skills to safely operate an ATV.

Whether they are used for work or for pleasure, failure to take proper precautions in the operation and use of ATVs could result in severe personal injury or death. Employers are required to conduct appropriate risk assessments, and provide instruction to workers in the safe operation of tools, machinery and equipment. The use of an ATV falls into this category.



**Figure 20-16** | The best way to learn how to operate an ATV is to complete a training program and to ride with a trained and experienced operator.

### FOUR STEPS TO ATV SAFETY

After proper trip planning, there are four steps to safe ATV use:

1. Know your ATV
2. Inspect your ATV
3. Wear proper protective gear
4. Operate your ATV in a safe manner

#### Important

When using ATVs for work purposes, all OH&S legislation must be met—in addition to any associated legislation and standards with ATV usage.

<b>Know Your ATV</b>	<ul style="list-style-type: none"> <li>• Take an ATV Safety course.</li> <li>• Read and understand the owner’s manual supplied with your ATV. Machines vary between manufacturers, make, and model year.</li> <li>• Practice riding techniques in an open area, off the road, and away from obstacles and other riders.</li> <li>• Be patient, it takes time to acquire the skills and knowledge to operate an ATV safely.</li> </ul>																
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<b>Wear Proper Protective Gear</b>	Helmet	<ul style="list-style-type: none"> <li>• Wear an approved helmet that meets Licensing and Equipment Regulations of the Motorized Snow Vehicles and All-Terrain Vehicles Act.</li> <li>• Helmets should fit snugly and be securely fastened.</li> <li>• Full-face helmets best protect your face and head.</li> <li>• Open face helmets (lighter and cooler) should be used with mouth protection.</li> <li>• Eye protection should be used with both types of helmets.</li> <li>• A helmet can be a mask and therefore, intimidating. Take it off when talking to people such as landowners.</li> </ul>
	Goggles/ Face Shields	<p>These items must be worn if the windshield does not provide adequate protection from environmental hazards. They should be:</p> <ul style="list-style-type: none"> <li>• free from scratches</li> <li>• shatterproof</li> <li>• securely fastened</li> <li>• well-ventilated to prevent fogging</li> <li>• tinted (bright days), clear (night), yellow (overcast)</li> </ul> <p>Regular sunglasses will not provide the needed protection on ATVs</p>
	Gloves	<ul style="list-style-type: none"> <li>• Off-road styles of gloves are available at motorcycle shops.</li> <li>• Gloves should be padded over knuckles to prevent bruising.</li> <li>• Good gloves prevent hands from getting sore, tired and cold, and provide protection if you have a spill.</li> </ul>
	Footwear	<p>Wear off-road style motorcycle boots with:</p> <ul style="list-style-type: none"> <li>• strong, over-the-calf boots.</li> <li>• heels to prevent feet from slipping off the pegs.</li> </ul>
	Clothing	<ul style="list-style-type: none"> <li>• Wear long-sleeved shirt and long pants.</li> <li>• Off-road riding gear with knee and shoulder pads provides best protection.</li> </ul>
<b>Operate Your ATV in a Safe Manner</b>		<ul style="list-style-type: none"> <li>• Stay away from dangerous slopes and impassable swamps.</li> <li>• Watch for and avoid sharp bumps, ruts, holes, and obstacles.</li> <li>• Look ahead—know what is coming up, so that you have time to react.</li> <li>• Adjust your speed according to conditions on the trail and the weather.</li> <li>• Always be alert for hazards.</li> <li>• Practice climbing and descending hills, and traversing a slope.</li> <li>• Modify driving practices to suit road and trail conditions in water and winter</li> </ul>

**Figure 20-17** | Following best practices for ATV maintenance and operation will, most often, prevent injuries.



## SPREAD THE WORD

Design a public awareness campaign aimed at a youth audience to promote one of the following:

- boating safety
- water safety
- off-road vehicles safety (including snowmobiles and/or ATVs)
- ice safety

Your campaign may take the form of a poster, a brochure, a radio announcement, or video.



## WHAT WOULD YOU DO **NOW?**

Review the **What Would You Do?** at the beginning of the chapter (page 329), recalling your initial response. After reading this chapter, would your answer change? Why or why not?



## CHAPTER CHALLENGE

Select an outdoor activity such as boating, camping, off-road riding or another of interest and plan a trip to an area of the province you would like to explore. Prepare a trip plan appropriate to the location, terrain, and time of year you would travel. Your trip plan should reflect the safety measures and equipment you learned about in this chapter including:

- your route and method of travel
- the essentials you'll need to take with you
- anticipated hazards and the controls you will put in place
- any necessary information or tasks to be completed before you leave



## DIG DEEPER

Select an occupation of interest that involves outdoor work. Research to learn more about the occupation including the nature of the work, the training required, any occupational health and safety hazards related to that occupation, and how they are controlled. If possible, identify and interview someone who works in that occupation for a first-hand point of view.

## MY OH&S

It is time to complete your course portfolio. But before you do, quickly review the pages of Unit 4. Revisit the activities you completed for the unit. What information stood out for you the most? Did anything surprise you? What information would you want to share with a friend or co-worker? Consider those items for possible inclusion in your portfolio.

### THE BIG IDEAS...

Select a minimum of five critical ideas that you have learned from the unit. To complete your list, consider the following:

- Why is it important?
- Why is it relevant to me?

### LEGALLY SPEAKING

Identify any significant information related to the law, your rights and your responsibilities that you might expect to encounter as a worker, supervisor, or employer.

### USEFUL RESOURCES

Create an annotated list of resources for future reference. Your list should include:

- the name of the resource
- why it was included
- where it can be located

Remember, resources may include documents, brochures, videos, web pages, organizations, and people.

### CAREER POSSIBILITIES

Identify at least one potential career related to occupational health and safety that might be of future personal interest including:

- a brief description of that career
- what it is you find interesting about that career
- any qualifications required
- programs of study and their locations

Your career option may be selected from within the unit or from external sources.

# First Aid

Emergencies can happen anywhere and at any time, from relatively minor cuts and scrapes to more serious incidents that may require the assistance of medical professionals. First aid is emergency help given to an injured or suddenly ill person using readily available materials. Only certified first aiders can administer first aid. As outlined by St. John Ambulance, the objectives of first aid are to:

- preserve life
- prevent the illness or injury from becoming worse
- promote recovery

First aid training is an important step for young workers in preparing themselves for emergency situations. First aid skills and knowledge can be applied throughout your daily life. In this course you will complete a first aid training session administered by a qualified first aid trainer.

First aid services are also a necessary component of the Emergency Preparedness and Response Plan in an Occupational Health and Safety (OH&S) program. The benefits of establishing first aid services include:

- greater awareness of hazards and risks
- reduced severity of workplace injury
- better worker morale
- improved productivity
- the potential to minimize the length and extent of medical treatment
- reduction in lost-time from work

## HISTORY OF FIRST AID

First aid is a complicated subject with a very complicated history. Although we have little information about prehistoric societies, people must have been confronted by many situations requiring first aid. For example, they must have developed ways to stop bleeding, to stabilize broken bones, or to determine if a particular plant was poisonous.

Aboriginal communities used medicines drawn from the natural environment. Traditional medicine was performed by healers, each with a unique set of skills and knowledge. Remedies, such as various mosses, may have been used to clean and dress wounds.

### It's the Law...



First aid services in the workplace are required by law. Each jurisdiction in Canada has Occupational Health and Safety First Aid Regulations.

Over time, people would have become more knowledgeable about how to deal with medical situations. Perhaps this was also the beginning of the distinction between medical care which could be provided by an amateur or a layperson versus a professional. This distinction continued to develop as medical education and training became more formalized.

The history of first aid also involved warfare. Because of the lack of medical expertise and attention, injuries in battle usually resulted in significant loss of life. In 1099, religious knights trained in medical care organized the Order of St. John to specifically treat battlefield injuries. In other words, although these knights were considered laypersons, they were formally trained to provide “first aid.”

In 1859, a Swiss businessman named Henry Dunant trained and organized local villagers to administer first aid to the injured of the Battle of Solferino, Italy. In 1863, four nations met in Geneva, Switzerland, and formed an organization which became the modern Red Cross. A decade later, an army surgeon proposed the idea of training civilians in what he termed “pre-medical treatment.” The term “first aid” first appeared in 1878 as a combination of “first treatment” and “National Aid.” In Britain, civilian ambulance crews were trained specifically to work for the railways, mines, and the police.

The practical skills of first aid have continued to evolve toward a separation between first aid and emergency medicine. Today, ambulances in this country are staffed by personnel who not only are familiar with first aid but who also have more advanced training as paramedics and emergency medical technicians (EMTs).

## FIRST AID AND THE LAW

First aid and CPR (cardio pulmonary resuscitation) training in the workplace is a vital component of an organization’s overall health and safety. All Canadian jurisdictions require the workplace to provide at least some level of first aid. The type of first aid equipment and training required depends on:

- the number of workers in the workplace
- the types of hazards present at the workplace
- the travel distance to a hospital/availability of professional medical assistance

In addition, each jurisdiction will have specific requirements for reporting injuries.

## NL OCCUPATIONAL HEALTH AND SAFETY FIRST AID REGULATIONS

The Occupational Health and Safety First Aid Regulations outlines the duties of employers to ensure adequate and accessible first aid within the workplace. Highlights include the following:

1. An employer shall provide and maintain the first aid supplies and services required by these regulations and shall ensure so far as is reasonably practicable their application towards prompt and effective first aid.
2. An employer shall post in a conspicuous position at a workplace a written notice which outlines a policy and procedure for the reporting of injuries.
3. Where an employer requires a worker to work alone the employer shall if it is reasonable to do so or if required to do so by an officer ensure that the worker holds a valid emergency first aid certificate.
4. Where more than one but less than 15 workers are engaged on one shift an employer shall ensure that one of the workers holds a valid emergency first aid certificate unless an officer directs that a higher certificate is necessary.
5. Where 15 or more but less than 200 workers are engaged on one shift an employer shall ensure that there is:
  - a) at least one worker who holds a valid standard first aid certificate unless an officer directs that a higher certificate is necessary; and
  - b) in addition, a worker holding a valid emergency first aid certificate for each group of 25 workers or part of it in excess of 25 workers.
6. An employer shall appoint a first aid attendant where 200 or more workers are engaged on one shift and in addition shall ensure that there is a worker with a valid emergency first aid certificate for each group of 25 workers or part of it in excess of 25 workers.
7. A person appointed under subsection (6) shall be situated in a position so as to be readily available in case of accident and in a state of dress and personal cleanliness consistent with the treatment of an injured person.

### First Aid Room

A first aid room is required in the following workplaces:

- when an employer employs 200 or more workers on one shift
- when an employer employs a total of 200 or more workers and if ordered to do so by an officer



The employer shall provide and maintain as conveniently as possible to the workplace a first aid room under the supervision of a first aid attendant.

### **Notice to be posted**

The employer shall ensure that there is posted in a conspicuous place in the vicinity of the first aid kit or the first aid room at a workplace a notice containing:

- the name of the particular person in charge of the first aid kit or first aid room
- the name and qualifications of each person trained to administer first aid
- an emergency procedure and a telephone list or other instructions for reaching the nearest police, ambulance, fire station, hospital, or physician

## **QUICK CHECK**

1. What are the three objectives of first aid?
2. What does CPR stand for?
3. Why do you think it is a requirement that a first aid attendant be in a position to be readily available in case of an accident and in a proper state of dress and personal cleanliness?
4. Is there a list of certified first aiders posted in your school? If so, where is it posted and why do you think this location was chosen?

# Glossary

- absorption** when hazardous substances enter the body through the skin
- accommodation** any change or adaptation to the work, hours of work, work duties, or workplace, including the provision of equipment or assistive services
- administrative control** a hazard control involving a change of practice or procedure
- air sampling pump** a lightweight battery operated pump that draws air, along with the substance, onto a medium which can then be analyzed
- alternate duties** non pre-injury duties within the worker's functional abilities
- alternative work** a different job or bundle of duties (not the pre-injury job or duties) to accommodate a worker who has temporary or permanent functional restrictions as a result of injury
- arc flash** an undesired electric discharge that travels through the air between conductors or from a conductor to a ground
- area monitoring** measuring the level of a given substance within a particular work area, room, or building
- asbestos** a mineral that does not burn, used especially as a building material in the past
- asbestosis** a serious, irreversible, incurable, and fatal disease that causes scarring of the lung tissue
- assistive devices** aids and attachments specifically designed for the worker and/or required by the worker to perform job-related activities
- attendant** a worker who is designated by the employer to remain outside a confined space to monitor the health and safety of those inside the space
- audiometry** the measurement of the range and sensitivity of a person's hearing
- awkward posture** a work activity that requires a body part to move away from neutral position
- baseline monitoring** generally conducted during a specific time period to determine potential work exposure and then used as a future reference to compare any improvements or changes that may take place
- belly bar** emergency contact bar designed as part of machinery and equipment that, when contacted, will immediately shut down the system
- biological hazards** micro-organisms or toxins that may cause harm to a worker's body
- captive key systems** use a series of keys or locks to start or shut down equipment during a hazardous operation
- carcinogenicity** the ability of an agent to cause cancer
- chemical hazards** chemical substances that can cause harm or damage to a person's body
- combustible** will burn under ordinary circumstances because of an outside source such as a match or friction
- concurrent disorder** a condition in which an individual experiences both a mental illness and a substance abuse problem
- conductors** materials that allow electricity to flow easily
- contact dermatitis** a skin disease resulting from contact with a hazardous substance
- contact eczema** see contact dermatitis
- contact stress** occurs when a body part presses against a hard surface damaging nerves, tendons, blood vessels, and other tissues due to pressure and decreased blood flow
- crash bar** see belly bar
- current electricity** the controlled flow of energy resulting from the movement of electrons around a circuit
- decibel** a unit of measure for sound
- de-energizing** bringing electrical equipment to zero energy
- detailed noise survey** conducted in locations where a preliminary study indicates high noise levels exist and workers are potentially over-exposed
- direct costs** measured in dollars and cents, those expenses immediately connected to an incident or illness
- directive** an official instruction that must be followed to correct an issue in the workplace
- disease latency period** the time it could take for a disease to develop after exposure to a health hazard

- double-insulated tool** a tool where the wire inside the device is insulated
- drift current** an ocean current that moves parallel to shore
- due diligence** the level of judgement or care that a person would reasonably be expected to take under particular circumstances
- ease back** a gradual return to pre-injury hours of work achieved by increasing the number of hours worked over a defined timeframe
- egress** the way a worker exits a confined space
- emergency response plan** outlines how employers and workers will respond in the event than an emergency occurs
- employee assistance program** a benefit program intended to help employees deal with personal problems that might adversely impact their work performance, health, and well-being
- engineering control** a hazard control involving removing the hazard completely from the workplace or substituting for something less hazardous
- engulfment** occurs when liquids or solids flow through a space enclosing workers and preventing their escape
- entrants** workers inside the confined space
- entrapment** the potential for a person to become trapped or suffocated in a confined space due to the inside shape of the space
- epidemiology** the study of how often and why diseases occur in different groups of people
- ergonomic hazards** physical factors within the environment that may harm a worker's musculoskeletal system
- ergonomic risk factors** work patterns that involve forceful exertions, repetitive movements, or sustained and/or awkward positions
- ergonomics** a science dedicated to fitting the job or task to the worker rather than fitting the worker to the task
- ergonomist** a professional who studies human abilities and limitations and then applies that knowledge to improve people's interaction with products, systems, and environments
- fall protection** a system that restrains a worker who is at risk of falling or stops a worker who has fallen
- fire tetrahedron** represents the four components necessary for a fire: fuel, oxygen, heat, and a chemical chain reaction
- flammable** materials that catch fire easily, burn rapidly and give off intense heat
- flash burn** a burn caused by sudden intense heat such as from an explosion
- flash point** the lowest temperature at which a liquid or solid gives off enough vapour to form a flammable air-vapour mixture near its surface
- force** the amount of work or muscular effort our bodies must exert to complete tasks
- gas monitor** an instruments that can measure the concentration of a particular gas in the air at a particular point in time
- grounding** a way for an unwanted electrical current to be dissipated into the ground instead of going through a worker
- hazard** any condition, substance, practice, or behavior that has the potential to cause loss due to injury, illness, disease, or property damage
- hazard control** a process or action taken to remove hazards or minimize risk
- hazardous product** any hazardous substance or material which meets or exceeds the criteria for inclusion in one or more of the WHMIS hazard classes
- health hazard** a hazard that may result in the development of disease or illness
- hearing conservation program** a written document that aims to protect workers from the negative health effects of noise exposure
- hidden costs** measured in dollars and cents, those costs more broadly incurred as a result of a workplace incident or illness
- hierarchy of controls** the categorization of controls into three levels: engineering, administrative, and personal protective equipment
- hold-to-run controls** requires machine operators to constantly keep controls activated in order for the machine to work
- human cost** the effect of incidents on people
- hypothermia** a condition when lower than normal body temperature occurs
- immediate causes** those events, conditions, or acts that immediately precede an incident
- immediately dangerous to life and health (IDLH)** a concentration of airborne contaminants that threatens harm to workers and is likely to cause death, acute or delayed health effects, or prevent escape from such an environment

- incident** an event that causes harm to a person, or damage to property or the environment
- industrial hygienist** a professional who studies and applies ways to protect the health of workers
- inerting** a type of purging and ventilation that introduces an inert (un-reactive) gas such as nitrogen into a confined space to displace oxygen and other contaminants
- ingestion** when hazardous substances enter the body through eating or drinking
- inhalation** when hazardous substances enter the body through the lungs (breathing)
- injection** when hazardous substances enter the body via a sharp such as a needle
- instantaneous sampling** identifies the concentration of a substance at a given location at a given moment in time
- insulators** materials that contain/control electrical charges
- interlock** a type of machine guard that prevents access to dangerous parts of machinery by shutting down the machine when the guard is not in place or disengaged
- intrinsically-safe tool** a tool that won't ignite gases or fuel
- isocyanate** an organic compound used especially in plastics and adhesives
- kinesiology** the study of human movement
- lock-out/tag-out (LOTO)** a common method of de-energization by ensuring that workers place personal locks on all energy sources to completely isolate or turn off all energy sources on tools, equipment or machinery
- machine guard** a physical barrier that prevents access to a machine or equipment hazard
- mechanical safety hazard** a hazard associated with the way machinery and equipment moves and operates
- mercury** a silver metal that is liquid at normal temperatures
- modified work** when the duties of the pre-injury job are changed to accommodate the worker's functional restrictions as a result of the injury
- musculoskeletal injury** an injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels, or related soft tissue
- musculoskeletal system** the combination of the muscular and skeletal systems working together including the bones, muscles, tendons and ligaments
- muster area** a prearranged gathering place to which you must report after evacuating a building
- near miss** an undesired and unplanned event that has the potential to cause harm to a person or damage to property or the environment
- neutral posture** the resting position of the joints
- nip point** a hazardous area created by two or more mechanical parts rotating in opposite directions
- no fault system** a system where workers are entitled to compensation benefits whether or not they, or the employer, were at fault in an incident
- noise** any unwanted sound
- noise dosimeter** a device that measures the personal noise exposure of a worker
- noise-induced hearing loss** a permanent hearing impairment resulting from prolonged exposure to high levels of noise
- non-sparking tools** tools that are commonly made with non-steel materials such as brass, copper, or bronze
- occupational asthma** a lung or respiratory disease and a chronic condition that occurs in response to one or more agents, or triggers, that are found in the workplace
- occupational health and safety committee** in workplaces employing 10 or more workers, this committee made up of employer and worker representatives monitors the health, safety, and welfare of workers
- occupational health and safety policy statement** a written statement of the employer's commitment to workplace health and safety
- occupational health and safety program** the plan developed and implemented by the employer for preventing incidents and occupational disease in the workplace
- occupational illness** illness or disease that may develop as a result of exposure to substances in the workplace
- occupational medicine** the branch of medicine concerned with maintenance of health and the prevention of diseases and incidents in the workplace
- occupational toxicology** the study of adverse effects of agents that may be encountered by workers while they are in the workplace

- personal monitoring** a measurement taken to determine a worker's personal exposure
- personal protective equipment (PPE)** worn by a worker to minimize exposure to occupational hazards. It acts as a barrier to protect the worker from the hazard.
- photoelectric sensors** devices that release harmless infrared light beams that, when blocked or crossed by workers or materials, will immediately shut down the machine
- physical barrier guard** see machine guard
- physical hazard** a condition or situation that can cause injury or stress to a worker's body
- pinch point** any place where a body part can be caught between two or more moving mechanical parts
- point of operation** an area on a machine where material is positioned for processing and where work is performed
- posture** the position of a body part in relation to an adjoining body part
- preliminary noise survey** identifies areas where potential noise problems exist
- presence-sensing device** a device that produces signals and stops the hazardous machine movement when something enters a danger zone
- primary witness** a person who was present at the time the incident occurred
- protocols** rules or procedures outlining how something should be done
- psychological health** an individual's ability to reason, reflect, and behave in a way that facilitates an effective performance in the workplace, at home, and in the community
- psychological safety** protection from injury to the psychological well-being that a worker may experience
- punching** quick and forceful movements of machinery required for stamping or blanking metal and other materials
- purging** the introduction of a substance such as air, steam, water, or inert gas into a confined space to displace or remove contaminants to an acceptable atmospheric level
- quorum** the minimum number of people required for an OH&S Committee meeting to take place. Must consist of one half of the membership provided that both employer and worker members are equally represented.
- repetitive movements** the same or similar work activities being performed frequently, or for an extended period, causing the same muscles to be used steadily with little time to recover
- representative number** enough workers tested to make assumptions about the entire group
- resistance** refers to how much the material in a circuit can slow down the flow of electricity
- rip current** an ocean current that moves straight out to sea beyond breaking waves
- root cause** the "real" or underlying cause of an incident that might not be immediately obvious
- safety engineering** utilizes a combination of engineering, physical, and behavioral sciences to reduce and eliminate losses due to workplace incidents and occupational disease
- safety hazard** a type of hazard that may result in physical injury to workers
- sampling** a form of data collection whereby a small sample of the potentially dangerous substance is analyzed to determine its potential impact on workers
- secondary witness** a person who may not have seen the incident but was in the vicinity when it occurred
- shearing** the mechanical action of cutting or trimming metal or other material with a knife or slide
- shoring** inserting supports for trench walls during trenching and excavation work activities to prevent their collapse
- side current** see drift current
- silica** a hard chemical compound found in quartz, sandstone, and other rocks
- silicosis** an irreversible, incurable, often times disabling, and sometimes fatal lung disease
- sound level meter** a device that provides an instantaneous noise measurement at a given point in time
- spontaneous combustion** occurs when a material ignites as a result of self heating
- spot sampling** see instantaneous sampling
- static electricity** a sudden discharge of energy as a result of an imbalance of electrical charges on or within a surface
- sustained posture** the body or body part holding in one posture for an extended period



**terms of reference** the written rules for OH&S Committee members in fulfilling their roles and responsibilities

**tertiary witness** a person who was not actually present at the time of the incident, nor afterwards, but who may provide relevant evidence

**threshold limit value (TLV)** the airborne concentrations of substances, representing conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effects

**threshold limit value—ceiling (TLV—C)** the concentration of airborne substances that should never be exceeded during any part of the working exposure

**threshold limit value—short term exposure limit (TLV—STEL)** the exposure of an airborne substance calculated by taking one or more samples during no more than a 15 minute period

**threshold limit value—time weighted average (TLV—TWA)** the average concentration of an airborne substance that is calculated for the eight hour work day, 40 hour work week

**threshold of hearing** the level at which the human ear can first detect the sensation of sound

**threshold of pain** the sound level where the first signs of pain are experienced

**tinnitus** a condition that includes ringing, clicking, hissing, buzzing, or roaring in the ears

**two-hand controls** a safeguarding device that requires both hands to control the equipment in order for it to operate

**undertow** an ocean current that moves down the slope of a beach, straight out and under incoming waves

**ventilation** the process of continually moving fresh air into a confined space in order to lower the levels of contaminants below hazardous levels

**voltage** a unit that measures the strength or power of an electric current

**WHMIS** stands for Workplace Hazardous Materials Information System—a communication system that uses a multi-faceted approach to share information about handling hazardous products

**worker health and safety representative** a worker, not connected with management, designated to monitor the health, safety, and welfare of workers in workplaces with more than one but less than 10 workers

**work-exacerbated asthma** asthma that is made worse because of exposure to a substance in the workplace

**workplace bullying** repeated, unreasonable, or inappropriate behaviour directed towards a worker, or group of workers, that creates a risk to health and safety

**workplace harassment** engaging in a course of vexatious comment or conduct against a worker in a workplace that is known or ought reasonably to be known to be unwelcome

**workplace health and safety designate** a person, appointed by the employer, to monitor the health, safety, and welfare of workers when less than six persons are engaged at a workplace and the designation of a worker health and safety representative is impractical

**workplace incident** see incident

**work-related injury** an injury that happens while on the job or is related to the job being done



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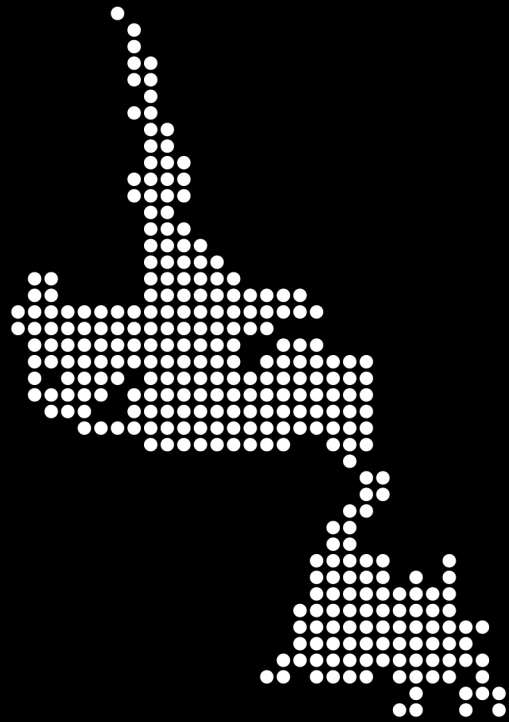
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