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3.1   Introduction

Hazard identification, risk assessment and risk control (sometimes referred to as just hazard assessment) is the starting point of all preventive efforts of an Occupational Health and Safety Program. We must be able to identify potential hazards in the workplace in order to be able to take action to eliminate or control them. Identification and control of hazards is a management function in just the same way as managing work flow, productivity, timeliness, cost or quality.

The hazard identification, risk assessment and risk control process is so important that it needs to be implemented both as a periodic **formal** exercise and as an ongoing **informal** exercise whenever a hazardous task is undertaken. Both are described in this chapter.

Note: See Section 3.7 for informal hazard assessments before undertaking hazardous tasks.

3.2   Formal hazard assessments

Formal hazard identification, risk assessment and risk control must be an ongoing process, not just a one-time exercise.   A hazard assessment process must be:
- Completed for all workplaces and operations as an initial step in setting up a Health and Safety Program;
- performed at the start of any work which is new to the work group;
- performed whenever there is a significant change to a building, equipment or work procedure; and
- reviewed yearly, to ensure that all information is current and that hazard controls are appropriate and in place.

3.2.1 Responsibility

It is the responsibility of Saint Mary's University Vice-President, Finance and Administration to ensure that the formal hazard assessment process has been undertaken. The Occupational Health and Safety Office of Human Resources will coordinate this process. Assistance in this process will be provided by the Joint Occupational Health and Safety Committee, Safety sub-committees, management, and experienced employees.

3.2.2 Hazard assessment asks "What if?"

Hazard Assessment is mainly an anticipatory function which tries to identify actual or potential hazards associated with existing or planned work, including evaluation of the materials, processes and equipment associated with that work and the environment in which it is or will be undertaken. The hazard identification, risk assessment and risk control process requires:

- the input of persons who have experience doing the existing work or the new work which is planned or have developed the plan for new work;
- a review of relevant occupational health and safety statistics, inspection reports, incident or near miss investigations, and records of concerns, complaints and work refusals;
- reference to published information or anecdotal evidence on similar hazards or work places to identify hazards which are known to exist in similar industries;
- consideration of applicable regulations and standards; and finally
- if the work is underway or the work area is ready for work to commence, a visit to the actual work site(s).

There is frequent confusion between the hazard identification, risk assessment, and risk control process and site inspections. The two functions may appear similar in nature, but they have different purposes and are undertaken using different techniques. Inspections deal with identifying present problems in the work place and are done by physically touring the location. When doing an inspection, one asks **"WHAT IS"?** For information on the inspection process, please see Chapter 13 of this Manual.

When doing a **hazard assessment**, we ask: **"WHAT IF"?** We try to identify both present and potential problems. What can, or has the potential to, harm people? The hazard identification, risk assessment and risk control process tries to identify not only what actual hazards have already been found but also what hazards may potentially exist in the workplace.

3.2.3 The hazard assessment process

The hazard assessment process includes the following three steps:
- Hazard Identification: compiling an inventory of actual and potential hazards;
- Risk Assessment: rating and prioritizing the hazards; and
- Risk Control: identifying controls presently in place and/or developing controls to be put in place to eliminate or reduce the impact of each hazard. This includes engineering controls, safety rules, safe work practices, training, etc., so that the work can be undertaken in a safe and healthful manner.

3.3   Step 1: Hazard identification: Inventory

The first step in the hazard assessment process is to produce a list of hazards.

3.3.1 Hazard identification perspectives

To develop a comprehensive list of hazards, one must examine all aspects of the work activity. This is most effectively done by looking at the work from several perspectives. The following **"4Ps"** help to remember these perspectives:

- the **Product** or service produced;
- the **Process** or tasks undertaken to produce the product or service, including any equipment which is used;
- the **Place** or work environment, including the physical environment (building, vehicle, field activities, etc.) and ventilation, lighting, weather, etc. where the work is done; and
- the **People** or employees who do the work, including their occupations and duties. Do not forget employees who may be present at other times, such as visitors, custodial or maintenance staff, or contracted workers or the employees of other employers who may be on site for some special purpose. Look at the duties undertaken by each category of employee. Also consider our students, clients and members of the public.

3.3.2 Hazard categories

There are a wide variety of workplace hazards, but generally they can be grouped into five categories. Considering each category when doing a hazard assessment will help the list of hazards to be complete:

- **Physical hazards** include the group of hazards usually thought of as "safety". This includes mechanical hazards such as getting caught in machinery, pinched, crushed or run over. It also includes hazards such as things falling on you, falls from heights, slips and trips. Finally, it includes various forms of energy, including electricity, ultra-violet and infrared light, microwaves, radio waves, ionizing radiation, noise, extremes of temperature, and fire and explosion;
- **Chemical hazards** include airborne gases, vapours, mists, dusts, and fumes as well as solids and liquids. Routes of exposure to chemical hazards include the skin (and eyes), ingestion (eating) and inhalation (breathing);
- **Biological hazards** include dangerous animals (bites, stings, etc.), allergic or toxic reactions to plants and animals (waste, dander, etc.), micro-organisms (mould, mildew, etc,) and infectious diseases (including vector-borne, airborne and those transmitted via body fluids);
- **Ergonomic hazards** include the interaction between people and machines (computers, controls, readouts, gages, signals, etc.) or equipment (seating, workstation design, etc.) and environmental conditions relative to human performance and comfort such as lighting, thermal environment, body position and repetitive motion; and
- **Psycho-social hazards** include such things as work-related violence, work related stress, boredom, and sleep deprivation.

3.4   Step 2: Risk assessment/Hazard rating

Once a list of present and potential hazards has been developed, each of these hazards must be rated on both the **Severity** (Hazard Consequence) of the occurrence and the **Probability** of it occurring.

3.4.1 Severity of risk

Severity of risk is a way of rating the consequence or impact of a hazard, if an incident does occur. We look at the worst possible severity of the outcome, using a four level scale:

4. **Catastrophic** - may cause death, permanent disabling injury or loss of facility (e.g.: fall from a high platform, shooter on campus, or major fire);

3. **Serious** - may cause severe (hospitalization or lost time) injury not resulting in permanent disability, severe occupational illness, or major property damage (e.g.: a slip on wet flooring leading to a fall and broken hip, an abusive client who makes threats against employees or the Campus, or major contamination of a building by mould);

2. **Marginal** - may cause non-serious injury or minor occupational illness resulting in lost time or minor property damage (e.g.: minor ergonomic problems such as poor seating, an abusive client causing employee stress, or damaged furniture); and

1. **Negligible** - would not result in an injury and would not affect employee health or cause significant property damage (e.g.: a rude client, or a chip in the paint of a doorway).

3.4.2 Probability of risk

Probability of risk is the likelihood that an incident will occur, regardless of what the outcome might be. We use the following five level scale:

5. **Frequent:** will likely happen often in the next year;

4. **Likely:** will likely occur in the next year;

3. **Occasional:** will likely happen some time in the next several years;

2. **Remote:** unlikely, but event could be experienced in the next several years; and

1. **Highly Unlikely:** event will likely never occur.

3.4.3 Relative risk/Significance of hazards

Once each hazard has been rated on the likely severity of its outcome and the probability of it occurring, using the criteria above, the scores need to be combined so that the relative risk/overall significance of each can be determined.

We can calculate the relative risk of each of the hazards which has been identified by multiplying the severity and probability values for each to create a numerical rating. These ratings will identity the level of risk for each hazard identified relative to the others. The higher the

number, the higher the risk and the more urgent it is to implement controls that will reduce both the probability of occurrence and the severity of the outcome if an incident should occur. The relative risk of hazards with various severity and probability ratings is demonstrated in the following table.

		SEVERITY OR IMPACT			
		4 Catastrophic	3 Critical	2 Marginal	1 Negligible
P R O B A B I L I T Y	5 Frequent	20	15	10	5
	4 Likely	16	12	8	4
	3 Occasional	12	9	6	3
	2 Remote	8	6	4	2
	1 Highly Unlikely	4	3	2	1

3.4.4 Setting hazard priority

This is the place in the process where the hazards are prioritized with the most serious hazards being those with a rating of 20 and the least serious having a rating of 1. Create a list with all the hazards in the order of their ratings. Start with the highest priority hazard and attempt to put controls for that hazard in place first, and then work down the list until all hazards are controlled.

Generally, any hazard which has a rating of 10 or higher on the hazard rating grid (see shaded

area on grid below) should be regarded as a **"Significant Hazard"** for which a Safe Work Practice should be developed to complement and ensure implementation of any other hazard controls.

		SEVERITY OR IMPACT			
		4 Catastrophic	3 Critical	2 Marginal	1 Negligible
P R O B A B I L I T Y	5 Frequent	20	15	10	5
	4 Likely	16	12	8	4
	3 Occasional	12	9	6	3
	2 Remote	8	6	4	2
	1 Highly Unlikely	4	3	2	1

3.5   Risk control

There are a number of possibilities for controlling each of the hazards which has been identified. Each hazard moves from its source, along a path, and eventually reaches the employee or the workplace. The hazard could be physical energy, a sharp object, a weapon, noise, radiation, a chemical vapour, etc., but all have a source, a path and may eventually reach the employee or affect the workplace. Therefore, control strategies may be effective by trying to affect the source, interrupt the path, or provide protection to the employee or the workplace at the point where the hazard reaches the employee or

the workplace.

3.5.1 Categories of hazard controls

Generally, the control method(s) will be found in the following categories:

- **Elimination**: Whenever possible, remove the hazard completely through elimination. Examples include automating a function to eliminate manual handling, eliminating the use of a toxic chemical, eliminating the use of a piece of dangerous equipment, or the performance of a dangerous task.

- **Substitution**: Where the hazard cannot be eliminated, consider alternatives to the processes, substances, machines or equipment being used. Substitution may reduce the risk of injury or illness to an acceptable level.

- **Engineering Controls**: Engineering controls involve the design of the workplace and its related processes. Engineering controls include ventilation systems, guards on equipment, fire suppression systems and enclosing of noisy machinery.

- **Administrative controls**: Where the hazard cannot be eliminated, and where substitution and engineering controls do not adequately manage the hazard, administrative controls are frequently introduced to lessen the risk. Administrative controls include developing Safe Work Practices or new policies, training and supervision. Approaches such as scheduling work, job rotation, procurement policies for equipment and materials, relocating employees from construction zones, etc. should also be considered.

- **Personal Protective Equipment**: Is the **final line of defence**. The requirement to rely on Personal Protective Equipment (PPE) is an admission that it has not been possible to eliminate the hazard or reduce it to an acceptable level by the use of other controls. This is the most unreliable control because it is dependent on correct choice of PPE, correct fitting, the service life of the PPE, employee compliance with use, and proper choice/decision about when to wear. There are lots of places for system failure. Therefore, normally, the use of PPE will require other administrative controls, such as development of a policy requiring use, development of a Safe Work Practice, employee training, supervision etc. to supplement this control option.

3.5.2 Risk control analysis

To assist in the analysis of the risk associated with each hazard that has been identified by the Hazard Identification process, the Risk Control Analysis Form in Appendix B should be completed. Starting with the most serious hazards first, identify hazard control measures for each hazard.

The degree of detail in the procedures will vary with the risk and the complexity of the task involved. High risk, complex tasks will require very detailed procedures.

3.5.3   Review of control measures

Starting with the most serious hazards first, review the controls which are needed to reduce the risk for each hazard to an acceptable level. Are these controls in place? If so, they should be noted on an Inspection Checklist or Safe Work Practice.

If not, an action plan should be developed.

3.6   Action plan and follow up

Once all hazards have been inventoried and controls identified, through the Hazard Identification, Risk Assessment and Risk Control Process and completion of the Risk Control Analysis Forms, an Action Plan is needed to ensure that any additional controls which are required are developed and implemented.

The Action Plan is an essential part of the OHS Program and supports the continuous improvement and due diligence goals of the OHS Program. The Action Plan may involve considerable additional work, including development and approval of policies, development of Safe Work Practices, design and installation of engineering controls, purchase of personal protective equipment, ergonomic assessment of workstations, employee training, etc. There may be implications for capital and operational budgets which will require additional planning, justification, approval and implementation.

Each item on the Action Plan must have responsibility assigned and a completion date or milestone dates established. A record must be kept of action on each item to ensure that progress continues and to document continuous improvement and due diligence. The OHS Office will monitor the Action Plan to ensure that progress is being made on all action items. The Joint Occupational Health and Safety Committee will be advised of the progress on any outstanding items on the Hazard Identification, Risk Assessment and Risk Control Process.

The final stage of the Hazard Identification, Risk Assessment and Risk Control process is to use results and all the controls which have been developed as inputs to the ongoing schedule of inspections, so that the inspection of each area will be focused on the observed and potential hazards present in that area and the control measures which have been identified as necessary. The ongoing presence and effectiveness of those controls must be included in the list of items observed during the inspection (inspection check list). Please see Chapter 13: Inspections for a discussion of the inspection process.

3.7   Informal hazard assessments before undertaking hazardous tasks

As well as the formal hazard assessment process, it is important for employees and supervisors to use a similar informal process every time work is undertaken. This process does not need to be formally

documented, although notes or a checklist may be useful. It requires only a minute or two to complete and consists of five steps:

- **Stop and think** before each task;
- **Identify the hazards** associated with the task. Is there anything unusual about the task or the place it will be done?
- **Assess the risks** associated with the hazards. How serious or probable are they? Is it safe to do the task? What controls are necessary? Refer to the Safe Work Practice if there is one.
- **Evaluate hazard controls** which are in place, including guards, pre-use inspection, training, personal protective equipment, or anything else that needs to be done before the task can be done safely. Are the necessary controls present? If not, get them in place before work begins.
- **Resume work**.

Appendix A: Form: Results of Hazard Assessment Process

The results of the initial and periodic Hazard Identification, Risk Assessment and Risk Control Process should be recorded on the following form, including identification of actual and potential hazards and subsequent scoring and ranking, as follows.

#	Hazard Description	Severity	Probability	Severity X Probability
1				
2				
3				
4				
5				
6				

Appendix B: Form: Risk Control Analysis

Hazard Description	
Details	
Severity of Risk (4-Catastrophic, 3-Serious, 2-Marginal, 1 Negligible)	
Probability of Risk (5-Frequent, 4-Likely, 3-Occasionally, 2-Remote, 1-Highly Unlikely)	
Relative Risk (Severity x Probability)	
Significant Hazard (Relative Risk of 10 or above)(Yes/No)	
Regulations and Standards (Yes/No)	
Details	
Workplace Controls In Place (Yes/No)	
Details	
Additional Workplace Controls Required (Yes/No)	
Details	
Inspection Checklist in Place for Identified Controls (Yes/No)	
Details	
Employee Competence Required (Training, Experience, Certification, Designated Competent)	
Details	
Personal Protective Equipment Required (Yes/No)	
Details	
Safe Work Practice In Place (Yes/No)	
Details	

Action Plan				
Details	When Due		Who	
Details	When Due		Who	
Details	When Due		Who	