# Hazard Analysis

## Using the Hazard Identification Checklist

The Hazard Identification Checklist is designed to help you recognize hazards that may be associated with your research and guide you through a process known as **Hazard analysis**. The process usually involves five steps:

1. Identify the specific tasks that must be completed to reach your project goals.
2. Determine if there are hazards associated with completing these tasks.
3. Identify the risks connected with the hazards.
4. Develop a list of controls (things you can do) to eliminate or minimize the risks.
5. Create a safe working procedure that describes how you will safely complete each task.

Some simple definitions and an example may help you better understand this process:

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

**A Risk** is the possibility that personal injury, property loss or environmental harm will occur when working with or near a hazard.

**The goal of hazard analysis is to find ways to minimize the chance of injury, loss or harm while you are working on your project.**

As an example, imagine that using a drill press to drill holes through several steel bars is one of the tasks you have identified in step 1 above.

After identifying the specific task(s), the Hazard Identification Checklist will help you determine if there are any hazards associated with the task. The checklist is an interactive form that includes a list of nine basic hazard categories with brief descriptions of hazards that you may encounter while working on a student project. In this example, you decide that the ***Mechanical*** category, which includes ***Power Tools and Equipment*** is the best choice. After checking the appropriate boxes, the form will open a series of questions to guide you through the remaining four steps of the process.

Step 2. Your response to the first question indicates that the primary hazard associated with this task is the **drill press** that you will use to drill holes through the steel bars.

Step 3. "**What are the risks…?**" To answer this question, if you are not already familiar with the risks, it is recommended that you do a quick internet search. Using the phrase "drill press injuries," you find an OSHA site that summarizes 137 accidents involving drill presses. Reading the accident summaries you learn that accidental contact with the rotating bit or being struck by a work piece that was not properly secured can result in entrapment, broken bones, dislocations, amputations and death.

Step 4. "**Describe controls….to minimize these risks.**" You come up with the following list of controls to minimize the possibility of accidental contact with the bit or being struck by an unsecured work piece:

- Work pieces must be securely clamped to the table or held in a vise while drilling.
- Training is required before operating the drill press.
- Do not wear loose clothing, gloves, or jewelry while operating the drill press.
- Long hair must be covered with a hat or styled to prevent contact with the rotating bit.
- Safety glasses must be worn when operating the drill press.

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 completing the task as well as instructions for completing the project safely.

## Performing a Hazard Analysis

It is very important that all members of the project team participate in the hazard analysis process. Team members are also encouraged to work closely with their advisor and others in the department or at the university with knowledge, information or experience with the work they are planning. The perspective, insight, and experience of many contributors will help ensure that hazards and risks associated with your project are not overlooked, or underestimated. Other safety resources that should be consulted include:

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

When identifying the risks associated with the hazard (step 3 above) and when developing the list of possible controls (step 4 above), 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?
- What are the chances that something can go wrong?
- What conditions could cause something to go wrong? (e.g. loss of power, control failure, etc.)
- What are the consequences if something does go wrong?
- 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 (step 4), 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.

## After the Hazard Analysis:

After the hazard analysis is complete and work on the project begins, 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 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.

| 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, 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 a wearing a respirator (PPE) for protection from chemical fumes when you can virtually eliminate the risk by using a chemical fume hood (engineering control).

### For additional information see

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

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

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

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

Prudent Practices in the Laboratory: 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:
www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/hazard-assessment.html