Michigan Technological University

TECHNICAL GUIDE: HAZARD ANALYSIS - Using the Hazard Identification Checklist

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SCOPE:
Applies to anyone involved with hazardous procedures or materials.

CONTENTS:

REGULATIONS:
Michigan Technological University requires that a hazard analysis be conducted prior to engaging in potentially hazardous operations or using potentially hazardous materials, in compliance with MIOSHA standards 1201, 1212 and OSHA recommended practices.

DEFINITIONS:
A **Hazard** is anything that has the potential to cause harm, injuries, accidents or other undesirable effects.

A **Risk** is the possibility that a personal injury, property loss or environmental harm will occur when working with or near a hazard. When identifying the risks associated with a hazard it is important to think about the specific types of injuries, loss or harm that the hazard may cause.

PROCEDURES:
A hazard analysis or job safety analysis is required whether engaging in research or workplace activities involving hazardous materials or procedures. The Hazard Identification Checklist* is designed to help you recognize hazards and guide you through a hazard analysis process consisting of five basic steps.

1. Identify the tasks
2. Determine the hazards
3. Identify the risks
4. Developing the list of controls
5. Create safe working procedures

Step 1 Identify the tasks: Develop a list of tasks that are performed as part of your research. After identifying the task, the Hazard Identification Checklist will help you determine if there are any hazards associated with the tasks you have identified.

Step 2 Determine the hazards: The checklist is an interactive form that includes a list of nine basic hazard categories with brief descriptions of some of the typical hazards in associated with each category. When a box is checked for a category, the form will open and ask for information about the hazard. You will need to identify risks that are associated with the hazard and subsequently controls that will be used to minimize those risks.

Step 3 Identify the risks: If you are not already familiar with the risks associated with the hazards you will be working with, you will need to do some background research. Safety resources include:

- MIOSHA regulations
- NIOSH recommendations
- Safety Publications from professional organizations
- Equipment and tool operating/instruction manuals
- Safety Data Sheets for chemicals and other hazardous materials.
- Safety information for hazardous processes.
- Safety officers associated with sponsoring organizations
- MTU office of Environmental Health and Safety

Use the Risk Rating Table to evaluate the likelihood and the consequences of a hazard causing personal injury, property loss or environmental harm. Although risk rating is in part a subjective exercise, it is important to recognize personal bias and the tendency to minimize risk and its consequences. For these reasons, a thorough understanding of the hazards and risks associated with the work is essential.

Risk Rating Table[1]

Severity of Consequences: Personal Injury, Property Loss, Environmental Harm

Likelihood of Occurrence	No Injuries, loss or harm.	Minor injuries possible	Moderate to life changing injuries possible	Life threatening injuries are possible from a single exposure incident
Almost Certain	Low	High	Unacceptable	Unacceptable
Likely	Low	Medium	High	Unacceptable
Possible	Low	Medium	High	High
Very unlikely	Low	Low	Medium	High

Step 4 Develop a list of controls: When developing the list of possible controls, think about things you can do that will reduce the likelihood and consequences of a risk causing personal injury, property loss or environmental harm. It may be useful to ask these questions:

- What can go wrong with the process, the equipment, or in the environment where you are working?
- How could it happen? What conditions could cause something to go wrong? (eg. loss of power, control failure, lack of training, etc.)
- How likely is it to happen?
- What can you do to prevent these things or make them less likely to occur?
- Is there a different way to complete the task that does not involve the hazard?
- What are the ways to protect yourself from the hazards you have identified?
- What will you do if something goes wrong?

NOTE: When working with chemical hazards, the answers to many of these questions may be found by referring to the Safety Data Sheet for the chemical. mtu.edu/sds.

As you develop the list of controls that can be used to eliminate or minimize the risk, it is important to understand that some controls are more effective than others at eliminating or minimizing risk. Use the Hierarchy of Controls table below to evaluate the effectiveness of the controls you plan to use.

Hierarchy of Controls

Most Effective	**Eliminate the Hazard:** Design the hazard out of your project plans; use alternative work procedures; etc.
	**Substitution:** Use a less hazardous material or find a less hazardous way to do the work.
	**Engineering Controls:** any device that is used to prevent contact with or exposure to the hazard (e.g. chemical fume hoods; guards on saws, fans, belts, pulleys, and other moving parts; barriers; splash shields; safety interlocks and other lockout devices).
	**Administrative Controls:** rules, regulations, warning signs, training, safe working procedures, and emergency response procedures are all used to define hazards and describe methods for minimizing the risk for injuries and accidents.
Least Effective	**Personal Protective Equipment (PPE):** appropriate clothing and footwear, gloves, safety glasses, face shield, welding mask, lab coat, protective apron, and anything else you wear or put on your body to provide additional protection. Best if used in combination with engineering controls. Respirators or dust masks may only be worn with approval from EHS.

Emphasis should always be placed on the most effective methods for reducing risk. The least effective controls are often considered as only supplemental or back-up measures for reducing risk. For example, you should never rely on wearing a respirator (PPE) for protection from chemical fumes when you can virtually eliminate the risk by using a chemical fume hood (engineering control).

Do the controls you have outlined, effectively reduce the likelihood and the consequences of these event occurring?

Risk Rating Action Table

Hazard Risk Rating	Action
Unacceptable	**STOP! Additional controls are needed before this work can be performed. Contact EHS for assistance**
High	**Additional controls recommended to reduce risk. Contact EHS for assistance. A trial run without the hazard is required to test your experimental design.**

Medium	**Perform work using controls as outlined. A trial run without the hazard is recommended to test your experimental design.**
Low	**Perform work using controls as outlined**

Step 5. Creating a safe working procedure. As the final step in the hazard analysis process, you will need to use the information that you entered on the hazard identification checklist to create a written safe working procedure. Your procedure should identify the hazards and risks associated with your project and provide details about the controls you will use to minimize the risks. For example, if training will be used as a method to reduce risk, you should include a list of the information that must be covered in the training. Similarly, if you are working with hazardous materials or working in hazardous places your procedure should provide a detailed description of how to safely perform the work. Your safe working procedure should provide step by step instructions for safely completing the task. Safe working procedure template.**

Procedures with a medium or high level risk rating should be validated by performing a trial run. During the trial run, hazardous materials used in the experiment may be substituted for non-hazardous materials or the size of the experiment scaled down. The trial run will help you familiarize yourself with the equipment and the performance of each step of the procedure. Evaluate what went well, and what did not go as planned. Were there any unanticipated problems? close calls? Are refinements needed? Modify your procedure accordingly based on the results of the trial run.

After the Hazard Analysis:

After the hazard analysis is complete and work on the project begins, research team members should continue to work closely as a group to ensure each other's safety. Learn to recognize and eliminate at-risk behavior (a leading cause for injury, accidents) such as: bypassing established safety practices to "save time" or "doing it an easier way;" not wearing safety glasses and other PPE; complacency resulting in unsafe work practices; poor housekeeping; scaling up a reaction without adequate preplanning; not using safety hoods, machine guarding or other engineering controls.

Continuously evaluate safety. What is going well? What could be done better? Are there any close calls that indicate areas for improvement?

If incidents occur, the research group should focus on learning from the experience and identifying additional controls and work practices that will ensure it does not reoccur. Report incidents and seek input from others on appropriate corrective actions.

COMPLIANCE:

In addition to the hazard analysis approach described in this document, the following hazard analysis approaches are some options for compliance with this requirement.

Link to the Hazard Identification Checklist

JSA document Chris is working on

American Chemical Society (ACS) Ways to conduct a hazard assessment: What if analysis, Job Hazard Analysis, Checklists, Standard Operating Procedures, Control Banding.

Chemical hygiene plan link (SOP link, chapter 2?)

FOR ADDITIONAL ASSISTANCE:

Contact EHS, safety liaisons, cho's, etc…. Someone please find a way to say this better…. Campus safety resources...

REFERENCES/SUPPORTING DOCUMENTATION:

1 Risk Rating Table is adapted from: https://www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/hazard-assessment.html and https://ehs.stanford.edu/wp-content/uploads/Laboratory-Risk-Assessment-Tool.pdf

*Hazard Identification Checklist: https://www.mtu.edu/ehs/docs/hazard-identification-checklist.pdf

**Safe Working Procedure Template: http://www.mtu.edu/ehs/docs/safe-working-procedure.pdf

Job Hazard Analysis: https:/www.osha.gov/Publications/osha3071.pdf

Risk Assessment: http://www.ccohs.ca/oshanswers/hsprograms/risk_assessment.html.

Hazard and Risk: http://www.ccohs.ca/oshanswers/hsprograms/hazard_risk.html

Hazard Control: http://www.ccohs.ca/oshanswers/hsprograms/hazard_control.html

Prudent Practices in the Laboratory: http://download.nap.edu/cart/download.cgi?&record_id=12654

Identifying and Evaluating Hazards in Research Laboratories: ACS committee on Chemical Safety

ACS website Hazard Assessment in Research Laboratories: https://www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/hazard-assessment.html