Unit	1039
Title	Describe Risk and Risk Controls
Document type	Learning Resource

BC **Forest Safety**

In consultation with industry subject matter experts, the BC Forest Safety Council (BCFSC) facilitated the production of this material.

Printed copies are considered uncontrolled and may be outdated. Current versions are available from the BCFSC. Refer to http://bcforestsafe.org/node/2823 for more information.

Feedback is welcome and may be sent to training@bcforestsafe.org.

Table of Contents

Unit Introduction 4
Section 1039-1: Hierarchy of Controls 5
Key Point 1.1: What is Risk Assessment? 6
Risk 6
Consequence 6
Hazard 6
Exposure 6
When to Do a Risk Assessment 6
Decide Who Might be Harmed and How 7
Determine the Level of Risk 7
Record Your Findings 8
Learner Activity 10
Answer 11
Key Point 1.2: What are Hierarchy of Controls? 12
Hierarchy of Controls 12
Eliminate or Substitute 13
Engineering Controls 13
Administrative Controls 13
Personal Protective Equipment and Clothing 13
Monitoring Control Measures 14
Record Your Findings 14
Key Point 1.3: Levels of Effectiveness for Safety Controls 15
Safety Controls 15
Training and Procedures 15
Summary 15
Section 1039-2: Evaluating Hazards 17
Key Point 2.1: Long-term and General Risks 18
Long-term risks 18
Evaluating Risk 18
Key Point 2.2: Immediate Risks 20
Immediate Risk 20
Key Point 2.3: How Change or Unexpected Events Affect Risk Levels 21
Environmental Changes 21
Human Factor Changes 21
Site Changes 22
Self-Quiz 23
Self-Quiz – Answers 25

Unit Introduction

By the end of this unit you will be able to demonstrate knowledge of:

- Hierarchy of controls
- Evaluating risk

Section 1039-1: Hierarchy of Controls

What you will learn in this section

By the end of this section, you will be able to demonstrate knowledge of the following key points:

1.1 What is risk assessment

1.2 What are of hierarchy of controls

1.3 Levels of effectiveness for safety controls

Key Point 1.1: What is Risk Assessment?

Before any work begins in an area the OHS Regulation requires that a thorough worksite assessment be conducted to:

- identify hazards and potentially dangerous situations
- identify ways to control the hazards
- report incidents when they do occur

Risk

Risk is defined as the probability that exposure to a hazard will have a negative consequence.

Simply put, risk is the idea that something might happen, usually something we don't want. It is the exposure to the chance of injury or loss.

Consequence

Consequence refers to the severity of an unwanted outcome, particularly in relation to the *number* of people exposed.

Hazard

A hazard is an agent or condition with the potential to create an unwanted outcome. An unwanted outcome is a *realized* hazard.

Exposure

Exposure refers to being in a position where you might be harmed.

When to Do a Risk Assessment

Risk assessment is a proactive process designed to ensure workers are protected. Specific risk assessment requirements for organizations in BC are defined in different parts of the OHS Regulations. A number of required health and safety processes are forms of risk assessment, such as workplace inspections and investigations. As a best practice a full-site risk assessment will help you plan for better worker protection.

If your organization is small and you're confident you understand what's involved, you can likely do the risk assessment yourself — you don't need to be a health and safety expert. If your organization is larger, involve the worker health and safety representative or the joint health and safety committee. It is the responsibility of the employer to make sure the assessment is done correctly.

If you have multiple work locations, be sure to do a risk assessment for each workplace. The hazards, and the risks they pose, may be different from place to place.

After you've completed your risk assessments, be sure to review them regularly to ensure they are accurate for your specific needs. Risk assessments should be reviewed whenever you introduce new equipment, materials, work processes or change work locations. At a minimum, make sure you update your risk assessments annually.

A risk assessment is not about creating huge amounts of paperwork. Instead, it is about understanding how workers may be harmed and identifying reasonable measures to control those risks in your workplace. Your risk assessment will help determine whether you've covered everything.

Decide Who Might be Harmed and How

For each hazard you need to be clear about the groups of people who may be harmed. This will help you identify the best way of controlling the risk. Be sure to ask co-workers if there are any groups you may have missed.

Here are some things to keep in mind:

- certain groups of workers may have specific requirements according to the OHS Regulation. These groups may include new and young workers, temporary workers, contractors, and those working alone
- take members of the public into consideration if they could be injured by your activities
- if you share your workplace with another business, consider how your work affects the workers from that business (and vice versa)

Determine the Level of Risk

Part of the risk assessment process is determining the level of risk that hazards pose to workers. Rate the risks as high, medium, or low. This helps you decide which risks are most serious and should be dealt with first.

For example, a busy loading dock where workers are frequently carrying heavy loads could be a high risk for pallet jack collisions and a moderate risk for back strains.

To help evaluate the risk level, try to answer the following questions:

- What can or could go wrong? Who might be harmed? For example, are all workers exposed to the hazard, or is it a smaller number?
- What kind of injury or illness could be suffered, and how severe would it most likely be?
- How long are workers typically exposed to the hazard? The longer the exposure, the higher the risk.

- How frequent is the exposure? If the task is repeated many times each shift, it usually carries more risk than a task done only occasionally.

Use this risk matrix to help determine level of risk.

Probability	Impact: Minor	Impact: Moderate	Impact: Major	Impact: Extreme
Rare	Low	Low	Medium	Medium
Unlikely	Low	Medium	Medium	Medium
Moderate	Medium	Medium	Medium	High
Likely	Medium	Medium	High	High
Very likely	Medium	High	High	High

Table 1: Risk Matrix

Record Your Findings

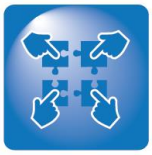
Be sure to record the findings of your risk assessment as these will be the primary tool you will rely on to control the risks in your workplace. A sample of a Risk Assessment Form is found in Figure 1 below. This includes noting the hazards, how people might be harmed by them, and what's already in place to control the risk. This documentation doesn't need to be complicated and it can help you communicate and manage risks in your workplace.

Risk Assessment Form

Date: _____	**Location:** _____
Name of person doing assessment:	This is a general form. Some activities involving steep slopes, confined spaces, and others require Regulation specific forms.
Activity / Procedure being assessed:	
Known or expected hazards associated with the activity:	
The risk of injury and its severity likely to arise from these hazards:	
Who is at risk?	
Measure to be taken to reduce the level of risk:	
Training prerequisites:	
Level of risk remaining:	
Action to be taken in an emergency:	
References, if any:	
Signature of Assessor: _____	

Figure 1: Risk Assessment Form

Learner Activity



Fill in the blanks with the risk level.

Probability	Impact: Minor	Impact: Moderate	Impact: Major	Impact: Extreme
Rare	Low	Low	Medium	Medium
Unlikely	Low	Medium	Medium	Medium
Moderate	Medium	Medium	Medium	High
Likely	Medium	Medium	High	High
Very likely	Medium	High	High	High

1. If the impact is minor and the probability is likely the risk is _____.
2. If the probability is rare and the impact is extreme the risk is _____.
3. If the impact is extreme and the probability is moderate the risk is _____.

Now check your answers on the next page.

Answer

Fill in the blanks with the risk level.

1. If the impact is minor and the probability is likely the risk is **medium**.
2. If the probability is rare and the impact is extreme the risk is **medium**.
3. If the impact is extreme and the probability is moderate the risk is **high**.

Key Point 1.2: What are Hierarchy of Controls?

The highest risk should be addressed first. If you cannot eliminate a risk, you'll need to implement control measures to minimize the risk. The hierarchy of controls can help you systematically take action to minimize risk.

By the end of this section you will understand the levels of controls including:

- Elimination
- Substitution
- Engineering controls
- Administrative controls
- Personal protective equipment (PPE)

Hierarchy of Controls

When considering how to reduce the risk, there is a certain order you should follow. This is called the hierarchy of controls. It is important to follow the hierarchy as shown below, rather than start with the easiest control measures.

Note that while the controls are listed in order of effectiveness, all five types of controls should be considered. They often work best in combination. For example, first responders cannot eliminate risks by choosing not to enter a burning building, but they can use engineering controls, administrative controls, and personal protective equipment and clothing to minimize the risks when they enter that building.

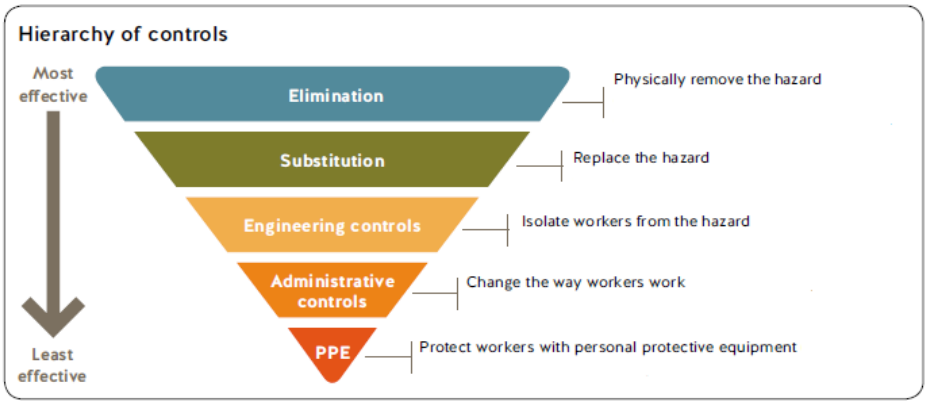


Figure 2: Hierarchy of Controls

Eliminate or Substitute

Eliminating the hazard completely is always the best choice. Substitution involves replacing the material or process with a less hazardous one.

When considering these options, ask yourself:

- Can this task be eliminated from the work process? For example, if falling is a hazard, eliminate the risk by storing stock at lower heights so you don't have to climb ladders to reach the goods.

Substitute where possible. Just make sure the substitutions don't create new hazards.

Engineering Controls

If you can't eliminate the hazards or substitute safer alternatives, engineering controls are the next best options. These involve using work equipment or other means to prevent workers from being exposed to a hazard. Engineering controls are physical changes to the workplace and may include equipment guarding, guardrails, traffic control lanes or barriers between vehicles and pedestrians.

For example, to mitigate slips or potential falls when servicing or walking on equipment, an anti-slip coating can be applied to the surface decks. This anti-slip coating is an example of an engineering control. Another example is ensuring the anti-vibration mounts on a chainsaw are functional.

Administrative Controls

Administrative controls involve identifying and implementing safe work procedures so your workers can perform their job duties safely. The findings of your risk assessment will form the basis of these safe work procedures.

Examples of administrative controls include implementing man-check procedures and prohibiting the use of mobile phones while workers are driving.

Personal Protective Equipment and Clothing

Using personal protective equipment (PPE) is another important control to protect workers.

For example, while operating a chainsaw, it is necessary to wear PPE that includes chainsaw pants rated to a minimum of 3600 feet-per-minute (fpm) threshold to reduce the exposure risk. Consider wearing anti-vibration gloves when operating a chainsaw to minimize the effects of vibration.

Monitoring Control Measures

Improving health and safety doesn't have to be costly, but the potential return on investment is huge. For example, placing a mirror on a dangerous blind corner of your worksite can help prevent vehicle incidents. Considering how serious a resulting injury might be, this provides a low-cost precautionary solution.

Protecting employees from harm requires ongoing effort. You will need to monitor the effectiveness of the hazard controls in place and improve those that don’t measure up. It is a good idea to:

- conduct regular safety inspections to track exposure to hazards
- organize a joint occupational health and safety committee and hold monthly meetings to discuss health and safety issues
- deal with safety issues as soon as possible

Record Your Findings

It is a good practice to document what you find from your risk assessment. This includes noting the hazards, how people might be harmed by them, and what's already in place to control the risk. This documentation doesn't need to be complicated, but it can help you communicate and manage risks in your workplace. It is important to date stamp your documentation including date and time of inspection.

Key Point 1.3: Levels of Effectiveness for Safety Controls

Safety Controls

When choosing safety measures or controls, it is important to consider where these measures lie on the hierarchy of controls. At the top of the hierarchy are system-level controls such as elimination, substitution, and engineering. At the lower end of the hierarchy are administrative controls and personal protective equipment.

Controls at the lower end of the hierarchy rely on worker performance to be effective. For example, a sign which is a type of awareness tool, requires a worker to see, correctly interpret and follow it for it to be effective. System-level controls are more effective because they do not rely on the workers performance to ensure safety. The greater the hazard or risk of injury, the more important it is to choose system-level controls.

Training and Procedures

Training and procedures are two types of administrative controls. They are at the low end of the safety hierarchy. While training and procedures are necessary, there are often gaps between what training or procedures “say should happen” and how the tasks are actually performed.

There are many reasons for these gaps. For example, workers sometimes change how they carry out a task in response to poorly maintained equipment or to increase efficiency. Sometimes training and procedures are out of date or do not accurately reflect the physical demands of a job. When it comes to safety critical tasks relying solely on training and procedures may not be effective.

Summary

It is important to consider the effectiveness of safety measures and their position on the hierarchy of safety when assessing safety risks or setting up a safety program.

At the top of the hierarchy are system-level measures such as elimination, substitution or engineering controls. These types of controls are more effective than safety measures such as signs, training and procedures and personal protective equipment which rely on workers’ behaviour to make them effective.

Providing warning signs, written work procedures and personal protective equipment is often required and are always helpful. But if the consequences of misunderstanding a sign or taking a shortcut could be catastrophic, these lower-level controls may not be adequate. Using system-level controls provides the highest level of safety.

Section 1039-2: Evaluating Hazards

What you will learn in this section

By the end of this section, you will be able to demonstrate knowledge of the following key points:

2.1 How to evaluate long-term and general risks, including frequency and probability

2.2 How to evaluate immediate risks, including frequency and probability

2.3 How change or unexpected events affect risk levels

Key Point 2.1: Long-term and General Risks

Evaluating risk is a proactive process to help you manage risk on the job. There are two categories of risk—long-term and immediate—and you need to be aware of both.

Long-term risks

Long-term risks are those risks where the consequences are delayed, or mild enough on a daily basis that they can become normalized. You stop paying attention enough to take the proper precautions.

For example, the vibration from operating a chainsaw every day has no significant immediate consequence but over time, exposure can lead to reduced hand function. Because the consequences aren't noticeable on a daily basis you might be tempted not wear protective gloves.

Another example of long-term exposure risk is hearing loss due to the noise of daily chainsaw use. The probability of hearing loss over time is high without hearing protection. But because the impact from the noise is cumulative and not noticeable in the short-term, working without ear protection might not seem an unsafe option.

Evaluating Risk

Evaluating risks helps ensure that hazards with the greatest potential impact and the greatest probability are given priority in terms of controls. The following questions might help when evaluating risks.

- What kind of injury or illness might I suffer, and how severe will it most likely be?
- How long am I typically exposed to the hazard? All day? Four hours? Two hours? The longer the exposure, the higher the risk.
- How frequently am I exposed? If it's five days a week, that carries more risk than if you're exposed only occasionally.
- What's the probability that I'll be exposed?

Refer to the Risk Matrix below to assign a "risk rating" to a hazard. Give the risks where exposure is more likely, and the potential consequences more severe, the highest priority.

		Impact			
		Minor	Moderate	Major	Extreme
Probability	Rare	Low	Low	Medium	Medium
	Unlikely	Low	Medium	Medium	Medium
	Moderate	Medium	Medium	Medium	High
	Likely	Medium	Medium	High	High
	Very likely	Medium	High	High	High

Table 2: Risk Matrix

When considering the likelihood or consequences of exposure, factor in the existing controls in place. Personal protective equipment and proper safety procedures reduce the likelihood of injury.

Any tasks that present an imminent risk of serious injury, or worse, should be stopped until controls are in place that will reduce the risk to an acceptable level.

Key Point 2.2: Immediate Risks

Immediate Risk

An immediate risk, as the name implies, is one where the outcome is felt immediately. Overhead hazards, struck-by hazards, kickbacks, and slips, trips, and falls all fit into this category.

For example, if you're not wearing your face screen and debris flies off your chainsaw, you'll feel the result right away. The outcome, whether an eye injury or a cut on the cheek, is an immediate one.

The challenge with immediate risks is that you can be lulled into thinking that if nothing adverse happens, there is no real risk. But the chance of injury or loss is there regardless of outcome. And everyday habits, such as wearing a face screen, can prevent an immediate risk from becoming an immediate, and unwanted, reality.

It's critical to be aware of patterns of behaviour that can lead to increased risk, whether long-term or immediate.

Key Point 2.3: How Change or Unexpected Events Affect Risk Levels

Logging sites are *dynamic* workplaces. Changing human, environmental and site conditions create different hazards and risk levels. These factors are inter-related. For example, risks associated with duration of exposure depend on site complexity, daily weather, your own competencies, and your state of mind—are you focused on work, versus fatigued or distracted by personal issues?

You are responsible for identifying changing conditions—that looming wind storm, or your own fatigue—and applying sound judgment to re-evaluate hazards and determine what different steps or controls are necessary to assure you and your co-workers remain safe.

Think of it this way. Anything outside of your normal plans for the day adds to risk levels: adverse weather conditions, a tree that sits back on you, an unusually high number of danger trees to deal with. Throw time pressure into the mix, as well as an unwillingness to ask for help, and it's a combination that can get workers seriously injured or killed.

Environmental Changes

Be on the alert for the following environmental factors that can increase risk levels on a worksite:

- fog, rain and snow
- wind
- lightning
- avalanches
- sunshine (impaired vision)

Human Factor Changes

Be aware of your own changing state of mind while on the job. Be alert to distractions, boredom, fatigue, stress, dehydration, hunger, and time pressures. Check in with yourself by asking the following questions:

- Am I focused on the job or distracted by personal matters?
- Am I alert and rested?
- Am I on 'auto-pilot' and not paying attention and simply just going through the motions?
- Am hungry or thirsty?
- Am I tired from the night before?
- Am I feeling stressed by a challenging task I don't feel equipped to perform?

- Do I feel rushed by workplace expectations, or by the fact that it's Friday afternoon and close to the end of my shift?
- Did I just do something that I wasn't supposed to do and now I'm trying to figure out how to fix it or cover it up before my supervisor or co-workers find out?
- Did another worker or supervisor say something to me that threw me off my game?

Site Changes

One day, all the trees you process are relatively straightforward. Another day, you might be up against a whole stand of rotten Hemlocks. The next, you're on a steep slope greater than 45 degrees. Increased complexity tends to go hand in hand with increased risk. Be aware of the potential for added risk, assess the hazards every day, and take the necessary controls.

Watch the SAFER Unexpected Events video to see how unexpected or unplanned events affect risk levels.

Self-Quiz

1. Which is a consequence? (1039.1.1)
   - ☐ Probability of exposure to a hazard
   - ☐ Position where harm may occur
   - ☐ An unwanted outcome
   - ☐ Potential for an unexpected event
2. Which two variables are commonly used in a risk matrix? (1039.1.1)
   - ☐ Frequency and probability
   - ☐ Level and duration
   - ☐ Impact and level
   - ☐ Probability and impact
3. What are the hierarchy of controls? (1039.1.2)
   - ☐ Hazard identification protocol
   - ☐ Evaluation methods
   - ☐ Strategies to manage risk
   - ☐ Levels of hazards
4. What type of safety controls are training and procedures? (1039.1.2)
   - ☐ Administrative
   - ☐ Substitution
   - ☐ Engineering
   - ☐ Elimination
5. What is an engineering control? (1039.1.2)
   - ☐ New safe work procedures
   - ☐ A physical change to the workplace
   - ☐ Additional training
   - ☐ Changing process for a less risky procedure

6. If the probability of something occurring is moderate and the impact is extreme, what is the risk level? (1039.2.1)

   ☐ No risk

   ☐ Low risk

   ☐ Medium risk

   ☐ High risk

Now check your answers on the next page.

Self-Quiz – Answers

1. Which is a consequence? (1039.1.1)

   Answer: **An unwanted outcome**

2. Which two variables are commonly used in a risk matrix? (1039.1.1)

   Answer: **Probability and impact**

3. What are the hierarchy of controls? (1039.1.2)

   Answer: **Strategies to manage risk**

4. What type of safety controls are training and procedures? (1039.1.2)

   Answer: **Administrative**

5. What is an engineering control? (1039.1.2)

   Answer: **A physical change to the workplace**

6. If the probability of something occurring is moderate and the impact is extreme, what is the risk level? (1039.2.1)

   Answer: **High risk**