University of Dayton

School of Engineering Safety Manual

A Reference Guide for Faculty and Staff

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INTRODUCTION

The School of Engineering recognizes that safety is both an engineering practice and a culture that values the quality of life of all people. To this end, the School of Engineering is committed to providing a safe learning and working environment for its students, faculty, staff, custodial and maintenance personnel, and visitors. This goal is accomplished by the establishment and observance of safety practices designed to avoid injury and damage. Incoming students will be taught these practices and will join the School in accepting responsibility for contributing to this culture.

In this document, the School of Engineering will be referred to as "the School," or abbreviated as the SoE. Additionally, the term "laboratory" will be used to describe both traditional laboratories, as well as other areas like machine shops or areas where potentially hazardous equipment or substances are used in research and/or instructional activities.

1.0 SAFETY REGULATIONS AND POLICIES

In consultation with the University of Dayton Environmental Health and Safety/Risk Management department, SoE safety policies and procedures have been developed in accordance with the following local, state, and federal standards:

- University of Dayton Safety Policies
- University of Dayton Chemical Hygiene Plan
- University of Dayton Laser Safety Policy
- OSHA Standard 29 CFR
- USEPA and Ohio EPA Regulations
- Ohio Building Codes
- Ohio Fire Code/NFPA
- ANSI Standards
- City of Dayton Regulations

2.0 ROLES AND RESPONSIBILITIES

All SoE administrators, faculty, staff and students are responsible for helping to promote a safety culture in offices, classrooms, and laboratories.

2.1 Dean

- Communicates to faculty, staff, students and visitors that health and safety is a top priority
- Ensures that all environmental health and safety regulations and policies are followed
- Determines penalties for non-compliance with health and safety policies

2.2 Department Chairs

- Ensure that all department faculty and staff complete required safety training
- Assist in distributing safety information to department faculty, staff and students
- Work with the SoE Safety Coordinator to address any department specific hazards, safety training, or safety equipment needs
- Approve key and key card access for all department laboratories and maintain a list of personnel and students with access to laboratories
- Report all incidents, accidents, potential chemical exposures and near miss situations

2.3 SoE Safety Coordinator

- Implement the SoE Safety Program
- Reviews and update safety policies and procedures at least annually
- Ensure that all faculty, staff and students complete required safety training
- Investigates accidents and chemical exposures
- Acts as a liaison between the SoE and the university Environment, Health and Safety/Risk Management (EHS/RM) office
- Maintains safety training records
- Performs annual laboratory inspections and department audits
- Tracks safety incidents and close calls

2.4 Principal Investigators

Principle investigators (PIs) include faculty and staff conducting and/or supervising research projects and faculty and staff instructing laboratory courses.

- Completes all required safety training
- Add new personnel (faculty, staff, and students) to the BioRaft Safety Management System and ensure all personnel have completed required safety training
- Develop standard operating procedures for all activities involving hazards and provide hazard-specific and/or laboratory-specific training
- Provide appropriate engineering controls and personal protective equipment needed to work safely with hazardous materials and ensure such equipment is used correctly
- Employ and encourage good housekeeping techniques in laboratories
- Work with Laboratory Managers to address issues cited during annual laboratory inspections

2.5 Laboratory Managers

- Completes all required safety training
- Maintain chemical inventories and Material Safety Data Sheets
- Maintain all laboratory equipment and safety equipment in proper working order
- Employ good housekeeping techniques in laboratories
- Address issues cited during annual laboratory inspections

2.6 Faculty and Staff Working/Teaching in Laboratories under the supervision of a PI

- Completes all required safety training
- Attend required hazard-specific and laboratory-specific safety training
- Follow standard operating procedures provided by supervisors and/or principal investigators
- Use engineering controls and personal protective equipment
- Employ good housekeeping techniques in laboratories
- Report all incidents, accidents, potential chemical exposures and near miss situations

2.7 Faculty and Staff Not Working in Laboratories

- Complete required safety training
- Report all incidents, accidents, potential chemical exposures and near miss situations

3.0 HAZARD ASSESSMENT

The SoE defines a hazard as anything that can hurt you, others or the environmental now or in the future. Hazards typically encountered in the SoE include biological, chemical, mechanical and energy hazards.

3.1 Hazard Assessment for Laboratories

PI's should complete hazard assessments for all laboratory activities involving hazardous equipment and/or materials and should incorporate the safety information generated during hazard assessments into standard operating procedures (SOPs). Personnel should review SOPs prior to conducting potentially hazardous activities in a lab.

3.2 Hazard Assessment for Independent Student Projects, Clubs and Teams

All students working on independent projects or on projects with clubs or teams should complete *a Student Project Statement/Hazard Assessment Form*. Students will provide information regarding:

- Project Details
- Hazard Identification

- Hazardous and Non-Hazardous Materials
- Tools and Equipment
- Trainings Verification
- Personal Protective Equipment
- Waste Disposal

Student Project Statement/Hazard Assessment forms should be reviewed by the students' faculty advisor and the SoE Safety Coordinator. Failure to complete a hazard assessment or to implement established safety practices may result in the suspension of the club or student group or loss of campus space.

HAZARD COMMUNICATION

4.1 Hazard Signs

All laboratories containing hazardous equipment or hazardous materials must have a blue hazard sign outside the entrance which details the hazards, emergency contact information, and personal protective equipment required. These signs are generated by the EHS/RM Office. Laboratory managers can click here to Request a Form or Update a Blue Hazard Sign on the EHS/RM office.

Hazards located within laboratories must also be identified using recognized signage.

4.2 Safety Information on Website and Porches

SoE faculty, staff and students can access information regarding the SoE Safety Program from the Engineering Porches page and on the School of Engineering website.

4.3 Safety Orientation for New Faculty and Staff

New faculty and staff are required to meet with the SoE Safety Coordinator to receive an orientation to the SoE safety programs. During this meeting, the SoE Safety Coordinator will develop a training schedule for new faculty or staff members based on their job duties.

4.4 Safety Training

4.4.1 BioRaft Safety Management System

The University of Dayton has recently adopted the BioRaft Safety Management System. All safety training for university faculty, staff and students will be administered and tracked through this on-line platform.

Safety courses have been developed by the Environmental, Health and Safety Department in consultation with the SoE to instruct faculty, staff and students on how to 1) recognize

hazards, 2) minimize risks associated with hazards and 3) respond appropriately when incidents occur. Courses also outline university and SoE safety programs and policies. Safety courses cover broad safety topics and set the foundation for laboratory-specific and hazard-specific training. See the *BioRaft Users Guide and Training Reference Sheet* for more information.

4.4.2 Training Matrix for SoE Laboratories

Across SoE laboratories, faculty, staff and students participate in a wide variety of activities that have associated hazards from chemical exposure, to robotics, to lasers, to nanomaterials and biohazards. In order to provide laboratory users with applicable safety training that is narrowly focused on the hazards that they will encounter in their labs. The BioRaft Safety Management system allows Laboratory Managers and Principle Investigators to identify hazards associated to individual laboratories and/or hazards based on job functions for their laboratory personnel. The system then correlates these laboratory and job hazards to the appropriate safety training.

4.4.3 Laboratory-Specific and Hazard-Specific Training

While EGR SAFETY courses provide basic safety training, it is critical that PI's and instructors provide laboratory-specific and hazard-specific training to faculty, staff, students and visitors working in and taking classes in laboratories. This training should include information regarding:

- Laboratory standard operating procedures (SOPs)
- Physical and health hazards
- Specific hazard instruction for chemical, biological, mechanical and electrical hazards
- Personal protective equipment
- Proper labeling storage and disposal of hazardous substances
- Emergency equipment locations and use
- Additional site-specific hazards

Laboratory-specific and hazard-specific training must be documented. PI's and lab instructors may use the *Hazard-Specific/Laboratory-Specific Training Record* form, training logs in SOPs or other forms of documentation. Laboratory-specific and hazard-specific training and documentation will be evaluated during annual laboratory inspections.

4.4.4 Training for Visitors

Visitors who plan to work in laboratories must complete basic safety training. Visitors attending camps, workshops or seminars that will be supervised by SoE faculty, staff and/or students must be given hazard-specific training prior to any activities in laboratories. Please contact the SoE Safety Coordinator for assistance in developing safety training for visitors and special functions.

4.4.5 Annual Laboratory Safety Refresher Training

All faculty, staff and students are required to complete laboratory safety training annually. Other specialized safety training such as Hazard Communication and Driver Safety training must also be completed annually. Training records and expiration dates can be found in the BioRaft Safety Management System. The system will automatically notify laboratory personnel when training is required.

4.4.6 Training Records

Safety training records will be created and retained in the BioRaft Safety Management System. Laboratory-specific training and hazard-specific training records should be kept in laboratories or in the department and should be made available for review during annual laboratory inspections.

5.0 ACCESS CONTROL

5.1 Kettering Laboratories Building Access

The entrance doors to Kettering Laboratories are locked overnight, on weekends and on university holidays. The building may be accessed during these times using a key card. As a general rule, undergraduate students should not be provided unlimited key card access to the building.

Faculty advisors or department administrators wishing to request key card access to the building for graduate students, faculty or researchers must request approval through the Dean's Office. Individuals must complete *Fundamental Workplace Safety* training before they are given building access.

5.2 Laboratory Access

Faculty advisors or department administrators wishing to request key card access or keys to laboratories for graduate students, faculty or researchers must request approval through the Dean's Office. Individuals must complete *Laboratory Safety* training before they are given laboratory access.

5.3 Working Alone

The University of Dayton has a policy that no students are allowed to work alone where a hazard is present. No undergraduate students or student workers should ever work alone in a laboratory. Graduate student researchers, however, may have special circumstances due to the nature of their work when they will need to work alone. Graduate students may only work alone in laboratories if they provide prior notification to their faculty advisor and/or department. Graduate students should be discouraged from working alone or unsupervised around hazards after normal business hours, on weekends, and on holidays.

5.4 Laboratory Doors

Laboratory doors must remain closed at all times. Work performed in laboratories may be dangerous and any accidental releases, explosions or fires will be contained by keeping doors to laboratories closed. Additionally, laboratory doors should remain closed in order to maintain proper air flow between the laboratories and outside public spaces.

Doors to laboratories should never be propped open by wood blocks, cement, boxes, or any other object that obstructs the doorway. Object used to prop open a door are tripping hazards and may become an obstacle to personnel exiting the room during an emergency.

6.0 INVENTORY CONTROL

6.1 Procurement

Laboratory personnel must verify the following before procuring hazardous chemical or materials:

- It is the least hazardous material that can be used for the project
- The material is not already available in the laboratory
- The smallest quantity needed for the project is being procured
- The laboratory has proper storage space for the material
- The laboratory is equipped for a spill or release of the material
- Laboratory personnel are trained on how to properly handle the materials

Laboratory personnel should work with department laboratory managers and administrative assistants to procure materials using the university on-line procurement system. Students are only allowed to order hazardous materials with written permission from PI's or instructors.

6.2 Storage

Chemicals stored in laboratories should be segregated by hazard class and compatibility, at a minimum. The Ohio Fire Code regulates storage of chemicals based on occupancy, classification, building construction, availability of flammable storage cabinets, quantities

and location of the laboratory. Contact the EHS/RM office for assistance with the interpretation of the fire codes.

All containers used for chemical storage should be labeled properly. Chemicals should not be stored on floor, on lab benches, or under hoods. Laboratory managers should routinely review chemical inventories to determine whether they can dispose of any excess chemicals and waste materials.

6.3 Inventories

All laboratories must keep an inventory of hazardous chemicals and materials. This list is to be submitted to the EHS/RM office so that emergency response personnel can be made aware of the contents of the room.

6.4 Disposal

The EHS/RM office will pick up hazardous waste for disposal. The following steps should be taken to ensure the proper disposal of hazardous waste and chemicals.

Process for Disposing Hazardous Waste
Step 1. Segregate waste by hazard class
Step 2. Seal the waste in a primary and secondary container
Step 3. Label the waste with a Hazardous Waste Label
Step 4: Fill Out a *Hazardous Waste Disposal Form* and submit it to the EHS/RM Office
Step 5: Coordinate with the EHS/RM office for pick-up of the waste

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 Proper Protective Clothing

All faculty, staff, students and visitors should wear proper clothing when working in laboratories. The following guidelines should be followed:

- Sturdy shoes that completely cover the foot must be worn at all times; no sandals, flip-flops, crocs, slippers, open-backed, or open-toed shoes
- No loose-fitting clothing, hanging jewelry, or sweatshirts with hanging drawstrings should be worn when working around equipment with rotating parts
- No shorts or skirts should be worn when operating cutting or welding tools or machines
- Laboratory coats, long pants and gloves should be worn when working with hazardous chemicals

Information regarding proper protective clothing required in each laboratory and shop is included on the blue hazard signs. Faculty, staff, students and visitors not wearing proper clothing may be prohibited from working in a laboratory or shop. PIs and laboratory

instructors are responsible for ensuring that their students and staff are wearing proper protective clothing in laboratories.

7.2 Eye Protection

Proper eye protection is required for faculty, staff, students, and visitors to laboratories. All faculty, staff and students working in a laboratory should wear safety glasses when using tools and machinery. Chemical goggles, splash goggles or a full face shield should be worn during chemical transfer and handling operations. PIs and laboratory instructors are responsible for ensuring that their students and staff are wearing proper eye protection in laboratories.

8.0 MACHINE AND EQUIPMENT READINESS

Machines and equipment used in the SoE should be maintained by laboratory managers and/or maintenance personnel at the interval required by the manufacturer and after any damage or modifications have occurred. Machine and equipment should also be calibrated according to manufacturer specifications. All equipment maintenance and calibration records should be readily accessible in the laboratory or in the Department office.

9.0 INCIDENT RESPONSE

9.1 Reporting

The SoE Safety Coordinator and the university EHS/RM office track all incidents that involve faculty, staff, students and visitors. When an incident occurs, a *UD Incident and Hazard Report* form should be completed and submitted to the SoE Safety Coordinator and the EHS/RM office. A *Worker Compensation Form* should also be completed if the incident involves an injury to a university employee.

The SoE Safety Coordinator and the university EHS/RM office periodically review incident reports to determine if institutional controls, engineering controls, personal protective equipment or training needs to be revised to protect against future incidents.

9.2 Emergency Evacuation Plan

The SoE have offices, classrooms and laboratories located in Kettering Laboratories, the Science Center and Fitz Hall. All SoE faculty, staff and students must evacuate these buildings during a fire alarm and meet in a designate area outside of the buildings. See the *Emergency Evacuation Plans for Kettering Laboratories* for more information. Please contact UD Environmental, Health and Safety for evacuation plans for other buildings on campus.

9.3 Weather Emergencies

The university will notify all faculty, staff and students when a severe weather warning has been issued for our area. In the event of a tornado or high wind warning, all faculty, staff and students in must take shelter in the basement or lowest level of a building. See the *Severe Weather Response Plan* for more information.

9.4 Safety or Security Threats

The university will notify all faculty, staff and students when there is a campus-wide safety or security threat. All faculty, staff and students should shelter in place away from doors and windows and monitor e-mail and/or cell phone messages for updates.

10.0 AUDITS

10.1 Department Safety Audits

In-depth safety audits of SoE departments will be completed periodically, as determined by the SoE Safety Coordinator and/or following any major safety incident.

10.2 Laboratory Inspections

All SoE laboratories are inspected annually. Inspections are performed by members of the university EHS/RM office, the SoE Safety Coordinator and a representative from each department.

Laboratory/shop inspections include the review of the following:

- Emergency information and equipment
- Fire Extinguishers
- Electrical panels and cords
- First Aid and Safety Equipment
- Compressed Gases
- Laboratory Hoods
- Personal Protective Equipment
- Chemical Storage, Chemical Inventory and Chemical Waste
- Other general items: housekeeping, food/drink, etc.

See the *Laboratory Inspection Checklist* used by university EHS/RM office for more information. Following the inspections, laboratory inspection reports are sent to the department chairs and laboratory managers identifying safety issues identified during the inspections. Laboratory managers must address these issues and provide the information regarding corrective actions to the SoE Safety Coordinator.