Risk Assessment

Best Practices for Achieving Environmentally Sound Management (ESM)

At Facilities that Refurbish and Recycle Used and End-of-Life Electronic Products in North America

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Commission for Environmental Cooperation

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Commission for Environmental Cooperation

Best Practices for Achieving Environmentally Sound Management at Facilities that Refurbish and Recycle Used and End-of-life Electronic Products in North America

Module 3b

Risk Assessment for Supervisors and Workers

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3 Module 3b: Environment, Health and Safety Risk Assessment—For Supervisors and Workers

3.1 Learning Objectives

By the end of this module you will be able to:

- identify important best practices for risk assessment at your facility,
- identify hazards and risks to worker health and safety and the environment, at your facility, and
- apply the risk assessment process at your facility, to contribute to the identification of hazards in the workplace.

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3.2 Pre-questionnaire

1. Identify one or more aspects you would like to learn about risk assessment today.

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2. Why do you think it is important for you to know about risk assessment?

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3. Are you involved in risk assessment at your facility? If so, how are you involved?

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3.3 Check-in on Topics Previously Covered in Module 1

Module 1 (Introduction to ESM)

Module 1

In Module 1 you learned about:

- the importance and benefits of environmentally sound management (ESM), including elements deemed necessary to achieve ESM at the facility-level;
- potential environmental, health and safety issues associated with refurbishing and recycling electronic products;
- worker health and environmental benefits of implementing ESM at your facility;
- economic benefits of implementing ESM at your facility;
- the benefits of participating in ESM validation and certification programs and how this can increase your client base, your inventory volumes, and potential profits; and
- the waste management hierarchy and how it applies to activities undertaken at electronics refurbishing and recycling facilities.

3.4 Introduction and Overview of this Module

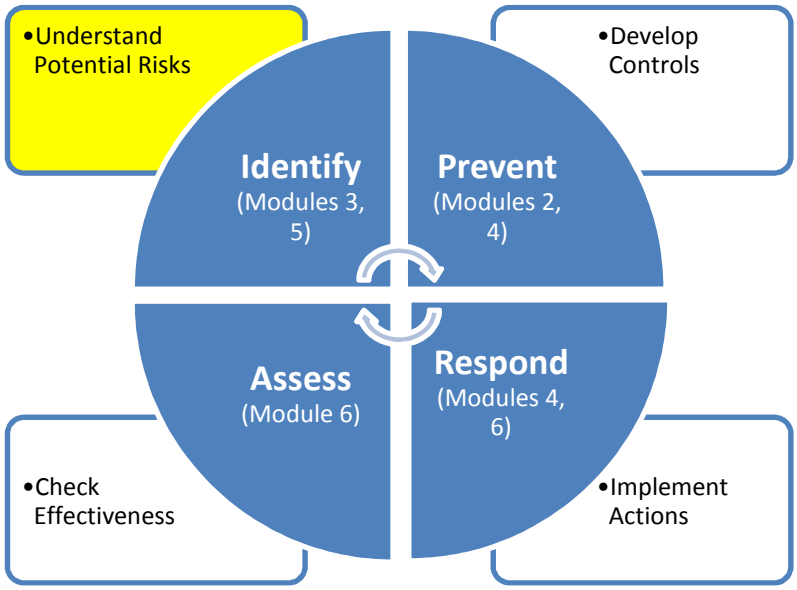
What Is Risk Assessment and What Does It Mean to You?

This module will answer this question and provide you with:

- an overview of the material and substance content commonly found in used and end-of-life electronic products, and why certain materials and substances are important for you to know about;
- the benefits of identifying, evaluating and prioritizing risks associated with hazards in your facility; and
- an understanding of how to identify hazards and risks to worker safety in your facility and to the environment, relating specifically to refurbishing and recycling[1] used and end-of-life electronic products, using a step-by-step process for risk assessment.

Exhibit 1 shows how the key responsibilities of operating a facility fit within the framework of ESM**,** and where these responsibilities will be covered in the training material. Module 3 (Risk Assessment) is in the quadrant on understanding potential risks to your facility.

Exhibit 1: Key Responsibilities of Operating a Facility within the Framework of Environmentally Sound Management



[1] Note that this module does not cover general occupational health and safety risk assessment information that is important for all sectors; rather it is focused on environmentally sound management aspects of health and safety as outlined in the "Overview of the Training Material" content which precedes Module 1.

3.5 What Is Risk Assessment?

REMINDER: ESM Criterion #2
Risk Assessment:
Identify actual and/or potential hazards and risks to public and worker health and safety and to the environment which are associated with activities, products and services.

Risk assessment is the process where you:[2]

1. Identify occupational and environmental hazards (this module),
2. analyze or evaluate the risks associated with those hazards (this module), and
3. determine appropriate ways to eliminate or control the hazards (Module 4).

Best Practice: Risk assessment should be conducted, at a minimum, on an annual basis and should cover all aspects of the facility's operations. It should include identification of situations or activities that may cause harm to workers (occupational hazard) or the environment (environmental hazard).

Risk assessment is the responsibility of management, but it is important for everyone who works at the facility to know about the process because:

- ✓ it is important for management to consult with employees during a risk assessment, to make sure that all the hazards and risks in different parts of the facility have been identified; and
- ✓ you know your job best and what might be a problem—you can help management identify the risks and hazards that might be present for you and/or other workers.

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[2] Canadian Centre for Occupational Health and Safety, <http://www.ccohs.ca/oshanswers/hsprograms/hazard_risk.html>.

3.5.1 Definitions of Risk and Hazard

What Is Risk?

Answer:

Risk is the chance or probability that a person will be harmed (experience an adverse health effect) or that the environment will be harmed if exposed to a hazard. A risk is expressed as the probability or likelihood of, for example, developing an illness or getting injured or of an environmental spill.

Definition: Risk vs. Hazard

Risk: the chance, likelihood, or probability that a person or the environment will be harmed if exposed to a hazard.

Hazard: the potential source of harm.

What Is a Hazard?

Answer:

A hazard is the potential source of harm to a worker or the environment. There can be occupational hazards or hazards to the environment.

A hazard to the environment**:**

- is the source of potential damage or harm to the environment from: accidental or non-routine industrial releases; routine industrial releases; risks posed by use of chemicals and products; risks during transportation, or specific industrial applications such as contaminated land and land-use planning.

An occupational hazard**:**

- is any source of potential damage, harm or adverse health effects to people at work; and
- can come from a wide range of sources, including any substance, material, process, or practice that has the ability to cause harm or adverse health effect to a person at work.[3]

Example of Hazard and Risk

Let us say you and your co-workers are throwing used computer parts into a big pile. The pile keeps getting bigger and bigger, to the point where it looks like it could fall down any time. In this case, the hazard is the pile of computer parts (one or all could come crashing down at any time and hit someone—this is the potential source of harm). The risk, which is high, is of someone getting hurt.

For Occupational Hazards, What Is an Adverse Health Effect?

Answer:

An adverse health effect is any change in body function or the structures of cells that can lead to illness or other health concerns. Adverse health effects include:

- bodily injury or illness;
- change in the way the body functions, grows, or develops, including effects on children, grandchildren, etc. (inheritable genetic effects);
- decrease in life expectancy; or
- a change in mental condition resulting from stress.

[3] ibid.

Notebook

Facility Check-in

What are some occupational hazards that might exist at a facility like yours?

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Notebook

Facility Check-in

What are some environmental hazards that might exist at a facility like yours?

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3.5.2 *Why Is Risk Assessment Important?*

Risk assessment provides a step-by-step process that helps a facility identify and prioritize actual and potential risks to the public, to worker health and safety, and to the environment. This process helps to lesson potential risks to human health and the environment. It is an important aspect of ESM.

Answer: Risk assessment also forms an integral part of a good health and safety management plan, as it helps to:[4]

- ✓ create awareness of hazards in the workplace,
- ✓ identify who may be at risk (employees, cleaners, visitors, contractors, the public, etc.),
- ✓ determine if existing control measures are adequate or if more should be done,
- ✓ prevent injuries or illnesses when done at the design or planning stage, and
- ✓ prioritize hazards and control measures.

Risks may be present during both normal and abnormal facility operating conditions, including during facility start-up and shut-down routines, equipment repair or maintenance, emergency situations and accidents, and material- and waste-handling practices.[5]

Used and end-of-life electronic products contain more than 1,000 different substances, some of which are hazardous and can cause concerns for human health and the environment. For example, exposures may occur when electronic products are broken or dismantled for parts using methods that change the properties of the components (such as the use of heat to melt or solder), or processed for metal or plastic reclamation using methods such as shredding, grinding, smelting and melting. In addition, some processes may use additives that contain hazardous substances (e.g., arsenic, strong acids and bases, and neutralizing agents) to further refine recovered metals.

Substances found in used and end-of-life electronic products that can make workers sick

Various substances present in used and end-of-life electronic products can make workers sick if proper risk counter measures are not in place, including training, competency and personal protective equipment. The following substances are considered to be hazardous and can enter the body via absorption, inhalation, or ingestion:

Mercury: used in backlighting of liquid crystal display screens and some batteries.

Lead: used in cathode ray tubes as radiation shielding; tin-lead solders; and plastic stabilizers.

Cadmium: used in cathode ray tubes as phosphorescent; some batteries; colour pigments; and plastic stabilizers.

Hexavalent chromium: used in colour pigments, plastic stabilizers, and anti-corrosion treatments.

Brominated flame retardants: used in plastic housings, circuit boards, cables, keyboards.

Beryllium: used in contact clips and springs, and rotating mirrors in laser printers.

[4] ibid.
[5] United Nations Environment Programme (UNEP). Basel Convention. 2011 (Revised). *Environmentally Sound Management (ESM) Criteria Recommendations*. Partnership for Action on Computing Equipment (PACE).

Notes

3.6 How to Conduct an Environment, Health and Safety (EHS) Risk Assessment

3.6.1 Overview of Steps to Conduct a Risk Assessment

Exhibit 2: Risk Assessment Steps[6]

Step 1. Identify the Stages of Operations

- What needs to be assessed? Identify at each stage of operations.
- Document these.

Step 2. Identify the Hazards

- What can go wrong? Identify real or potential hazards by thinking of possible problems at each stage of operations.
- Document these.

Step 3. Assess the Hazard and Exposure to the Hazard (Level of Risk)

- How often is the hazard likely to happen? How could this hazard impact workers, the community or the environment?
- Document the results of the assessment.

Step 4. Identify the Consequence or Effect of the Hazard / Characterize the Risk

- What is the consequence if something goes wrong? Is the risk large? Will the impact be minor or major? Are there long term implications?
- Document the results of the characterization.

Step 5. Evaluate and Prioritize the Risk

- Which risks are the most important to direct resources to risk management?
- Document the results of the prioritization.

The risk assessment process should include the steps described in sections 3.6.2–3.6.6:[7]

Best Practice: The risk assessment process should include documenting, implementing, communicating and maintaining the:

- ✓ roles and responsibilities for risk assessments;
- ✓ procedures to identify, prioritize and assess environment, health and safety hazards associated with new, existing and planned activities; and
- ✓ environment, health and safety risk and hazard information, to reflect changes in operational, environmental or regulatory requirements.

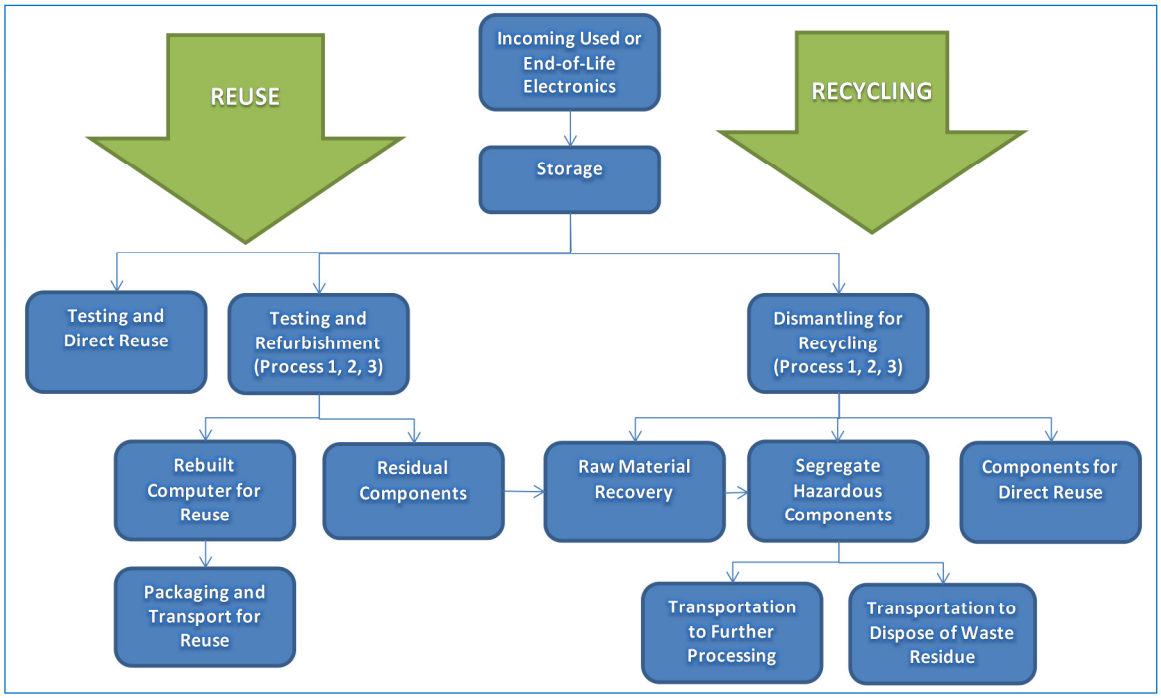
[6] Adapted from: Fairman, R., CD Mead, and WP Williams. 1998. *Environmental Risk Assessment—Approaches, Experiences and Information Sources*. EEA Environmental issue report No 4. Monitoring and Assessment Research Centre, King's College, London. European Environment Agency (EEA).

[7] UNEP. Basel Convention. 2011. *Guideline on Environmentally Sound Testing, Refurbishment & Repair of Used Computing Equipment*. Partnership for Action on Computing Equipment (PACE) Project 1.1.

3.6.2 Step 1 of a Risk Assessment: Identify the Stages of Operations

To identify what needs to be assessed, it is important that the risk assessment team clearly defines the stages of the facility's operations. In the case of e-recycling or e-refurbishing, a good starting point would be to examine the entire operation of the facility as a map, and document all of the processing steps. From this map, the team can examine each process in detail and identify the potential hazards that exist (see Step 2: Hazard Identification). A simplistic example of this map is presented in Exhibit 3, although it is expected that a real map for a real-life facility would be larger, have more detail, and show more processes.

Exhibit 3: Facility Process Mapping to Identify What Needs to Be Assessed



3.6.3 *Step 2 of a Risk Assessment: Identify the Hazards*

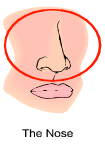
Hazards at a Facility to Workers or to the Environment

At every processing step documented in Step 1, your team should identify potential hazards for Step 2. This includes assessing potential worker exposure to hazardous substances and materials, ergonomic risks, workplace hazards, and the potential for unintended releases to the environment. Hazard identification should be done by a competent team of individuals who have a good working knowledge of hazardous substances and your workplace. At a minimum, supervisors and workers should be involved, and preferably a risk assessment professional as well.

Hazard identification must take into account:[8,9]

- ✓ routine activities (processing, use, handling or storage) and non-routine activities or unusual conditions such as maintenance, repair, shutdown, power outages, or emergencies;
- ✓ the procedures currently used to control exposure by means of engineering controls, work practices, and hygiene practices;
- ✓ knowledge of hazardous substances and their main pathways of contaminating the environment (dust dispersal, or through wastewater);
- ✓ accident/incident/near-miss records;
- ✓ risks to visitors or the public, and groups that may have a different level of risk, such as inexperienced workers, persons with disabilities, or new or expectant mothers; and
- ✓ the actual and potential exposure pathways of workers to hazardous substances.

Inhalation ***Ingestion*** ***Absorption*** ***Eye Exposure***



Example of step 2: hazard identification *prior* to shredding

Many different types of electronic devices contain hazardous components that should be removed prior to shredding, such as cathode ray tubes, batteries, printer cartridges, and mercury lamps. Once shredded, hazardous substances can contaminate equipment and other shredded materials.

Example: Batteries should be removed from electronic devices and motherboards prior to shredding—otherwise workers can be exposed to caustic electrolytes. Shredding lithium-ion cell batteries can also start fires, if unreacted lithium reacts with oxygen in the air or with moisture, generating heat and potentially, hydrogen gas.

OECD. 2003. *Technical Guidance for the Environmentally Sound Management of Specific Waste Streams: Used and Scrap Personal Computers*.

8 Canadian Centre for Occupational Health and Safety, <http://www.ccohs.ca/oshanswers/hsprograms/hazard_risk.html>.

9 Environment Canada. 2004. *Screening level human health and ecological risk assessment for generic e-waste processing facility*. Prepared by MJC & Associates.

Some of the hazards identified at refurbishing and recycling facilities for electronic products are presented in Exhibit 4 and should be addressed in facility risk prevention and management programs (*note that the exhibit excludes generic hazards present at any industrial facility*).

Exhibit 4: Potential Health and Environmental Hazards from Refurbishing/Recycling Facilities that Process Electronic Products:[10]

Area	Hazard to Workers	Hazard to the Environment
Receiving	▪ Exposure to hazardous substances where equipment has broken (e.g., lead, mercury), or hazard from sharps from accidental breakage.	▪ Unintended releases to air from broken equipment (e.g., lead, mercury) are possible. ▪ Soil contamination from spills/breakage.
Testing (Refurbishing Facilities)	▪ Worker exposure to and workplace contamination of hazardous substances via inhalation (e.g., mercury, resulting from accidental breakage of lamps) or ingestion (e.g. lead, cadmium, from accidental breakage of CRTs). ▪ Hazards from sharps from accidental breakage.	▪ Unintended releases to air of contaminants such as mercury from accidental breakage. ▪ Unintended releases to soil of hazardous contaminants such as lead, cadmium or other hazardous substances from accidental breakage.
Operations—Manual and Mechanical Processes	*Refurbishing:* Mainly manual processes. ▪ Exploding capacitors as a result of upgrading computer capacity. ▪ When replacing mercury-containing liquid crystal display screen lights during refurbishment, workers may be exposed to mercury via inhalation. *Recycling*: Manual and mechanical processes. ▪ Shredding: Shredding operations produce hazardous dusts. Workers may be exposed via inhalation or ingestion if protective equipment is not worn, or from inadequate handwashing. ▪ Shredding: If batteries are not removed prior to shredding, they can release caustic substances and may cause electrical short circuits and fires, which are hazardous to workers.[11] ▪ Smelting: Heating processes can cause air emissions such as metal fumes and metal oxide particulates, (e.g., beryllium or cadmium, from batteries), as well as particles of incomplete combustion (PAHs), and generation of dioxins and furans from plastics or circuit boards that contain brominated flame retardants (BFRs), and may expose workers and downwind communities via inhalation. ▪ Metallurgical: Substances, such as cyanide, that may be added in some recovery processes are hazardous to worker health when ingested.	▪ Shredding: Shredding operations can produce hazardous dusts. Local communities may be exposed via inhalation or ingestion through local contaminated plants and animals. ▪ Smelting: Heating processes can cause air emissions such as metal fumes and metal oxide particulates, (e.g., beryllium or cadmium, from batteries), as well as particles of incomplete combustion (PAHs), and generation of dioxins and furans from plastics or circuit boards that contain brominated flame retardants (BFRs), and may expose local communities via inhalation, and plants and animals via ingestion from airborne deposition. If slag from smelting is re-smelted via precipitation or leaching, it can generate wastewater with toxic metals, which could contaminate local surface water if improperly managed.[12] Disposal of slag in landfill can also be hazardous if it has not been rendered stable. ▪ Granulating Plastics: Halogenated compounds containing chlorine and bromine are present in plastics. If burned they can form airborne dioxins and furans, which are persistent environmental pollutants that accumulate in air, water and soil. Dioxins and furans are toxic and can cause reproductive and developmental problems in humans and animals.

[10] *Sources*: United Nations Environment Programme (UNEP). Basel Convention. 2011. *Guideline on Environmentally Sound Testing, Refurbishment & Repair of Used Computing Equipment*. Partnership for Action on Computing Equipment (PACE) Project 1.1.
UNEP. 2007. *E-waste. Volume I: Inventory Assessment Manual*. International Environmental Technology Centre.
Environment Canada. 2004. *Screening level human health and ecological risk assessment for generic e-waste processing facility*. Prepared by MJC & Associates.

[11] UNEP. Basel Convention. 2009. *Guideline on the Refurbishment of Used Mobile Phones*. Mobile Phone Partnership Initiative (MPPI) Project 1.1.

[12] Concentrations of arsenic, chromium, lithium, molybdenum, antimony, selenium, beryllium, silver, cobalt, cadmium, copper, nickel, lead and zinc have been documented in rivers and reservoirs near electronic waste processing facilities that do not practice ESM.

Exhibit 4 (Continued)

Area	Hazard to Workers	Hazard to the Environment
Equipment Maintenance via Manual Labour	▪ Workers may be exposed to hazardous substances in cleaners and/or dust via inhalation or ingestion via skin contamination.	▪ Local air emissions may result from poor air containment from cleaning operations, or improper maintenance of air containment controls.
Material and Waste Handling	▪ After material separation processes, waste material must often be handled manually and properly packaged for transport to final processing or disposal. Hazardous substances that could enter the body at this stage via absorption, inhalation, or ingestion if improperly handled include, for example: mercury, lead, cadmium, hexavalent chromium, brominated flame retardants, or beryllium.	▪ Local air emissions of hazardous substances if proper air containment, spill containment, and wastewater management are not in place during material handling/holding.[13]
Storage / Holding	▪ After waste material is properly packaged it is typically held in a holding area until enough material is accumulated for viable transport. Holding areas could expose workers to accidental inhalation or ingestion via skin contamination, with hazardous substances that are not packaged and stored properly.	▪ Indoor or outdoor holding/storage areas may leach hazardous substances from electronic waste or components (e.g., batteries), which could contaminate soil, groundwater or surface water if non-pervious flooring and spill containment does not exist. ▪ Holding areas used to store removed mercury lamps prior to transport to mercury recovery facilities may result in unintentional releases of mercury vapor to air, which could contaminate workers and the local environment.
Downstream	▪ To conform with the principle of ESM, refurbishers and reyclers that process electronic products should also take reasonable care to ensure that any downstream processors and transport providers that they do business with also have suitable risk prevention and management programs in place. ▪ Further detail presented in following pages.	

Why is exposure to these substances so hazardous for workers?

Answer: Exposure to these substances can make you very sick if appropriate risk counter measures are not in place. Workers exposed to heavy metals and other toxic substances can develop serious and life-threatening illnesses and diseases (e.g., lead or mercury poisoning, berylliosis, etc.).

How is the environment affected by these substances if they are released?

Answer: Hazardous substances that may be released from processing used and end-of-life electronic products may contaminate air, land and water. Many contaminants are able to migrate far outside the facility and can be ingested by plants and animals.

[13] Hazardous substances such as mercury, lead, cadmium, chromium, and beryllium are toxic to plants and animals and even a small amount can contaminate entire ecosystems through air deposition to soil and surface water, and accumulation in animals and vegetable matter.

How should the hazards be documented?

Answer:

The following is a sample of a hazard identification form,[14] which can be customized for your needs at your workplace. One of these could be completed for each process being assessed during the risk assessment.

Exhibit 5: Sample Hazard Identification Form

Name of person doing assessment:	
Date:	
Activity/Procedure being assessed (1):	
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?	
References (if applicable):	
Signature of assessor:	

[14] Canadian Centre for Occupational Health and Safety, <http://www.ccohs.ca/oshanswers/hsprograms/sample_risk.html>.

3.6.4 Step 3 of a Risk Assessment: Assess the Hazard

What should be examined to assess the hazard?

Answer:

To assess the hazard and determine its level of risk (severity of harm), you may wish to consult the expertise of an occupational health and safety professional. The following should be considered when assessing hazards at the workplace:[15]

- environmental and occupational health and safety legal requirements,
- industry codes of practice/best practices,
- information about previous injuries, illnesses, “"near misses,” accidents and emergency situations,
- location and management of hazardous processing activities, materials, and components,
- observations and recommendations of workers to eliminate or reduce hazards at the workplace,
- potential routes of hazard transport, where substances like lead and mercury may accumulate in work areas or be transported to other areas (e.g., lunchroom, washrooms, home), and
- results of testing (e.g., emissions, discharges, air sampling, blood testing, etc.).

Example of Step 3: Hazard Assessment

—Tips for Risk Assessors—

When assessing potential hazards or exposure, also consider infrequent or accidental releases, such as the breakage of mercury-containing lamps and cathode ray tubes during shipment unloading and processing, which can also pose significant risks to worker health and safety during acute or chronic exposure.

Since airborne contaminants can pose hazards through other routes of entry, such as contact with eyes and absorption through skin, you should consider and evaluate all potential routes of entry and associated hazards from airborne particles, not just inhalable dusts.

Electronics Product Stewardship Canada (EPSC). (2010). *Recycler Qualification Program for End-of-life Electronics Recycling*. Guidance manual.

Remember to include factors that contribute to the level of risk, such as:

- work environment (layout, general housekeeping, accident- prone areas, etc.), and
- worker skills and competency and use of personal protective equipment.

[15] Canadian Centre for Occupational Health and Safety, <http://www.ccohs.ca/oshanswers/hsprograms/hazard_risk.html>.

Assess the Hazard and Exposure to the Hazard (level of risk) (Step 3, Continued)

Is there a methodology for assessing the hazard?

Answer: It is important to identify the level of risk by thinking about the consequences or effects of the hazards that you have identified.

Exhibit 6 presents one example of how you can document the level of risk, also called severity of harm. When you document the level of risk, consider whether the impact would be:[16]

1. slightly harmful (e.g., superficial injuries; minor cuts and bruises; nuisance and irritation; ill-health leading to temporary discomfort; easily contained environmental spill localized on site);

2. harmful (e.g., short-term illness with potential for full recovery; burns; concussion; dermatitis; asthma; ill-health; non-hazardous emission to the air or water; etc.); or

3. extremely harmful (e.g., poisonings; multiple injuries; fatal injuries; occupational cancer; acute fatal diseases; other severely life shortening diseases; blindness; release of hazardous substances to air, soil, or water which cannot be easily cleaned up; etc.).

An example of a hazard has been included in the first row of Exhibit 6.

Exhibit 6: Example of Level of Risk[17]

Hazard	Level of Risk / Severity of Harm		
	Slight Harm	Moderate Harm	Extreme Harm
Hazard 1: When equipment arrives at my facility, workers in the receiving area are sorting equipment so fast that often equipment is not secured properly and breakage happens. Often, the breakage includes cathode ray tubes or LCD monitors.			√
Hazard 2 (Describe)		√	
Hazard 3 (Describe)			√
Hazard 4 (Describe)	√		

[16] Adapted from Canadian Centre for Occupational Health and Safety, <http://www.ccohs.ca/oshanswers/hsprograms/hazard_risk.html>.

[17] *Source*: British Standards Organization, as cited in Canadian Centre for Occupational Health and Safety, <http://www.ccohs.ca/oshanswers/hsprograms/hazard_risk.html>.

Group Discussion

Take another look at Exhibit 4: Potential Health and Environmental Hazards from Refurbishing/Recycling Facilities that Process Electronic Products. As a group, go through the table and talk about what the level of risk might be for many of the hazards.

3.6.5 Step 4 of a Risk Assessment: Identify Consequences of the Hazard / Characterize the Risk

How do you characterize the risk?

Answer:

It is important for your team to characterize the risk by thinking about the consequence or effect of the hazards that you identified (level of risk) in combination with the potential occurrence. Although there is no one way to characterize risk, Exhibit 7 presents an example of how you can integrate the potential occurrence into the table using the following scale:

Very Likely—Typically experienced at least once every six months

Likely—Typically experienced once every five years

Unlikely—Typically experienced once in 5–10 years

Very unlikely—Less than 1% chance of being experienced

Exhibit 7: Example of Characterizing Risk[18]

Hazard	Likelihood of Harm / Potential Occurrence	Level of Risk / Severity of Harm		
		Slight Harm	Moderate Harm	Extreme Harm
Hazard 1 (Describe)	Very unlikely	√		
Hazard 2 (Describe)	Unlikely		√	
Hazard 3 (Describe)	Likely			√
Hazard 4 (Describe)	Very likely	√		

[18] ibid.

Group Discussion

Again, go back to Exhibit 4: Potential Hazards to Health and the Environment from Refurbishing/Recycling Facilities that Process Electronic Products. As a group, go through the table and talk about what the potential occurrence (likelihood of harm) might be for many of the hazards.

In a group, fill out a sample Hazard Identification Form from Exhibit 5, also below.

Sample Hazard Identification Form

Name of person doing assessment:	
Date:	
Activity/Procedure being assessed (1):	
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?	
References (if applicable)	
Signature of assessor:	

3.6.6 Step 5 of a Risk Assessment: Evaluate and Prioritize the Risk

How do we prioritize risks?

Answer:

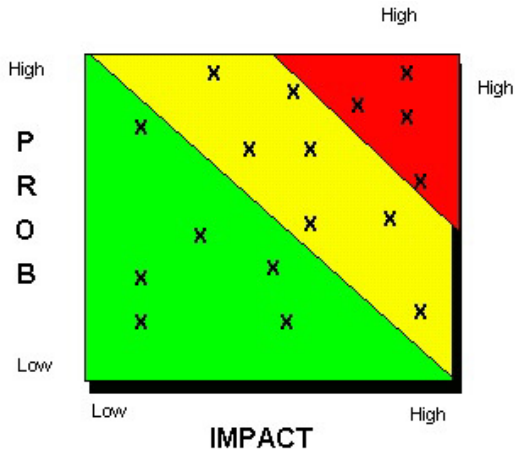
There is no single way to prioritize hazards. Ranking hazards requires knowing about the workplace activities and being able to show objective judgement. One option is to use the table already prepared (from Step 4) and identify which cells have extreme harm identified and are *also* ranked as likely or very likely in potential occurrence—with these hazards prioritized. Exhibit 8 presents one example of this method.

Exhibit 8: Example of Risk Prioritization – Chart Checklist

Hazard	Likelihood of Harm / Potential Occurrence	Level of Risk / Severity of Harm		
		Slight Harm	Moderate Harm	Extreme Harm
Hazard 1 (Describe)	Very unlikely	√		
Hazard 2 (Describe)	Unlikely		√	
Hazard 3 (Describe)	Likely			√
Hazard 4 (Describe)	Very likely	√		

A second example of a methodology is to plot the results on a grid. The X-axis along the left is the *probability or frequency*; and the Y-axis along the bottom right is the *severity of harm*. Moving from bottom to top of the probability scale is from low to high probability, and moving from left to right along the impact scale is from low impact to high impact (severity). The risks are plotted on the grid individually. Following, any risks that show up in the upper right area of the grid (both high probability and high impact) should be priority.

Exhibit 9: Example of Risk Prioritization—Grid Plot



Summary and Checklist – Risk Assessment Process

Step	What to do
Step 1. Identify the Processes	❒ Figure out what to assess: map the facility operations and document the processing steps.
Step 2. Identify the Hazards	❒ Identify potential hazards for each processing step from Step 1.
Step 3. Assess the Level of Risk	❒ For each hazard, ask yourself whether the impact of the hazard would be *slightly harmful, harmful*, or *extremely harmful.* ❒ Document the level of risk in a chart.
Step 4. Characterize the Risk	❒ For each hazard, ask yourself whether the harm is *very likely, likely, unlikely,* or *very unlikely.* ❒ Document the potential occurrence in a chart.
Step 5. Evaluate and Prioritize the Risk	❒ Management ranks or prioritizes the hazards. ❒ Look at which hazards show *extreme harm,* and be *likely* or *very likely* to happen.

What happens after risks are prioritized?

Answer:

They are eliminated or minimized. The risk assessment process gives managers increased capacity to manage identified risks. The process enables managers to: know more about the risks in their facilities; know more about the scope, magnitude and likelihood of these hazards and risks; and ensure that all reasonable care is taken to prevent, minimize or otherwise address identified hazards and risks.

For more information on risk minimization, see Module 4

Group Discussion

What were some of the challenges that your group experienced when you went through the risk assessment process (i.e., identified hazards, level of risk, and potential occurrence)? How could these challenges be dealt with in the workplace?

Notes

3.7 Summary—Key Take-away Messages

The Risk Assessment Process:

- ✓ It is important to identify and assess risks relating to direct facility activities, operations and services.
- ✓ Used and end-of-life electronic products contain hazardous substances such as lead, mercury, cadmium, and beryllium. Other hazardous substances, such as dioxins and furans, are formed during recycling operations. All hazardous substances can pose hazards to worker health and safety, the local community, and the broader environment, and are important to identify and consider during the risk assessment process.
- ✓ The Risk Assessment process includes five steps:

  Step 1. Identify the stages of operations

  Step 2. Identify the hazards

  Step 3. Assess the hazard and exposure to the hazard (level of risk)

  Step 4. Identify the consequence or effect of the hazard / characterize the risk

  Step 5. Evaluate and prioritize the risk
- ✓ To ensure ESM, risks are prioritized during the risk assessment process, and then eliminated if possible, or minimized when they cannot be eliminated.

Notebook

Please check off which of the following risk assessment measures your facility has in place.[19] Then, write some notes in the right-hand column on what you think could be a priority for action.

Risk Assessment: Putting the Training into Practice	
How can you apply risk assessment to your work?	**Key items to apply to your job**
❒ Are you a part of risk assessment at your facility?	•
❒ Knowing more about hazards to health, to the community and the environment related to processing electronic products, can you do your job any differently?	•
❒ Could you help your facility assess risks in the interest of minimizing them and make your workplace safer?	•
	•

[19] UNEP. Basel Convention. 2011 (Revised). *Environmentally Sound Management (ESM) Criteria Recommendations*. Partnership for Action on Computing Equipment (PACE).

3.8 Post-questionnaire

1. Were the questions you had about risk assessment answered (see Pre-questionnaire, Question #1) If not, what questions do you still have?

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_____

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2. Check back on how you said you were involved in the risk assessment process at your facility (Pre-questionnaire, Question #3). What other ways could you contribute to it?

_____

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3.9 Additional Resources

- **Canadian Centre for Occupational Health and Safety** website: <http://www.ccohs.ca/>. Available online: downloadable posters on health and safety and WHIMIS fact sheets.
- **US Occupational Safety and Health Administration** website: <http://www.osha.gov/>. Available online: written programs and examples to meet the state regulations; hazardous materials training and other training materials; resources for small businesses, etc.
- **Autogestión en Seguridad y Salud en el Trabajo** website: <http://autogestion.stps.gob.mx:8162/>. Available online: written programs, examples, norms, training materials, Q&A, etc.
- **International Labour Organization** website: www.ilo.org. Training materials: <http://www.ilo.org/safework/info/instr/lang--fr/nextRow--20/index.htm>.
- **Injury and Illness Prevention Program, University of California, Berkley**. Office of Environment, Health and Safety. Examples of worksheet for hazard identification: <http://www.ehs.berkeley.edu/images/ehs/iipp/iippform1.pdf>.
- **Injury and Illness Prevention Program, University of California, Berkley**. Office of Environment, Health and Safety. Examples of worksheet for safety assessment: <http://www.ehs.berkeley.edu/images/ehs/iipp/2012_iipp3shopselfinsp.pdf>.
- **Health and Safety Ontario**. Tips for Conducting a Hazard Assessment: <http://www.healthandsafetyontario.ca/Resources/Articles/WSPS/9-tips-on-conducting-a-hazard-assessment.aspx>.