UMBC OFFICE OF ENVIRONMENTAL SAFETY AND HEALTH (ESH) PROCEDURE	**TITLE:** **Hazard Identification and Control**
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I. PURPOSE

The purpose of this procedure is to establish guidelines for University leadership, management, faculty, and staff to identify actual and potential workplace hazards, and to provide a framework for implementing measures to effectively control hazards that are identified, as part of a comprehensive and effective safety management program.

This procedure seeks to further the University mission of providing a workplace and a learning community that is free from recognized and foreseeable safety and health hazards, in compliance with Occupational Safety and Health Administration (OSHA) and all other applicable regulations and standards.

II. SCOPE

Applies to all UMBC faculty and staff, including student employees.

Contractors shall be expected to perform all work on University property and equipment in alignment with their respective employers' policies and procedures, and in accordance with regulatory requirements.

III. PROCEDURE

Introduction

One of the most important elements in having a safe and healthy workplace is having a clearly defined process for identifying and controlling workplace hazards.

Effective safety management, including identifying and controlling hazards, involves a shared responsibility for safety among all employees at all levels of the organization.

Without a culture of shared responsibility for safety, employees face a higher risk of injury and illness, and organizations are often forced to be reactive when correcting safety issues, rather than be proactive in identifying and correcting safety hazards before they lead to an incident. Referring to the tools outlined in this procedure will help to ensure that safety concerns are identified, assessed, and controlled in a collaborative and proactive manner.

Hazard Control Cycle

Effective hazard control follows a four-step process:

Step 1: Identify Hazards

The first step in the process is to identify the hazards involved with the work being conducted that could lead to harm.

The hazard identification process can be formal or informal and can involve things such as (but not limited to):

- Reviewing the equipment, tasks/activities and materials involved in the work;
- Reviewing past experiences, such as past incidents and near-misses;
- Reviewing publicly available information on incidents and near-misses from other organizations, particularly similar ones.

Types of Hazards

Hazards can generally be placed into one of the following categories:

- Physical Hazards
    - Physical hazards are hazards that have an adverse physical or physiological effect on the body and are typically able to be detected through senses, such as through physical contact. Common types of physical hazards include:
        - Musculoskeletal (Ergonomic)
            - Hazards from ergonomic factors such as force, repetition, vibration, and awkward postures. This commonly derives from poorly designed or arranged equipment.
        - Environmental
            - Hazards stemming from a factor in the environment such as heat and cold, noise, humidity, severe weather, as well as radiation.
        - Mechanical
            - Hazards that stem from physical action of machinery, tools, or equipment or their accompanying materials, such as entanglement, pinch points, crushing, friction, cutting, contact with moving parts or flying objects, and caught in/caught between hazards.
        - Electrical
            - Hazards from contact with live/energized electrical parts or electric current, including shock, electrocution, and burns.
        - Slips, Trips, and Falls
            - Hazards from slippery surfaces, uneven, unlevel or cracked surfaces, or obstacles and obstructions.
- Chemical Hazards
    - Hazards from chemicals that can lead to adverse health effects, including toxicological, carcinogenic, mutagenic, or irritating effects. Chemicals can exist in many different forms, including solids, liquids, dusts, fumes, mists, gasses, and vapors. Primary routes of chemical hazard exposure are through inhalation, absorption, or ingestion.

- Biological Hazards
    - Hazards stemming from plant and animal agents, as well as microorganisms such as viruses, bacteria, mold, fungi, or parasites. Examples of hazards include toxicological and irritating effects. Common routes of exposure include inhalation, ingestion, and injection (such as a contaminated needlestick).

Step 2: Assess the Risk

Once hazards are identified, the next step is to assess the level of risk for each hazard. A risk assessment involves considering the potential impact or consequences of someone being exposed to an identified hazard.

The goal of a risk assessment is to provide a framework for decision-making for the employer when deciding which hazard controls to implement and how to implement them.

Essentially, a risk assessment seeks to determine:

- The types of harm that exposure to the hazard could cause
- The severity of the harm
- The likelihood of the harm occurring
- Whether any existing control measures in place are effective at controlling the hazard

Generally, the level of risk increases as the likelihood of harm and its severity increases. Factors such as how often the work is performed (daily, weekly, monthly), the amount of people involved in the work, the work duration, and the conditions in which work is completed, are all involved in determining the overall level of risk from the hazard.

Other factors that contribute to risk may include the experience level of the employees, if the work involves multiple work groups, such as employees and outside contractors, and the time of day the work is performed - for example, less experienced employees or work being performed at night may pose a greater risk due to inexperience or fatigue.

Risk assessments should be documented whenever possible, and should always be documented for work that falls under the following categories:

- There is a moderate to high risk of harm
- A new task or process is introduced, or a significant change is made to an existing task or process, such as new or modified equipment, chemicals, or other hazardous substances.

- The task or work is complex, presents many hazards, or involves multiple stages, phases, or workgroups.
- When required by legislation (such as OSHA) or by accrediting or administrative bodies.

Two examples of commonly used risk assessment tools are the 5x5 Risk Matrix, and the. Job Hazard Analysis. Templates of both types of assessments are provided as appendices to this procedure for organizational use.

- Note: This is not an exhaustive list of risk assessment formats. The examples provided in this procedure are not intended as a replacement for any existing risk assessments currently required by existing UMBC or departmental policy or procedures, regulatory requirements, or as required by administrative or accrediting bodies.

Example A: The "5x5" Risk Matrix

The 5x5 (five by five) Risk Matrix is a simplified version of the quantitative risk assessment. It can be used to objectively score risks based on severity and likelihood of occurrence using a 5 point scale. The 5x5 method provides an easy to follow visual representation of risk levels, and reduces the need to conduct time-consuming quantitative analyses.

With the 5x5 Risk Matrix, risks are calculated and assigned a score based on the formula: ***Likelihood x Severity = Risk Score.*** The higher the score, the greater the risk.

- Likelihood Points (1 being the least likely, 5 being the most):
  - **1 - Very Unlikely**– unlikely to happen and/or have minor or negligible consequences
  - **2- Unlikely** – possible to happen and/or to have moderate consequences
  - **3 - Fairly Likely/Possible**– likely to happen and/or to have serious consequences
  - **4 - Likely** – almost sure to happen and/or to have major consequences
  - **5 - Very Likely** – sure to happen and/or have major consequences
- Severity Points (1 being the least severe, 5 being the most)
  - **1- Insignificant/Negligible**– won't cause serious injuries or illnesses
  - **2 - Minor** – can cause injuries or illnesses, only to a mild extent

- **3 - Moderate** – can cause injuries or illnesses that may require medical attention but limited treatment
- **4- Major** – can cause irreversible injuries or illnesses that require constant medical attention
- **5 - Fatal/Catastrophic** – can result in fatality or catastrophic harm.

			Severity				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Catastrophic
LIKELIHOOD	1	Very Unlikely	1. Acceptable	2. Acceptable	3. Acceptable	4. Acceptable	5. Acceptable
	2	Unlikely	2. Acceptable	4. Acceptable	6. Adequate	8. Adequate	10. Tolerable
	3	Fairly Likely	3. Acceptable	6. Adequate	9. Adequate	12. Tolerable	15. Tolerable
	4	Likely	4. Acceptable	8. Adequate	12. Tolerable	16. Tolerable	20. Unacceptable
	5	Very Likely	5. Acceptable	10. Tolerable	15. Tolerable	20. Unacceptable	25 Unacceptable

Example of the 5x5 Risk Matrix pictured above.

Final Risk Score

Once the points for severity and likelihood are determined, they are multiplied to get the final risk score, or risk rating. As seen in the above photo, the lowest score possible is 1 (1 Severity x 1 Likelihood) for the lowest risk, and the highest score possible is 25 (5 Severity x 5 Likelihood), reflecting the highest risk.

Interpreting Risk Scores

Once each hazard is given a risk score, they should be ranked in order from highest risk to lowest risk. The highest risk hazards should be given the highest level of attention when determining the priority of addressing each hazard, and when determining the type of controls to be implemented, ensuring that the most effective controls, and the associated resources needed to implement them, go to the highest risk hazards.

Hazard Control Plan

The final phase of the 5x5 Matrix is the Hazard Control Plan. A Hazard Control Plan (or HCP) is a road map that helps to document and plan for how hazard controls will be implemented. As a general rule, the highest risk hazards should be given first priority in

control implementation. Hazard control selection and implementation will be further discussed in Step 3: Implement Controls.

Example B: Job Hazard Analysis

A job hazard analysis, or JHA, is a type of assessment that is used to break a job down into steps, identify the hazards with each step, and determine the controls and personal protective equipment (PPE) necessary to perform each step safely and effectively. JHA's are sometimes also referred to as a Job Safety Analysis, or JSA.

The primary difference between a JHA and other types of risk assessments is the scope. Whereas other types of risk assessments are broader in scope and focus on all types of hazards, the JHA focuses on hazards associated with a particular task.

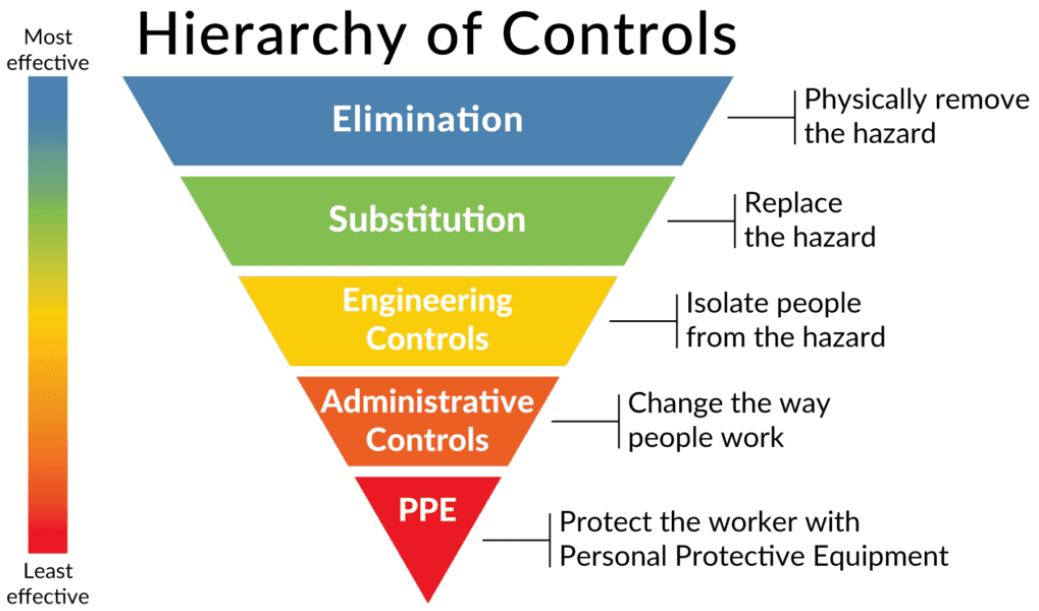
Many find a JHA to be a valuable tool because it not only helps to identify and control the hazards associated with a job or activity, it also serves as a written standard operating procedure (SOP) for that particular job or activity.

Step 3: Implement Controls

Once hazards have been identified and their associated risks, the next step is to select and implement controls for each hazard.

The effectiveness of controlling a workplace hazard relies heavily on the concept of ***Hierarchy of Controls***. Developed by OSHA, the hierarchy of controls is a system for ranking the effectiveness of various safety measures. It is often used as a framework by safety professionals to determine which measures should be taken to control a particular hazard. The hierarchy ranges from greatest to least effective.

As previously mentioned, the goal should always be, whenever feasible, to select the controls that are the most effective in preventing employee exposure to the hazard. When multiple hazards are present, priority should be given to the hazards that present the greatest risk of harm.



Pictured above is a graphic from OSHA that displays the relationship of the hierarchy of controls.

1. Elimination (most effective)

Elimination is the first level in the hierarchy of control and is considered the most effective way to control a hazard. This involves completely removing the hazard from the workplace. By eliminating a hazard altogether, any potential harm or injury is prevented from happening.

Elimination Example: If a machine is causing excessive noise, it can be eliminated by replacing it with a quieter model.

2. Substitution

Substitution is the second most effective method of controlling a hazard. This involves replacing a hazardous material, ingredient, or piece of equipment with a less dangerous one. The idea is to replace an occupational risk with something that has no risk or very little risk.

Substitution Example: If a chemical is causing skin irritation, it can be replaced with a less irritating chemical.

3. Engineering Controls

Engineering controls are the third level of control. Engineering controls involve isolating a hazard or changing the way a task is performed to reduce exposure to a hazard. This often involves adding safety measures to make the work easier such as installing machine guards.

Engineering Controls Example: Installing ventilation to remove fumes from the air is an example of an engineering control (such as local exhaust systems, snorkels, and fume hoods).

4. Administrative Controls

Administrative controls are the fourth level of control. Administrative controls involve changing work practices or making adjustments to work tasks to reduce exposure to a hazard. This may involve making changes to operational processes, work schedules, or introducing signage or warnings in the workplace.

Administrative Controls Example: Requiring employees to take breaks every 20 minutes when working with a loud machine is an example of an administrative control.

5. Personal Protective Equipment (PPE - least effective)

Personal protective equipment (PPE) is the fifth level of control and is the least effective method of controlling a hazard. PPE should only be used as the last line of defense and when other methods of control are not possible or effective.

PPE Example: PPE includes clothing, gloves, and other items that protect the body from exposure to a hazard.

A PPE hazard assessment must be conducted to determine the appropriate PPE for the particular task, job, or activity. Once PPE for a particular activity is chosen following an assessment, employees must be trained on how to use the PPE effectively and safely.

Training should cover the following topics:

1. How to obtain PPE
2. What types of PPE are used for the particular task, job or activity
3. Where and how the PPE is stored, cared for, and maintained
4. How to put on, appropriately wear, and take off PPE, including adjusting for proper fit
5. How to properly use the PPE
6. General PPE safety practices, including PPE inspection and reporting improperly functioning PPE

Refresher training must be provided if new PPE is introduced or if changes to PPE requirements are made following a hazard assessment.

PPE Selection Guidance:

- For Non-Research Faculty and Staff, including administrative, support, and professional staff, refer to the PPE Hazard Assessment and Selection Guide for Non-Research Activity

- For Research and Laboratory Activity - Refer to the UMBC Laboratory Safety Guide

Step 4: Monitor and Review

The final step of the hazard control process is to monitor and review the assessment and the subsequent controls that were implemented. Monitoring and reviewing for effectiveness is a critical step in determining whether the measures implemented have controlled hazards effectively, or whether additional measures are necessary.

When to Review:

- When New Employees are Hired
    - New and inexperienced employees are particularly susceptible to an injury or incident, so it's a good time to review existing assessments to determine if controls are effective to reflect any staffing changes.
- New Machinery, Tools, or Equipment are Introduced
    - New machinery, tools, and equipment can potentially introduce new hazards into the workplace. A review of existing assessments and controls
- Following an Incident or Near-Miss
    - Reviewing after an incident or near-miss will help to determine if current controls are effective and if new or different control measures need to be implemented, or other corrective measures are needed, to prevent future incidents.
- On a Periodic Basis
    - A good practice is to review existing assessments at least annually to ensure controls are still effective at reducing hazards. The necessity of frequency can vary depending on a variety of factors, including how frequently the work is performed and how many people are involved in performing the work.

Conclusion

Effectively identifying and controlling hazards is a critical part of workplace safety and health. It is also a continuous process. Taking the time to regularly identify hazards and assess risks demonstrates a commitment to safety and the prevention of harm, which will in turn promote a positive safety culture.

By following a defined process for hazard identification and control, departments can ensure that there is a high level of awareness of existing hazards, as well as any new hazards that may present themselves when conditions in the workplace change. Following the processes described in this procedure ensures that proactive measures can be taken to control hazards before an incident occurs.

IV. ROLES AND RESPONSIBILITIES

Department and Area Managers, Administrators, Supervisors

- Ensure risk assessments for work tasks/activities are conducted when workplace conditions or processes indicate they are needed, including when required by existing UMBC or departmental policy or procedure, or as required by regulations, standards, or by accrediting or administrative agencies.
- Facilitate the implementation of control measures to eliminate or reduce the risk of injury or harm to acceptable levels.
- Ensure employees are aware of safety hazards associated with their areas or assigned tasks and provide information, written instruction, training and supervision necessary for their protection.
- Retain all completed risk assessments for periodic review and inspection.

Employees

- Participate in workplace risk assessments and provide feedback to supervision and leadership on measures that are necessary to effectively control identified hazards.
- Utilize and adhere to measures that are implemented to control workplace hazards.

- Notify supervision when conditions in the workplace indicate a need for a risk assessment to be conducted of the job, activity, or task being performed in order to effectively identify and control hazards.
- Report all injuries, near-misses, and unsafe conditions to supervision in a timely manner.

Office of Environmental Safety and Health

- Provide technical guidance and consultation to departments on methods for effectively identifying hazards and assessing risks.
- Provide recommendations for effective hazard control measures as necessary to affected departments.
- Investigate reported safety concerns or unsafe conditions and provide recommendations for corrective actions to supervision and leadership.

VI. REFERENCES

- UMBC Policy VI-13.00.01 - Environmental Safety and Health Management and Enforcement
- UMBC ESH Procedure - General Safety Rules for UMBC Employees
- UMBC PPE Hazard Assessment and Selection Guide for Non-Research Activity
- UMBC Laboratory Safety Guide
- UMBC Job Hazard Analysis Template
- UMBC Risk Matrix and Hazard Control Plan Template