Academic Laboratory Standard Operating Procedure (SOP) Development Program

Academic Affairs Laboratories of Ferris State University

Number: AALSSD-2-60-1006	**Author:** Anne Hawkins	
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I. APPLICABILITY

The Academic Affairs Laboratory Safety Standard Operating Procedure Written Program is designed to provide guidelines for developing, writing, implementing, maintaining and recordkeeping for laboratory specific Standard Operating Procedures (SOPs). The Standard Operating Procedures shall serve as references for performing laboratory work involving hazardous materials, infectious materials, processes, procedures and instrumentation/equipment operations.

The Academic Affairs Laboratory Safety Standard Operating Procedure Written Program is issued by the Academic Affairs Director of Laboratory Safety under the direction of the Provost and Vice President for Academic Affairs as a secured document, in accordance with the Academic Affairs Laboratory Safety Management System. The Academic Affairs Laboratory Safety Standard Operating Procedure Written Program is accessible on the Academic Affairs Laboratory Safety Website. A printed copy of this program shall be made available upon request to anyone, including the representatives of credentialed local, state or federal regulators with jurisdiction to inspect.

II. KEY ELEMENTS

A. **SOPs are sets of instructions or steps to be followed when laboratory work involves hazardous materials, processes, procedures and instrumentation/equipment operations.**

B. **The SOP development involves at least three levels of expertise:**

1. **The SOP shall be written by the laboratory personnel having the most experience, knowledge, and who shall be routinely involved.**
2. **The Principle Investigators for the laboratory shall be responsible for reviewing all SOPs relevant to the operations of the laboratory for the purpose of: approving or disapproving new documents, changing existing documents and removing non-relevant SOPs.**
3. **The Academic Affairs Director of Laboratory Safety shall be consulted concerning specific regulations that may impact the SOPs.**

C. **SOPs shall not serve as a substitute, but rather as a supplement to:**

1. **An SDS for a specific chemical**
2. **An instrumentation/equipment operation manual**
3. **An instrumentation/equipment user/hardware manual**
4. **A research laboratory notebook**

III. ROLES IN THE PROCESS

A. Responsibilities and Authority of the College Dean

1. Support Academic Affairs Laboratory Safety Management System compliance in meeting federal, state and local regulating requirements within any remodeled, renovated, existing or new laboratory facilities.

2. Receive notification from the Department Chair/Director/Head, Faculty or Staff in the event of an incident.

3. Notify the Academic Affairs Director of Laboratory Safety of any incident as soon as they become aware of the situation.

4. Request assistance from the Academic Affairs Director of Laboratory Safety when conditions change within any Academic Affairs laboratories that may impact the operations of that laboratory to:

    a. Conduct a Hazard Assessment

    b. Identify the appropriate engineering controls, personal protective equipment, and work practices.

5. Oversee compliance training requirements for Faculty, Staff and Student Employees that have been established for any Academic Affairs laboratory area.

B. Responsibilities and Authority of Department Chairs/Directors/Heads

1. Support Academic Affairs Laboratory Safety Management System compliance in meeting federal, state and local regulating requirements within a laboratory facility.

2. Notify the Dean's office if the Department Chair/Director/Head receive notification from the Faculty or Staff of an incident.

3. Ensure all training requirements for Faculty, Staff and Student Employees who have been authorized to use or work in any Academic Affairs laboratory area have been complied.

4. Support completion, in a timely manner, of all written laboratory SOPs addressing laboratory work that involves hazardous materials, processes, procedures and instrumentation/equipment.

5. Support SOP training and recordkeeping compliance requirements for Faculty, Staff and Student Employees who have laboratory responsibilities.

C. Responsibilities and Authority of Faculty and Staff Who Provide Oversight for the Laboratory

1. Conduct and document hazard assessments:

    a. Prior to acquiring gifted, loaned, rented or purchased instrumentation/equipment.

    b. On laboratory start-up or scale-up materials, processes, procedures and instrumentation/equipment.

    c. When there are changes to the materials, processes, procedures and instrumentation/equipment involved.

2. Oversee the SOPs' development by laboratory personnel having the most experience and knowledge, and who may routinely be involved in the experimental or operational processes.

    a. Ensure that developers of the SOPs includes the step-by-step detailed usage and handling recommendations provided by the material/chemical manufacturer.

    b. Ensure that developers of the SOPs include the step-by-step detailed usage and handling recommendations provided by the instrumentation/equipment manufacturer.

    c. Ensure that developers of the SOPs include all the material handling, disposal, personal protective equipment, and engineering controls (such as hoods) requirements that directly supports the steps in the SOP.

    d. Encourage the usage of pictures within the SOPs, such as in the case of operating instrumentation/equipment, to add clarity to the proper operations.

    e. Ensure that developers of the SOPs include any references used to develop the SOP in the reference section of the SOP.

3. Shall sign all step-by-step detailed SOPs, acknowledging that the contents, requirements, and responsibilities outlined in the SOPs are correct based on the hazard assessments.

    a. SOPs which are signed by the Principal Investigators, Faculty Laboratory Instructors and/or Laboratory Supervisors shall be considered to have been reviewed by qualified personnel and are considered an official SOP for the laboratory. The new or revised SOP documentation may be implemented after the laboratory personnel who will be performing the SOP have been trained. This training shall be documented in writing and filed in the training files associated with the Principle Investigator, Faculty Laboratory Instructor or Laboratory Supervisor.

    b. SOPs that are not signed by the Principal Investigators, Faculty Laboratory Instructors and/or Laboratory Supervisors are not considered to have been reviewed by a qualified personnel, and are not official SOP for the laboratory. They may be implemented only under direct Principal Investigators', Faculty Laboratory Instructors' or Laboratory Supervisors' supervision.

    c. When an SOP is no longer required to support hazardous materials, processes, procedures or instrumentation/equipment, they shall be removed from service by the Principal Investigators, Faculty Laboratory Instructors and/or Laboratory Supervisors. The removal process shall follow these steps:

        1. On the first page of the SOP, designate it as "No Longer Applicable" with the date of this action and the signature of the Principal Investigator, Faculty Laboratory Instructor and/or Laboratory Supervisor.

        2. The SOP shall be removed from the active SOPs and placed in the designated "Non Active SOPs" file.

4. Shall identify a location for all SOPs within the laboratory:

    a. This location shall be signed and easy to access by anyone within the laboratory

    b. It shall contain both active and non-active SOPs

5. Shall review all SOPs on a yearly basis:

a. This review shall be documented on the last page of the SOP with the Principal Investigator's, Faculty Laboratory Instructor's or Laboratory Supervisor's signature and date.

b. If this annual review identifies changes to the SOP; this information shall be denoted on the last page of the SOP.

1. All laboratory personnel shall be trained on the changes and their training documented.

2. If the SOP requires a re-write, it shall go through the approval process. All laboratory personnel shall be trained on the revised SOP and their training documented.

C. Responsibilities and Authority of Laboratory Personnel

1. Under the direction of the Faculty or Staff who provide oversight for the laboratory, the Laboratory Personnel will assist with:

a. Conducting and documenting hazard assessments

b. Developing the step-by-step SOP detailing:

1. The use of hazardous materials

2. Processes and procedures specific to the laboratory in which they work

3. Instrumentation/equipment operations as they relate directly to the laboratory

2. Obtain the training necessary to:

a. Perform processes and procedures within the laboratory which they are assigned.

b. Operate the instrumentation/equipment within the laboratory which they are assigned.

c. Maintain compliance with applicable environmental, health and safety federal, state and local regulations.

3. Understand the use of SOPs, their locations, and the method used to conduct their annual review.

4. Comply with the SOPs recordkeeping requirements.

D. Responsibilities and Authority of the Academic Affairs Director of Laboratory Safety

1. Shall develop, maintain and revise this written program as needed;

a. As a secured document to ensure compliance with applicable regulations.

b. Evaluate the overall effectiveness of this program on a periodic basis, and revise the program as needed to effectively establish and maintain a safe workplace environment, and to ensure compliance with federal, state and local occupational health and safety and/or environmental regulations and standards.

IV. PROCESS

A. Type of SOPs

1. Based on the Hazard Assessment (template located in Appendix A) SOPs may be divided into three types:

    a. Material Hazards (such as but not limited to biological, chemical and radiation hazards)

    b. Process Hazards (describes the process hazards and may include chemical, biological and radiation hazards if they are a part of the process)

    c. Instrumentation/equipment usage (describes how to use, in simple step-by step processes)

2. Material Hazard SOPs shall be written based on the individual hazard material, or with some chemicals by chemical family, as long as the hazards of the grouping do not cloud the user's understanding of the hazards associated with each member of a chemical manufacturer.

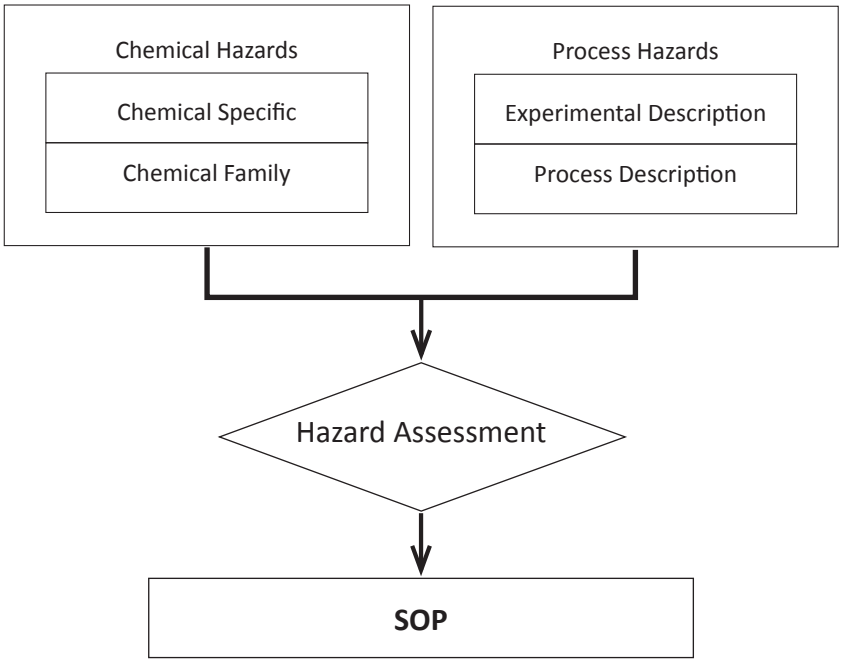
3. Process Hazard SOPs shall be written based on the evaluation of the hazards presented by the materials in use, and an evaluation of the processes or procedures.

    a. Review the type and quantity of the hazardous materials being used, along with the frequency of use

    b. Evaluate the processes and experimental design, work space adequacy, laboratory personnel preparedness and qualifications

4. SOPs for Particularly Hazardous Substances shall include a description of a designated area, containment devices, decontamination and waste disposal procedures.

5. Instrumentation/equipment SOPs shall include the very basic step-by-step processes needed to perform the daily operations of the instrumentation/equipment. This type of SOP is intended to supplement the owner's operation manual.



B. Conduct Hazard Assessment

1. The Principal Investigators, Faculty Laboratory Instructors or Laboratory Supervisors shall conduct an analysis of possible laboratory based hazards using the assessment tool in Appendix A.

2. This assessment shall occur:

    a. Whenever possible, while the processes, procedures or instrumentation/equipment are in use.

    b. Record the potential hazards.

    c. Identify the engineering, administration and personal protective equipment controls that will mitigate the hazards identified.

3. After determining both the material hazards and the processes, procedures and instrumentation/equipment hazards, the Principal Investigators, Faculty Laboratory Instructors or Laboratory Supervisors shall determine the level of controls needed to allow for the reasonable safety of the laboratory personnel performing the described processes, procedures or instrumentation/equipment.

    a. When requested, the Academic Affairs Director of Laboratory Safety shall assist the Principal Investigators, Faculty Laboratory Instructors or Laboratory Supervisors.

    b. When changes occur to either the materials involved, the processes, procedures or instrumentation/equipment following the initial hazard assessment, these changes may alter the level of control originally identified and included in the SOP. A new hazard assessment will be required.

C. SOP Development

The laboratory personnel who are most familiar with the materials, processes, procedures or instrumentation/equipment, and who may routinely be performing the processes, procedures or using the instrumentation/equipment, shall write the SOPs.

1. Using the SOP template in Appendix B, the writer, along with the completed Hazard Assessment and, in the case of instrumentation/equipment, the owner's operation manual along with their working knowledge, write the step-by-step SOPs.

2. Section One of the SOP requires the following information:

    a. Identify the type of SOP (Material Hazard, Processes, Instrumentation/Equipment)

    b. The names of the individuals involved with the preparation of the SOP

    c. The date developed, which is the final draft date

    d. The date of approval will be the date the Approver signs the document and authorizes its implementation by qualified, trained and approved laboratory personnel without the direct supervision of the Principal Investigators, Faculty Laboratory Instructors and Laboratory Supervisors

    e. Approval of an SOP may only occur by a Ferris State University Approver. This individual will sign the SOP and provide the date the document was signed in the Date Approved section

3. Section Two of the SOP, the Purpose and Scope Section, identifies:

    a. The specific materials, processes, experiments or instrumentation/equipment involved

b. The laboratory personnel involved and the necessary skill level needed to perform the SOP

c. The location where the materials and instrumentation/equipment will be used and the location where the processes and experiments will be performed

4. Section Three of the SOP, the Hazards and Control Section, identifies:

    a. The materials, processes, procedures or instrumentation/equipment hazards associated with this task which may present exposure hazards, health hazards or physical hazards.

    b. Any potential exposures that may be encountered when using the instrumentation/ equipment, such as aerosol generation during missing centrifuging or sonication, when hazardous conditions occur such as extreme temperatures.

    c. Any technique hazards such as weighing air reactive solids

    d. Any special handling and storage requirements needed to work with the material, process or instrumentation/equipment

5. Section Four of the SOP, the Engineering Control Section, identifies the equipment that shall be used when carrying out the procedure, such as but not limited to chemical fume hood, biosafety cabinet and vacuum.

6. Section Five of the SOP, the Personal Protective Equipment Section, identifies the specific PPE requirements for the tasks and the specific hygiene practices to be performed with each process, instrumentation/equipment usage, or hazardous chemical.

7. Section Six of the SOP, Procedure Section, identifies the step-by-step information for preforming the material, process, procedure and instrumentation/equipment operations.

    a. Material SOP – describes how to work with the specific material and it identifies:

        1. The hazards associated with this specific material

        2. How to transfer the material

        3. Incompatibilities with other materials or agents that should be considered when planning a process or procedure

        4. Transferring to a waste container and vessel compatibility

    b. Process SOP -- describes in detail the procedure used to perform the process, procedure or instrumentation/equipment;

        1. The use of pictures are encouraged to enhance the end user's understanding.

        2. Include any procedure that shall be followed to start or end a process or procedure, including any specific steps that shall be followed once the process or procedure is complete.

    c. Instrumentation/Equipment SOP -- describes the step-by-step procedure for using the instrumentation/equipment;

        1. This type of SOP is not intended to take the place of the owner/operator manual.

        2. The use of pictures are encouraged to show operational settings and emergency power down steps.

8. Section Seven of the SOP, the Waste Disposal Section, identifies the step-by-step process for handling hazardous waste.

    a. This section will identify what materials are hazardous, non-hazardous or biohazardous waste

    b. If materials can be combined into a single waste container, the handling procedure for the collection, storage and disposal will be written out step-by-step

    c. If materials cannot be combined into a single waste container, special handling requirements will be written out step-by-step

    d. The type of compatible containers will be identified for each type of waste generated

    e. The labeling requirements and segregation prior to disposal

9. Section Eight of the SOP, the Emergency Response Section, identifies specific steps directly related to the material, process, procedure and instrumentation/equipment to take in the event of an emergency.

10. Section Nine of the SOP, the Training/Recordkeeping/Definition Section, contains the following information:

    a. Definitions of all terms and regulatory acronyms if applicable

    b. Training requirements—what training the laboratory personnel shall have successfully completed prior to having authorization to perform the SOP

    c. Determination if the SOP is of such a hazardous nature that the Principal Investigators, Faculty Laboratory Instructors or Laboratory Supervisors will be required to grant in writing authorization for the laboratory personnel to perform the SOP

    d. Recordkeeping requirements which identifies the requirements and the purpose of keeping the records

    e. Change control to the SOP, what changes may be made, and requires the approval of Principal Investigator, Faculty Laboratory Instructors or Laboratory Supervisors

    f. The history of the changes made to the document

    g. Appendix which contains any appendix that supports the SOP such as but not limited to:

        1. Work flow diagrams

        2. Work Instructions

        3. Checklist

        4. Forms

V. DEFINITIONS

The following is a list of common terms and their definitions as they are used in the Academic Laboratory Standard Operating Procedure Development Program.

Approver
An individual who is employed by Ferris State University as a Principal Investigator, Faculty Laboratory Instructors or Laboratory Supervisor, responsible for the laboratory or laboratory process, experiment or instrumentation/equipment that is addressed in the written SOP.

Chemical Family
If chemical family SOPs are used, the families must be defined to ensure all the chemicals making up the family have similar physical and health hazards, common signs and symptoms of exposure intended processes/handling and anticipated laboratory personnel exposure. The SDSs associated with the chemicals in the chemical family shall be referenced when developing the SOP. The final SOP for a chemical family shall provide appropriate guidance to ensure laboratory personnel have the knowledge of the specific hazards, personal protective equipment, handling, storage and disposal.

Employee
An employee contributes labor and expertise to an endeavor of an employer (Ferris State University), and is usually hired to perform specific duties that are packaged into a job. The term “employee” refers to a specific defined relationship between an individual and the University.

Faculty
The term is most commonly used in this context in the United States, includes professors of various rank: assistant professors, associate professors and full professors, usually tenured (or tenure-track) in terms of their contract of employment, as well as adjunct and instructors. Department chairs, Deans, vice presidents, presidents and librarians for this document will be considered faculty members.

Laboratory Start-up
The starting of the laboratory, changes in research or new research direction/grants.

Material
Chemical, biological or radiation.

Laboratory Personnel
Faculty, Staff, Student Employees and Students who perform duties within the laboratory.

Procedure
May refer to a routine event or an experiment which occurs in the laboratory that is documented by means of an SOP.

Student
A learner, or someone who attends an educational institution.

Student Employee
Is a part-time employee who is duly enrolled at Ferris State University, is registered for classes and whose primary purpose for being at the University is the achievement of a degree or certification.

Standard Operating Procedure (SOPs)
A written set of steps to be followed by “laboratory personnel.” This document details an operation in terms of the steps to be taken by the laboratory personnel in the order in which they should be accomplished. The SOP provides detailed written instructions to achieve uniformity of the performance of a specific function.

Work Practice Controls
Controls that reduce the likelihood of material release by altering the manner in which a task is performed.

Writer
Individual or individuals who, based on their knowledge and work experience, have been requested by the Principal Investigators, Faculty Laboratory Instructors or Laboratory Supervisors to used the hazard assessment and their working knowledge to document in a step-by step form how to use hazardous materials, perform a process or experiment, and how to use instrumentation/equipment.

VI. RELATED OR REFERRED TO DOCUMENTS

Appendices

-Appendix A: Laboratory Comprehensive Hazard Assessment and Controls Form - AALSSD-2-60-1006-F01

-Appendix B: Standard Operating Procedures Template - AALSSD-2-60-1006-FF01

Appendix A

Laboratory Comprehensive Hazard Assessment and Controls Form

Laboratory, Work Site, Project:
Department/College:
Completed by (print name and title):
Principle Investigator (print name):
Department Head (print name):

Instructions:
Review the Hazard Description (column 3) for each Exposure Condition (column 2) and check the ones that are present (column 1). For every condition present, review the Examples of Engineering Controls and Personal Protective Equipment (column 4) and then complete the Specific Engineering Controls and PPE (column 5) that you intend to use to reduce or eliminate the hazard.

Check if Present (column 1)	**Exposure Condition** (column 2)	**Hazard Description** (column 3)	**Examples of Engineering and Personal Protective Equipment (PPE)** (column 4)	**Specific Engineering Controls and Personal Protective Equipment (PPE)** (column 5)
Biological Hazards				
	Animals	Splashes, bites, exposure to animal body fluids, injuries due to animal size or caging, allergies, and disease transmission	Requires approval by IACUC	
	Carcinorgens	Cancer	Posted work areas, glove box, fume hood, special handling, and gloves	
	More on BSL level		See Academic Affairs Director of Laboratory Safety	
	Human Blood or Other Potentially Infectious Materials	Disease transmission	May require IRB approval; Blood-borne Pathogen training, and Universal Precautions	
	Toxins		See Academic Affairs Director of Laboratory Safety	
	Infectious Pathogens	Disease transmission	Good microbiological methods, engineering controls, gloves	
	Nano-particles	Unknown health hazards due to small size	Containment; See Academic Affairs Director of Laboratory Safety.	

Check if Present (column 1)	**Exposure Condition** (column 2)	**Hazard Description** (column 3)	**Examples of Engineering and Personal Protective Equipment (PPE)** (column 4)	**Specific Engineering Controls and Personal Protective Equipment (PPE)** (column 5)
	Recombinant DNA	Depends on nature of DNA segments, host vector systems; Introduction of foreign genetic materials into personnel or environment	Requires IBC Approval; Good microbiological methods, engineering controls and personal protective equipment	
Chemical Hazards				
	Chemicals, low hazard with low splash probability	Skin and eye irritation	Safety glasses, chemical resistant gloves, lab coat, closed toe shoes of good structure, long pants; Be aware of the nearest eyewash and shower	
	Compressed gases	Aphyxiation, accidental tip over, content release, and pinch points	Gas cylinders must be secured to stationary objects in a safe location away from danger or impact; Safety glasses and gloves	
	Controlled Substances	Drugs and certain other chemicals (narcotic and non-narcotic)	Proper training, handling and dispensing procedures, recordkeeping, safety glasses; Under the jurisdiction of federal and state laws	
	Corrosive liquids w/reasonable probability of splash	Skin and eye damage	Chemical splash goggles or face shield, neoprene gloves, lab coat, closed toe shoes, and chemical resistant apron	
	Cryogenic liquids, ultra-cold freezers, dry ice	Aphyxiation, skin, eye and tissue damage, frostbite	Ventilation, safety glasses, goggles or face shields for splash hazards, insulated gloves, and closed toe shoes	
	Organic solvents	Skin/eye damage, absorption through skin, organ damage	Chemical splash goggles or a face shield with safety glasses, heavy resistant gloves, lab coat, closed toe shoes, chemical resistant apron, eyewash and shower	
	Volatile, hazardous or highly hazardous chemicals	Inhalation of toxic vapors, skin contact	Fume hood, glove box, safety glasses, and personal protective equipment	
	Regulated Wastes	Exposure, environmental release	Safety glasses, gloves, proper storage and disposal procedures, training and safe handling procedures	

Check if Present (column 1)	**Exposure Condition** (column 2)	**Hazard Description** (column 3)	**Examples of Engineering and Personal Protective Equipment (PPE)** (column 4)	**Specific Engineering Controls and Personal Protective Equipment (PPE)** (column 5)
	Special cleaning agents	Exposure, allergies	Safety Data Sheets, hazard communication training, proper procedures, and personal protective equipment	
	Toxic Substances	Poisons, neurotoxins, teratogens, mutagens, carcinogens, and subsequent environmental impact.	Proper training procedures, storage, disposal, and personal protective equipment	
	Washing glassware	Skin lacerations from broken glass	Safety glasses, rubber gloves, lab coat.	
	Chemical		See Academic Affairs Director of Laboratory Safety concerning chemical specific engineering and personal protective equipment	
Radiological Hazards				
	Ionizing Radiation	Cancer, teratogenic	Approved by Radiation Safety Officer	
	Non-Ionizing Radiation	Eye or skin damage, burns, heat, cancer	Approval by Radiation Safety Officer	
Physical Hazards				
	Compression (pressure)	Injury from sudden release of energy from valves, compression chambers	Energy control, safety glasses, shields, body position	
	Confined Spaces	Exposure, falls, dangerous atmospheres, asphyxiation, noise, vibration	Buddy system, lanyards, ventilation, monitoring	
	Elevated heights	Fall injury	Lanyards, anchors	
	Energized Equipment	Pinched, crushed, caught, pulled in, electrocution	Energy control, signage, guards, no jewelry, tie back long hair	
	Extreme Environmental Conditions	Hypothermia (cold), frostbite (cold), heat exhaustion (heat) or heat stroke (heat)	Training, physiological monitoring, rest cycles and fluid replacement	
	Impact	Injury to head or body	Hard hat, impact resistant toed shoes, body position	
	Manipulation of large objects	Injury, death	Training, proper lifting equipment, procedures, inspections, buddy systems	
	Material Handling	Physical injury, strains, sprains	Training, buddy system, gloves, Standard Operating Procedures	

Check if Present (column 1)	**Exposure Condition** (column 2)	**Hazard Description** (column 3)	**Examples of Engineering and Personal Protective Equipment (PPE)** (column 4)	**Specific Engineering Controls and Personal Protective Equipment (PPE)** (column 5)
	Noise	Deafness, hearing damage, inability to communicate	Noise monitoring, hearing protection, training, and engineering controls (e.g., enclosures, baffles, mufflers)	
	Penetration	Injection, wounds	Training, padding of surfaces, signage, and body position	
	Respirable Dust	Lung damage	Local exhaust ventilation. monitoring, respirator	
	Vibrating Equipment	Cumulative trauma disorders.	Gloves, protective shoes, hearing protection	
Emergency Procedures				
	Animal	Exposure, bites, animals are missing or have been miss-treated	Training, Documentation of Animals wellbeing, log of Animals, Control access	
	Biological	Exposure, eyes, skin, inhalation, absorption, injection	Training procedures, clean up spill kit available, medical follow-up	
	Chemical	Exposure, eyes, skin, inhalation, absorption, injection, fire, explosion	Training procedures, clean up spill kit available, medical follow-up, first responders information provided to local authorities	
	Radiation	Exposure, eyes, skin, inhalation, absorption, injection, fire, explosion	Training procedures, clean up spill kit available, medical follow-up, first responders information provided to local authorities	
	Equipment/ Instrumentation Failures	Equipment fails to operate as designed	Training, out of service, work orders, manufacture preventative maintenance performed, valid service agreements	
	Wide spread power failure	Impact on animals, ventilation, equipment that is left to operate unattended, security for room and special operations	Training, back up power	
	Waste Reaction	Chemical waste reaction resulting in fire, smoke, odor, heat	Training, designated location for waste accumulation	
Training Requirements				
	Biological Material	All students, student employees, faculty and staff with exposure to biological material	Training on specific biological material used, spill clean-up, storage and security sign off sheets. Recordkeeping for 3+ years	

Check if Present (column 1)	**Exposure Condition** (column 2)	**Hazard Description** (column 3)	**Examples of Engineering and Personal Protective Equipment (PPE)** (column 4)	**Specific Engineering Controls and Personal Protective Equipment (PPE)** (column 5)
	Chemical Material	All students, student employees, faculty and staff with exposure to chemical material	Training on specific chemical material used, spill clean-up, storage and security sign off sheets. Recordkeeping for 3+ years	
	Radiation	All students, student employees, faculty and staff with exposure to radiation material	Training on specific radiation material used, spill clean-up, storage and security sign off sheets. Recordkeeping for 3+ years	
	Equipment/ Instrumentation	All students, student employees, faculty and staff using equipment/ instruments in the laboratory including but not limited to hoods, BSC, and GC's	Training on equipment used per manufacture instructions sign off sheets. Recordkeeping for 3+ years	
	Emergency/ Disaster Preparedness	All students, student employees, faculty, and staff with laboratory responsibilities	Training on the procedures to use in the event of an emergency, evacuation and major utility failure	
	Laboratory operation (research) specific	All students, student employees, faculty, and staff with laboratory responsibilities	Define in the laboratory's specific operation manual, or chemical hygiene, biosafety, animal biosafety, or radiation manuals. Recordkeeping for 3+ years	
	Shipping Export and Import of laboratory material and equipment	Noncompliance with DOT or IATA regulations	See Academic Affairs Laboratory Safety	
Laboratory Operations				
	Pre-start up of laboratory operations	Placement of the equipment, chemicals, biological, radiation sources, and animal in compliance with local, state and federal regulations	Perform a dry run of equipment, ensuring equipment/instrumentation functions according to manufacture specifications. Obtain Physical Plant help for electrical, plumbing, or carpentry, and establish preventative maintenance as required by manufacture	

Check if Present (column 1)	**Exposure Condition** (column 2)	**Hazard Description** (column 3)	**Examples of Engineering and Personal Protective Equipment (PPE)** (column 4)	**Specific Engineering Controls and Personal Protective Equipment (PPE)** (column 5)
	Pre-start up of laboratory procedures	All procedures, based on conditions of start up have been identified, documented and training provided to all students, student employees, Faculty, and Staff who will be involved in the laboratory procedures.	All procedures are available for review in the laboratory, with yearly review required, or if there is a change in procedure whichever comes first. Recordkeeping for training 3+ years.	
	Pre-startup laboratory medicals	All medicals as required by state and federal regulations, or accreditation best practices.	See Academic Affairs Laboratory Safety and IACUC if animals involved.	
	Pre-startup laboratory inspection schedule established	To ensure hazards are identified and corrective actions taken.	Establish a schedule for walk-throughs of the laboratory to ensure hazards are identified and corrective actions are taken. If animals are involved, the IACUC will perform a walk-through of all areas where animals are used or housed.	
	Pre-startup signage	Signage to address Emergency Preparedness, Biological, Chemical, Radiation and Equipment hazards or special handling	See Academic Affairs Director of Laboratory Safety, Radiation Safety Officer, and IACUC Chair.	
	Pre-startup Security	Provide security for chemicals, biological materials, radiation, laboratory technical information, and drugs.	See Academic Affairs Director of Laboratory Safety, Radiation Safety Officer, DPS, IT, and Legal as needed.	
	Pre-start up SDS (MSDS)	SDS Compliance or Laboratory Chemical Safety Summaries are available for chemicals under development.	All chemical materials have most current SDS in the SDS notebook kept within the laboratory.	

Check if Present (column 1)	**Exposure Condition** (column 2)	**Hazard Description** (column 3)	**Examples of Engineering and Personal Protective Equipment (PPE)** (column 4)	**Specific Engineering Controls and Personal Protective Equipment (PPE)** (column 5)
	Laboratory Close out or transfer	Biological, chemical, and radioactive materials not accounted for when moved, no longer needed as part of the current laboratory practice, or when laboratory operation is stopped. Signage changes and security changes.	Establish a procedure and process to address the removal of all biological, chemical, and radioactive materials and equipment—See Academic Affairs Director of Laboratory Safety and Radiation Safety Officer	

Additional Comments:

Certification: I certify this hazard assessment was conducted according to University Policy and the signatures below indicate acknowledgement.

Completed by (print): _____ Date: _____

Completed by (signature): _____ Date: _____

Principle Investigator (print): _____ Date: _____

Principle Investigator (signature): _____ Date: _____

Department Head (print): _____ Date: _____

Department Head (signature): _____ Date: _____

Appendix B **Academic Laboratory S.O.P. Title:**_____

Section One:

☐ Material Hazard

☐ Process/Task/Equipment

☐ Instrumentation/Equipment

PURPOSE AND SCOPE SECTION

a. *The specific materials, processes, experiments, or instrumentation/equipment involved*
b. *The laboratory personnel involved and the necessary skill level to perform the SOP*
c. *The location where the materials and instrumentation/equipment will be used and the location the processes and experiments will be performed*

HAZARDS AND CONTROL SECTION

a. *The materials, processes and instrumentation/equipment hazards associated with this procedure which may present exposure hazards, health hazards or physical hazards*
b. *Identify any potential exposures that may be encountered when using the instrumentation/equipment, such as aerosol generation during missing centrifuging or sonication, when hazardous conditions occur, such as extreme temperatures*
c. *Any technique hazards such as weighing air reactive solids*
d. *Any special handling and storage requirements needed to work with the material, process or instrumentation/equipment*

ENGINEERING CONTROL SECTION

a. *Identifies equipment that shall be used when carrying out the procedure, such as but not limited to chemical fume hoods, biosafety cabinets, and vacuums*

PERSONAL PROTECTIVE EQUPIMENT SECTION

a. *Types of PPE may be required beyond the minimum based on the hazard assessment. These requirements will be defined in this section*
b. *Address the specific hygiene practices to be performed with each process, instrumentation/equipment usage, or with hazardous chemicals*

PROCEDURE SECTION

a. *Materials – an SOP of this type addresses how to work with the specific material, and it identifies:*
    i. *The hazards associated with this specific material*
    ii. *How to transfer the material*

   iii. *Incompatibilities with other materials or agents that should be considered when planning a process or experiment, transferring to a waste container, and compatibility with the specific vessel or spatula*

b. *Process – an SOP of this type describes in detail the procedure used to perform the process, task or equipment:*
   i. *The use of pictures is encouraged to enhance the end user's understanding; highlights all laboratory safety processes in place*
   ii. *Include any procedure that shall be followed to start or end the process or experiment, including any specific steps that shall be followed once the process is complete*
c. *Instrumentation/Equipment – an SOP of this type describes the step-by-step description for handling hazardous waste (not intended to take the place of the owner/operator manual):*
   i. *The use of pictures is encouraged to show operational settings and emergency power down steps*

WASTE DISPOSAL SECTION

a. *Identify what materials are hazardous, non-hazardous, or biohazardous waste*
b. *If materials can be combined into a single waste container, the handling procedure for the collection. Storing and disposal will be written out step-by-step*
c. *If materials cannot be combined into a single waste container. Special handling requirements will be written out step-by-step*
d. *Type of compatible containers will be identified for each type of waste generated*
e. *Labeling requirements and segregation prior to disposal*

EMERGENCY RESPONSE SECTION

a. *Specific steps directly related to the material, process or instrumentation/equipment to take in event of an emergency*
b. *Labeling requirements and segregation prior to disposal*

TRAINING/ RECORD KEEPING & DEFINITIONS

a. *Training requirements – what training the laboratory personnel shall have successfully completed prior to having authorization to perform the SOP*
b. *Definitions of all terms and acronym regulations specifically defined if applicable*
c. *Determination if the SOP is of such a hazardous nature that the Principal Investigator and/or Laboratory Supervisor will be required to grant, in writing, authorization for the laboratory personnel to perform the SOP*

REFERENCES

a. *Identify applicable references used to develop the SOP*

Appendix B

Approval of an SOP may only occur by a Ferris State University Approver. This individual will sign the SOP and provided the date the document was signed in the Date Approved section.

Approver Signature: _____

Date Approved: _____

Review Date: _____ ☐ annual review ☐ changes made

Changes made on review date: _____