

# **ILLINOIS INSTITUTE OF TECHNOLOGY SAFETY POLICY COMMITTEE**

## **Laboratory and Workshop Safety Policy**

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## APPENDICES

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## **1) PURPOSE**

In order to provide a safe, healthful laboratory and workshop experience for faculty, staff, students and visitors, all Illinois Institute of Technology (“IIT” or “University”) departments offering laboratorycourse work and/or research must provide laboratory space users with relevant safety protocols. Such protocols should be approved prior to the use of Research Laboratories, Instructional Laboratories, each as defined below. Each department shall develop and maintain a written laboratory safety program (“Program”), consistent with this policy, to ensure that Users of laboratory or workshop space receive safety instruction related to the unique risks and safety issues relevant to the department’s Research Laboratories, Instructional Laboratories. Each department’s Program should be developed in coordination with the University’s Director of Environmental Health and Safety, who will review the Program annually andwill submit such Program, when he or she deems a Program is acceptable, to the Campus Safety Working Group, and as needed to the Institutional Biosafety Committee and/or Radiation Safety Committee for final review.

## **2) SCOPE**

A Program should inform laboratory users of the nature of hazards that they are likely to encounter in Research Laboratories and Instructional Laboratories while pursuing their research or course work. A Program should describe how safe operating procedures will be defined in each laboratory space and how the implementation of safe operating procedures will be enforced. By way of guidance, in a chemical/biological lab a Program should address Hazards that include, but are not limited to, the following:

- a) handling cylinder gases;
- b) flammable materials, fire hazards, sparks and burn injuries;
- c) handling acids, bases and corrosive chemicals;
- d) handling toxic materials;
- e) radiation, laser and X-ray hazards;
- f) moving and lifting heavy objects and avoiding head injuries;
- g) handling cryogenic materials;
- h) handling extremely hot materials;
- i) exposure to ultraviolet light and welding hazards;
- j) exposure to dust and fumes;
- k) handling biohazards, including recombinant DNA;
- l) avoiding hearing loss due to high pitched and loud noises;
- m) high voltage electrical hazards;
- n) fire safety and evacuation procedures; and
- o) hazard communication protocols.

## **3) DEFINITIONS**

**Student(s)** – A currently enrolled, part-time or full-time IIT student who is enrolled in a course of study utilizing one of IIT’s instructional laboratories.

**Laboratory Users** – Students and other individuals who utilize laboratory space for research, instruction, or clubs, as well as visitors to laboratory space and facility workers.

**Hazards** – Objects or circumstances that pose a threat of direct bodily harm, such as sharp objects and equipment, and the threat of long term degradation of health, such as exposure to chemical and toxic substances.

**Laboratories** – Any defined space used as a laboratory, machine shop, auto shop, photographic darkroom or any other designated area where faculty, staff and/or students perform potentially hazardous tasks beyond those hazards normally associated with an office environment. The Hazards to be considered include chemical, mechanical, electrical or radiation (including lasers). This space may also be used by University clubs.

**Research Laboratories** – Laboratory space maintained by the University's colleges that are intended primarily to support research purposes.

**Instructional Laboratories** – Laboratory space maintained by the University's colleges that are intended primarily to support instructional purposes.

**Workshops** – Generally involve hands-on learning activities along with discussion, interaction, presentation and debate on a given topic including areas where clubs perform tasks. For purposes of this Policy, the word Laboratory will also cover workshops.

**Faculty Laboratory Safety Coordinator** – A faculty member appointed by the Provost to assist departments in developing, implementing and monitoring policies, procedures and standards that are consistent with this Policy and who assists the Director of Environmental Health and Safety when dealing with matters concerning safety and the faculty or students. The Faculty Laboratory Safety Coordinator has the responsibility of gathering and archiving all documentation pertaining to compliance with the Laboratory Safety Policy and transmitting these to the Director of Environmental Health and Safety.

**Safety Data Sheet** – A written electronic or printed document describing a hazardous chemical which is prepared in accordance with 29 CFR 1910.1200(g). More generally, it is an informational tool generated by manufacturers and suppliers of chemicals to provide safety information. A Safety Data Sheet is kept for each chemical used in Instructional Laboratories and Research Laboratories.

**Personal Protective Equipment** – Equipment to provide a protective barrier from a potential Hazard. Examples include, but are not limited to, safety glasses, lab coats, goggles, face shields, disposable garments, respirators and gloves.

**Responsible Person** – This term applies when this procedure is addressing both instructors and Principal Investigators. It also applies to advisors in charge of clubs or IPRO projects.

**Standard Operating Procedures** – A written hazard document detailing a comprehensive evaluation of the potential hazards associated with the work in Laboratories. This document details how to safely work with hazardous materials, processes and equipment.

**Work Practice Controls** – Changes in the way an individual performs physical activities in order to reduce exposure to hazards. Work practice controls involve procedures and methods for safe work and include, but are not limited to:

- use of neutral postures to perform tasks (straight wrists, lifting close to the body);

- use of two-person lift teams;
- technique or sequence of events for a process; and
- wearing specific Personal Protective Equipment.

#### 4) RESPONSIBILITIES

Providing a safe environment for Students, staff and faculty is a responsibility shared by laboratory personnel, Environmental Health and Safety personnel, faculty and academic administration. Responsibility for working safely lies with those scientists, technicians, faculty, students, and others who are performing the work. Each level must communicate effectively with the others in order to accomplish this task; effective communication requires identification of those responsible for laboratory safety and individual ownership of those responsibilities. This section outlines what must be done and by whom, in a specific timeframe, and how documentation of these activities will be generated and maintained.

- a) **Deans:** Deans are responsible for ensuring that the department chairs or academic units reporting to them understand and perform their duties with respect to their programs, which shall include at least the following:
  - Provide department chairs with a written description of their laboratory safety obligations; this may be the responsibilities identified below, or such obligations may be tailored to suit the needs of the relevant academic unit with reference to the applicable University safety policies;
  - Maintain current copies of departmental records related to laboratory safety as may be required by this policy and the Director of Environmental Health and Safety;
  - Annually audit documentation related to laboratory safety is required by this policy and by the Director of Environmental Health and Safety to ensure that documentation is current and complete, and that copies have been transmitted to the Director of Environmental Health and Safety, as necessary;
  - Retain approved documentation related to variances to an applicable safety procedure;
  - Work with department chairs to accomplish compliance with the department's program for any issues that may arise that cannot be addressed consistent with the relevant academic unit's budget authority; and
  - Provide support for training Department Safety Officers, Laboratory Safety Coordinator and Responsible Persons as necessary to be competent in performing safety duties.
- b) **Chairs and Directors:** Department Chairs and Directors of academic units are primarily responsible for compliance with the department's program, including the development of their department's or unit's safety Program, which shall include at least the following:
  - Designation of a Department Safety Officer who is qualified and able to assume the responsibilities set forth in this Program;
  - Development and review at least annually a written description of the Department Safety Officer's duties, which description shall be sent to the Faculty Laboratory Safety Coordinator;
  - Ensuring that Laboratory Users are offered the appropriate safety training by the respective Principal Investigators or Laboratory Safety Coordinator prior to their use of the laboratory space; written records of this training substantially in the form of Exhibit B shall be sent to the Faculty Laboratory Safety Coordinator at least annually;

- Ensure that Responsible persons have received the appropriate safety training prior to their use of the laboratory space; written records of this training shall be sent to the Faculty Laboratory Safety Coordinator at least annually;
- Periodic review and revision of all laboratory safety related documents required by this policy and by the Director of Environmental Health and Safety, and transmission of the final documentation to the relevant Dean and the Director of Environmental Health and Safety;
- Review of any written request for a variance to an applicable safety procedure, and if approved, transmit the document to the Department of Environmental Health and Safety for review and approval. Once approval from the Department of Environmental Health and Safety has been obtained, a copy of the approved document will be maintained by the Chair, and if not approved, the Chair shall so inform the applicant in writing (see attached variance guideline);
- Maintaining a current written list of assignment(s) of the department's laboratory space, and ensuring that the relevant Principal Investigators and department's Laboratory Safety Coordinator(s) are provided with a written copy of their respective responsibilities, with additional duties as required by the Chair, but in no event less than those responsibilities described below, and communicating these lists, in writing, no less frequently than annually, to their Dean and the Director of Environmental Health and Safety; and
- Working with Responsible Persons and Deans to ensure compliance with applicable laboratory safety policies and programs for any issues that may arise that cannot be covered by direct costs of research grants or department budgets, consistent with the requirements of the Laboratory Safety Inspection Policy.

c) **Faculty Laboratory Safety Coordinator** – The Faculty Laboratory Safety Coordinator shall assist departments in developing, implementing and monitoring laboratory safety standards that are consistent with applicable University safety policies. The duties of the Faculty Laboratory Safety Coordinator shall include:

- Participating in periodic laboratory inspections as requested by the Director of Environmental Health and Safety, (See IIT Laboratory Inspection Policy);
- Working with faculty, staff and the Director of Environmental Health and Safety to develop and implement means of achieving compliance with applicable University laboratory safety policies in a way that minimizes the impact of compliance on the primary functions of the Director of Environmental Health and Safety, Deans, Chairs and Responsible Persons;
- The Faculty Laboratory Safety Coordinator also shall be responsible for the following:
  - Providing, on an annual basis, a list of documents required by the Director of Environmental Health and Safety to Deans, Chairs, faculty and staff;
  - Assisting the Director of Environmental Health and Safety in working with the faculty, Chairs and Deans to develop and maintain easily used systems by which pertinent records are to be transmitted, maintained, revised, updated, reviewed and audited;
  - Assisting the Chairs and Responsible Persons in the development of a Program, chemical hygiene plans, emergency plans, variances, standard operating procedures, and other documentation required by the Director of Environmental Health and Safety, as they may apply to laboratory safety;
  - Assisting Chairs and faculty members in the development, presentation, and record-keeping for laboratory safety training activities;

- Providing Responsible Persons, Chairs and Deans the most recent versions of University laboratory safety-related policies on an annual basis or whenever such policies are modified or initiated;
- Requesting, on an annual basis, the assignments of laboratory space for which each Principal Investigator or Laboratory Safety Coordinator is responsible, and to ensure that these individuals are provided with a written copy of their respective responsibilities as described in the Program and this policy;
- Assisting, as requested, the Deans in their annual audits and the Chairs in their annual reviews of required laboratory safety documentation;
- Assisting, as requested, faculty members in the preparation of written laboratory safety variance applications;
- Assisting, as requested, Responsible Persons with assessments of the safety standards of their respective laboratory space;
- Assisting, as requested, the Responsible Persons in bringing their laboratory space into compliance with applicable University safety policies; and
- Acting as a resource available to the staff, faculty, academic administration, and the Director of Environmental Health and Safety in ensuring compliance with relevant University safety policies.

d) **Responsible Person** – Each laboratory space may have assigned to it one or more Responsible Person. The duties of the Responsible Person include the following:

- Creating a written list identifying the Hazards in their laboratory in a form substantially similar to Appendix A and provide it to the Department Safety Officer in advance of performing work;
- Attain approval from the Institutional Biosafety Committee when procedures require the use of Biological Hazards;
- Attain approval from the Radiation Safety Committee for procedures involving radiation;
- Developing a Standard Operating Procedure for all hazardous chemicals and related equipment processes, and obtain approval for such procedure from the Department of Environmental Health and Safety;
- Reviewing at least annually the relevant Chemical Hygiene Plan, if applicable;
- In consultation as appropriate with the Laboratory Safety Coordinator and/or Department Safety Officer, developing as necessary written reference materials, based upon their expertise, defining proper and safe Work Practice Controls, which necessarily should include identifying and avoiding unsafe practices as well;
- With respect to Instructors using Instructional Laboratories as part of their curriculum, instructing Students concerning the Hazards posed by working in that laboratory space or workshop:
  - an Instructor may delegate this responsibility to a qualified teaching assistant or staff person, but the Instructor is ultimately responsible for verifying that such instruction was in fact completed; and
  - verification may occur through the filing of an Safety Verification Form, attached here as Appendix B, signed by the Instructor.
- Identifying and documenting, using a form substantially similar to the Safety Verification Form included as Appendix B, Laboratory Users who received safety instruction and who are thereby permitted to work in the relevant laboratory space or workshop;

- Ensuring that Work Practice Controls are observed in the laboratory space;
- Denying access to individuals who did not participate in required safety instruction, or who have demonstrated a lack of understanding of, or an inability to follow, Work Practice Controls;
- Maintaining their respective laboratory space in safe operating condition;
- Submit a Safety Policy Variance Request to the Chair or Department Head if reasonable acceptations must be made to Safety Policies; and
- Supplying and/or requiring the use of Personal Protective Equipment, as necessary.

e) **Department Safety Officer** – The Chair shall appoint a Department Safety Officer who may be selected from the faculty or staff of that unit, who will coordinate and report on the status of the department's compliance with the requirements of the Program. The Department Safety Officer under this Policy may also act as a safety officer in connection with other safety-related programs and policies as may be necessary. The duties of the Department Safety Officer will include, but need not be limited to:

- Touring periodically that department's laboratories and, if requested, working with the relevant faculty and staff, help the relevant faculty and staff prepare an itemized list identifying the hazardous materials, equipment and processes to which students will be exposed;
- Working with the faculty and staff in charge of the Research Laboratories, Instructional Laboratories, to develop a program of safety instruction for the students who use those labs;
- Ensuring that Program documentation is available to Chair of the department, Director of Environmental Health and Safety and Lab Supervisor;
- Collecting accident reports concerning injuries that have occurred in each department's laboratories; copies of these reports should be provided to the Director of Environmental Health and Safety;
- Working with Responsible Persons and Laboratory Safety Coordinator to create and maintain a written emergency response plan outlining the response to possible accidents in the laboratory space, including a list of offices and people to notify; a copy of this emergency response plan should be filed with the Director of Environmental Health and Safety;
- Providing assistance, upon request, to identify Hazards in that department's Research Laboratories, Instructional Laboratories;
- Ensuring that a compiled written list of the identified Hazards in a format substantially similar to Appendix A has been completed by the Principal Investigator and/or Instructor, and posted with other safety documentation for the laboratory space;
- Encouraging Principal Investigator and researchers to post Standard Operating Procedures in conjunction with the department's Chemical Hygiene Plan;
- Working with the faculty and staff in charge of the laboratory space to develop programs of safety instruction, and reporting to the Dean or Chair, and to the Director of Environmental Health and Safety, concerning specific matters involving the department's implementation of and compliance with the Program;
- Reviewing the hazard assessment documents submitted by the Responsible Person for regulatory compliance and safety concerns that the Responsible Person may be unaware of, and providing feedback; and

- Delivering a list of identified Hazards to the department's Dean and Chair, the department's instructors or Principal Investigators, the Director of Environmental Health and Safety and Faculty Laboratory Safety Coordinator.

f) **Laboratory Safety Coordinator** - The Chair shall appoint a Laboratory Safety Coordinator whose duty it is to promote a safe work environment for individuals utilizing a department's Instructional Laboratories. The Laboratory Safety Coordinator, in conjunction with possible teaching assistants, will staff the department's Instructional Laboratories whenever such facility is open for use. The Laboratory Safety Coordinator may also fill the role of Department Safety Officer. The Chair shall also appoint a Laboratory Safety Coordinator for Research Laboratories for such facilities that are shared by multiple Principal Investigators or researchers. The Laboratory Safety Coordinator shall be a professor, staff person or qualified teaching assistant. The duties of the Laboratory Safety Coordinator include, but need not be limited to, the following:

- Maintaining a file of Safety Data Sheets describing hazardous chemicals being used in each laboratory space and making this file accessible to anyone on request;
- Maintaining the relevant laboratory space and its equipment in safe working order;
- Having, on hand, Personal Protective Equipment that Laboratory Users are required to use but that they may not be required to furnish for themselves, as necessary;
- In coordination with the Responsible Person, requiring that Laboratory Users are certified and that they comply with safe working procedures;
- The authority to expel uncertified and non-cooperating Laboratory Users from the laboratory space;
- Generating accident reports documenting injuries that occur in the laboratory space and maintaining a file of these reports, consistent with IIT's Incident Investigation Policy;
- Ensuring that safe Work Practice Controls are maintained in the relevant Instructional and research Laboratories;
- Denying access to Laboratory Users who have not received the requisite laboratory safety instruction, or who demonstrate an inability to follow establish laboratory space Work Practice Controls;
- Using their knowledge of safety to assist instructors in filling out required safety forms such as the Hazard Identification Form;
- Assisting the Responsible person in maintaining the relevant Laboratories in a safe operating condition; and
- Ensuring that there are no unforeseen Hazards caused by incompatible experiments run in the same area.

g) **Laboratory Users** – Anyone who is entering a lab/workshop unescorted would be a laboratory user. Laboratory user responsibilities are:

- To be aware of the hazards in the area he or she is around or working with; and handle those hazards in a safe manner;
- Observe environmental, health and safety related signs, posters, warning signals and written directions;
- Use personal protective equipment and engineering controls (e.g., fume hood) appropriate to the work;

- Properly label all chemical containers and provide secondary spill containment for all hazardous liquid chemicals;
- Curtail or stop work if the work can possibly pose an imminent danger to health or safety, and immediately notify a supervisor in the chain of authority over the work;
- Warn co-workers about defective equipment and other hazards;
- Be aware of location of safety equipment such as fire extinguishers, eyewashes, safety showers;
- Develop good safety practices and habits;
- Undertake operations in accordance with the laboratory/workshop approved procedures;
- Practice good housekeeping;
- Report unsafe conditions to the Principal Investigator, Instructor, Department Safety Officer, Laboratory Safety Coordinator, Chair or Department of Environmental Health and Safety;
- Complete required safety training;
- Be familiar with the Emergency Plan, and the emergency assembly area for their building, and participate in emergency drills; and
- Inform visitors entering his or her laboratory/workshop of potential hazards and appropriate safety rules and precautions.

h) **Visitors** - Short term visitors to laboratories will be escorted at all times by a trained Principal Investigator, Instructor, Department Safety Officer or teaching assistant.

i) **The Department of Environmental Health and Safety** – Aside from duties spelled out in other IIT Policies, the Department of Environmental Health and Safety will:

- Provide technical consulting assistance and services for fulfilling the University's commitment to provide a safe environment and to conduct its operations in compliance with applicable laws and regulations and accepted practices for health, safety and environmental protection;
- Develop and implement safety policies;
- Provide training resources to the IIT community;
- Help laboratories achieve the use of safe work practices; and
- The Department of Environmental Health and Safety shall review safety documentation such as, but not limited to Standard Operating Procedures, Chemical Hygiene Plans, Hazard Identification Forms and Variances:
  - (1) If documentation is approved it will be sent to the appropriate parties.
  - (2) If documentation is not approved, the Department of Environmental Health and Safety will assist the Responsible Person with making corrections and additions.

j) **Committees** – Illinois Institute of Technology has committees to oversee specialized hazards that have extended federal oversight. Any processes that require the use of these materials must be approved by the committees before the material can be ordered or used. Approval forms from these committees can also be used as the Standard Operating Procedure for the specific materials and processes.

- Institutional Biosafety Committee – includes oversight of the use of any biological hazards.
- Radiation Safety Committee – oversees the use of any radioactive material.
- Institutional Animal Care and Use Committee - oversees research involving the use of animals.
- Laser Safety Committee - oversees the use of lasers.
- Institutional Review Board - oversees research involving human subjects.

## 5) INSTRUCTION

Before a Laboratory User may utilize a laboratory, the Responsible Person, shall inform a Laboratory User of relevant Hazards the user may face in the laboratory space and instruct the Laboratory User in proper safety procedures to be followed in those areas. In the case of the Responsible Person, their Chair or Supervisor shall ensure that they receive proper safety training. This instruction should include, at a minimum, (i) a description of the nature of the Hazards, (ii) an explanation of how to protect one's self from the Hazards, and (iii) an explanation of the relevant procedures to be observed should an incident occur. In addition, the instruction should include the following:

- Providing "hands on" instruction to ensure clarity of Laboratory User's understanding;
- Selecting the proper Personal Protective Equipment and ensuring that it is worn;
- Demonstrating the proper use of available Personal Protective Equipment and specify items of Personal Protective Equipment that Laboratory Users must furnish themselves;
- Administering to Laboratory Users a written safety skills exam of the Instructor's or Principal Investigator's devising;
- Maintaining and posting an up to date list of Laboratory Users approved to use of the laboratory space; and
- Providing this list upon request the Department Safety Officer and the Faculty Laboratory Safety Coordinator.

## 6) UPDATE AND REVIEW

- a) Review. A department must review its Program as needed, but in no event less than every annually to ensure that it is compliant with all applicable laws and IIT policies and to evaluate its effectiveness. Revised plans must be submitted to the Director of Environmental Health and Safety for final approval.
- b) Updates. A laboratory must complete a new Hazardous Identification Form (Appendix A) whenever the laboratory has experienced a material change, such as, but not limited to, the use and/or introduction of a new piece of equipment which may pose safety concerns or the addition of new chemicals, including a substantial change in the quantity, quality or use of chemicals or the discontinuation of a previously used chemical.

## 7) RECORDKEEPING REQUIREMENTS

- a) List of Safety Certified Laboratory Users. A list of Laboratory Users who have been instructed and certified to work in each lab will be updated at least once a semester by the Responsible Person, and this list will be posted in each lab or workshop and in a file maintained by the Department Safety Officer, with a copy to the Director of Environmental Health and Safety and Faculty Laboratory Safety Coordinator.
- b) Safety Data Sheets. Compliant with the Globally Harmonized System sheets will be kept on file in each lab or workshop covering any hazardous materials used in that facility.

- c) Accident Reports. Reports documenting injuries suffered in each lab or workshop will be kept in a file maintained by the Department Safety Officer, with a copy to the Director of Environmental Health and Safety and Faculty Laboratory Safety Coordinator.
- d) Plan and Procedure Manuals. The department's Plan and any written procedures defining approved work practice controls relevant to each laboratory or workshop shall be stored in a file in that facility and in a file maintained by the Department Safety Officer and made available upon request, with a copy to the Director of Environmental Health and Safety and Faculty Laboratory Safety Coordinator.

## **8) APPROVAL**

The IIT Safety Policy Committee reviewed and recommend the adoption of this Policy on September 19, 2005, and this Laboratory and Workshop Safety Policy is approved and effective this 10<sup>th</sup> day of October 2005. Modifications and updates to this policy have been reviewed and approved and are effective as of the date noted on the cover page. The Safety Policy Committee will review the contents, implementation and effectiveness of this Policy no less than annually (but as often as necessary) to ensure that it meets all required legal and regulatory requirements and is adequately providing a safe and healthful environment for IIT faculty, employees and students.

By: \_\_\_\_\_ /s/  
Allan S. Myerson, Provost and Senior Vice President

By: \_\_\_\_\_ /s/  
John P. Collins, Vice President for Business & Administration

**APPENDIX A**  
**HAZARD IDENTIFICATION FORM**

***PLEASE INSERT ALL REQUESTED INFORMATION BELOW FOR EACH LABORATORY USED BY YOUR DEPARTMENT. A COPY THIS FORM SHOULD BE SENT TO THE DEPARTMENT'S DEAN/CHAIR, ITS INSTRUCTORS AND THE DIRECTOR OR ENVIRONMENTAL HEALTH AND SAFETY.***

EQUIPMENT	MAKE & MODEL	HAZARD
CHEMICAL NAME & CLASS	MAXIMUM QTY ON HAND	HAZARD
OTHER CONDITION		HAZARD

Compiled by: \_\_\_\_\_  
(Print Name)

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## **APPENDIX B**

### **SAFETY VERIFICATION FORM**

This Form is to be delivered to the Department's Designated Safety Officer, \_\_\_\_\_, prior to individuals performing any work in a laboratory or work shop.

Department: \_\_\_\_\_

Building & Room:

Class Title: \_\_\_\_\_

Instructor(s): \_\_\_\_\_

Name and Title of Individual  
Providing Safety Instruction: \_\_\_\_\_

Date Safety Instruction Provided: \_\_\_\_\_

## Verification

I, \_\_\_\_\_, do hereby certify that Laboratory/Workshop Safety Instruction was provided to the individuals listed below in connection with the above-referenced class on the date and by the individual above-referenced, and that the individuals listed below have demonstrated an understanding of the instruction provided. This instruction was provided in a manner that is consistent with my Department's procedures and policies relating to laboratory/workshop safety instruction and Illinois Tech's policy on Laboratory and Workshop Safety.

## Students

(Print names – add pages as necessary)

Name of Instructor/PI: \_\_\_\_\_ Date: \_\_\_\_\_

## APPENDIX C

### STANDARD OPERATING PROCEDURES

#### **I. Preparing Standard Operating Procedures for Laboratory and Workshop Activities**

An important first step in planning laboratory experiments is a comprehensive evaluation of the potential hazards associated with the work. This includes hazards that may be posed by chemicals, biological and radioactive materials, equipment, physical hazards and conditions. This risk analysis should not be divorced from the other components of the planning process, but rather integrated into a single process evaluation. This evaluation should be documented and used a tool for future reference in the form of a Standard Operating Procedure. In most cases Standard Operating Procedures should be developed in a collaborative environment, with the involvement of multiple researchers as opposed to individually.

Principal investigators and Instructors must add Standard Operating Procedures to the appendices of the Chemical Hygiene plan or in the case of Laboratories that do not require a Chemical Hygiene Plan the Standard Operating Procedures should be in a binder near the entry door of the laboratory or workshop. Standard Operating Procedures are required when the chemical or process that will be used has unique hazards not covered by the general information in the Chemical Hygiene plan. This also includes information about other hazards besides chemical such as, but not limited to mechanical equipment, biological hazards, radioactive hazards, electrical work, laser work, etc. These are also required in areas that do not require Chemical Hygiene plans such as engineering shops, and machine shops.

Processes that are required to be approved by committees such as the Bio-safety Committee and the Radiation Safety Committee can use the approved forms in place of a standard Operating Procedure. Instructional Laboratories may use a reference to classroom material such as workbooks or text books as long as the material includes the elements of Standard Operating Procedures discussed below.

#### **II. Elements of a Standard Operating Procedure**

There are no absolute correct or incorrect methods for developing a Standard Operating Procedure, nor is there a single acceptable format. The process is not intended to be about filling out forms; the process, when completed appropriately, ensures that safe work practices have been developed for the experimental work. Standard Operating Procedures can be integrated directly into laboratory manuals or procedural experimental guides, developed for a specific hazard such as an individual chemical or class of chemicals or specific equipment. Standard Operating Procedures can be stand-alone documents or supplemental information included as part of research notebooks, experiment documentation or research proposals. Standard Operating Procedures must contain, at a minimum, the following information:

- **Identification:** Identify, specifically, the intended scope of the Standard Operating Procedure. The Standard Operating Procedure can focus on specific processes and procedures, individual hazardous materials or groups of hazardous materials, equipment and conditions.
- **Process Hazards Assessment:** A hazards assessment which details potential hazards associated with the activity/process. This would include hazardous materials, physical hazards, equipment items electrical hazards, lasers etc.

## APPENDIX C STANDARD OPERATING PROCEDURES

- **Exposure Controls Review:** The hazards assessment information should be utilized to consider potential exposures using the four “routes of exposure” as a foundation.
- **Engineering Controls:** A detailed description of the engineering control requirements of the process/procedure along with a method of ensuring proper operation and efficacy.
- **Personal Protective Equipment:** A detailed description of the Personal Protective Equipment requirements of the process/procedure along with the location of supporting reference information.
- **Storage and Handling Requirements:** Detail storage requirements for hazardous materials and process handling issues specific to the procedure.
- **Proficiency and Authorization:** The training requirements for the specific procedure, or piece of equipment should be clearly defined, along with a mechanism to ensure proficiency within the laboratory. Specific procedures for access control and authorization during the procedure should also be outlined.
- **Waste Management:** Outline waste materials to be generated and appropriate waste management procedures for the work.
- **Decontamination Procedures:** Specific methods for decontamination/cleaning appropriate to the work being completed should be included.
- **Emergency Procedures:** Detail the specific procedures to be followed if emergency situations arise from the process/procedure. These steps will be based on the hazard assessment and controlssections.

The Department of Environmental Health and Safety can assist in the development of laboratory specific Standard Operating Procedures. A Standard Operating Procedure template and an example of an experimental review and completed Standard Operating Procedure have been provided for your consideration.

### **III. Guideline for Writing and Formatting a Standard Operating Procedure**

The purpose of this guideline is to provide advice on writing standard operating procedures so that they may be performed accurately and consistently. The goal in writing a laboratory procedure is to create a document that is easy to read, understand and follow.

Although a large amount of detail may result in Standard Operating Procedures that are too complicated for daily use, leaving out any of the major steps may lead to confusion. Since training is meant to complement the Standard Operation Procedure, the writer need not attempt to answer all possible questions or scenarios. Sufficient information should be included so as to minimize variation among users of the Standard Operating Procedure. The responsibility for writing a Standard Operating Procedure belongs to a person who is likely to use the procedure and who understands its quality assurance aspects.

## APPENDIX C STANDARD OPERATING PROCEDURES

### **A. Standard Operating Procedure Components**

As a guide, the following components may be included when writing Standard Operating Procedures: Purpose/Objective, Scope, Responsibility, Definitions, Hazards and Safety Considerations, Equipment and Supplies, Procedure, Records, References and Supporting Documents, and Change Records.

### **B. Standard Operating Procedure Format**

This guideline suggests three possible formats for a Standard Operating Procedure: hierarchical, simple steps and flowchart. Other formats exist and may be used depending on the requirements of the Standard Operating Procedure user. Two factors may be considered in determining the format of a Standard Operating Procedure: the number of decisions the user may need to make during the procedure, and the length or complexity of the procedure.

The Department of Environmental Health and Safety will also accept forms approved by committees in place of Standard Operating Procedures. These forms include, but are not limited to an approved IBC application, an approved Radiation Safety Form. If these procedures are being performed in an instructional laboratory or instructional workshop, the Department of Environmental Health and Safety will accept a reference to the classroom material, such as a workbook or textbook that the instructor is using to teach the class. The classroom material must state the specific hazards and the safety protocols that will need to be followed to avoid the hazards. If classroom material does not include that information, the instructor will be required to submit a Standard Operating Procedure.

The “hierarchical” format is a descriptive text that includes the procedure and other Standard Operating Procedure components within numbered sections and sub-sections. An example of the hierarchical format is shown in Appendix C, Example 1, Procedure for Cleaning Laboratory Glassware.

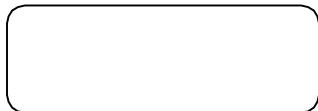
The “simple steps” format is a short list of steps and may be used for procedures that are simple and require few or no decisions. This format consists of a numbered list of simple, brief instructions.

An example of the simple steps format is shown in Appendix C, Example 2, Procedure for Preparing a Gram Stain.

## APPENDIX C STANDARD OPERATING PROCEDURES

The “flowchart” format is graphical and may be used for long procedures that require decisions. Standard geometrical shapes that indicate functional types of steps may be used.

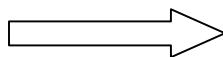
A flattened oval represents a starting or ending point.



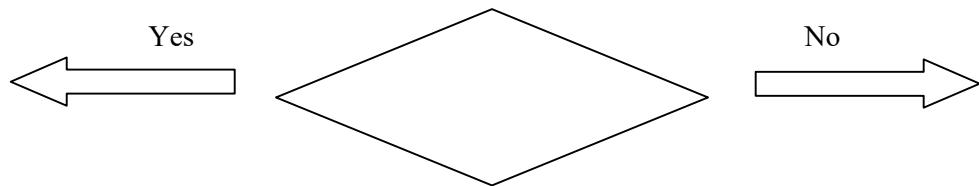
A rectangle indicates the worker should perform an action.



An arrow indicates the direction of flow.



A diamond indicates a decision point. It must have at least two arrows leading away from it, indicating paths to take after the decision.



An example of the flowchart format is shown in Appendix C, Example 3, Detection and Enumeration of Presumptive *B. cereus* in Foods.

### I. Standard Operating Procedure DEVELOPMENT ANDIMPLEMENTATION

#### 1. Develop First Draft of the Standard Operating Procedure.

Begin by writing a title for the Standard Operating Procedure. The title should be clear, concise and descriptive. For example, a Standard Operating Procedure titled “pH Meters” is not descriptive of the content; a more appropriate title would be “Operation and Calibration of pH Meters.”

Include a Title, Author, and Effective Date.

Choose a format and write the steps of the procedure. Whichever format is chosen – hierarchical, simple steps, or flowchart -- the procedure should be written concisely. If possible, use imperative sentences, which begin with an action verb, for example: “Incubate for 1 hr.” Acronyms and abbreviations should be used in moderation and only when they are widely understood, not for shorthand purposes.

## APPENDIX C

### STANDARD OPERATING PROCEDURES

#### 2. Distribute the Draft Standard Operating Procedure for Review.

Ask for comments and feedback from the individuals who will actually be executing the Standard Operating Procedure, as well as from technical experts or advisors. Revise the draft, if necessary, based on their comments.

#### 3. Submit the Standard Operating Procedure to the Department of Environmental Health and Safety for approval.

- If the Standard Operating Procedure is approved, the Department of Environmental Health and Safety will send a copy to the applicant, the Department Chair and the Faculty Laboratory Safety Coordinator.
- If the Standard Operating Procedure is not approved, the Department of Environmental Health and Safety will inform the applicant of corrections needed and assist the applicant in making the changes.
- Because of Federal, State and Local regulations, there is a possibility that some Standard Operating Procedures will not be approved. In that case, the Department of Environmental Health and Safety will inform the applicant.

#### 4. Test the Standard Operating Procedure.

The best way to test any Standard Operating Procedure is to let someone who is not thoroughly familiar with the work follow the procedure exactly as it is written down. Observe the test and make changes as questions or hesitations come up.

#### 5. Post the Standard Operating Procedure

Place a copy of the Standard Operating Procedure in the Chemical Hygiene binder if applicable. If the Standard Operating Procedure is for an area that does not require a Chemical Hygiene Plan, place a copy in a binder near the entry door to the laboratory or workshop. Distribute copies to the persons who will be using the Standard Operating Procedure.

#### 6. Conduct training.

Schedule and conduct training in the Standard Operating Procedure, especially for new procedures and new personnel. A training attendance list including name, date of training and signature of the trainee should be posted behind the Standard Operating Procedure.

**APPENDIX C**  
**STANDARD OPERATING PROCEDURES**

**II. REFERENCES**

1. C.V. De Sain and C.V. Sutton, Standard Operating Procedures (SOP): Content, Format, and Management, The Tamarack Group
2. EPA Quality System Series: Guidance for Preparing Standard Operating Procedures (SOP's), EPA QA/G6, [www.epa.gov/quality](http://www.epa.gov/quality)
3. C.V. De Sain and C.V. Sutton, Documentation practices: A Complete Guide to Document Development and Management for GMP and ISO 9000 Compliant Industries
4. Los Alamos National Laboratory. September 18, 1997. Standard Operating Procedure(SOP) Writer's Guide.
5. R. Stup, Standard Operating Procedure: A Writing Guide, Penn State Dairy Alliance. 2001

## **APPENDIX C, EXAMPLE 1** **PROCEDURE FOR CLEANING LABORATORY GASSWARE**

### **1. Cleaning**

1.1 Remove all labels off glassware using a sponge or acetone.

1.2 Wash with a laboratory detergent (Alconox or similar detergent) under hot tap water using a brush to scrub inside of the glassware, stopcocks, and other small pieces. This is a good step to use if your glassware contains any particulates.

1.2.1 For removing organic compounds, it may be useful to use one of the following cleaning procedures:

- A thorough rinse with pesticide grade acetone, methanol or hexane
- Soaking in an oxidizing agent (Chromic acid or equivalent)
- Soaking in a mixture of HCl : HNO<sub>3</sub> (3:1 v/v)

1.2.2 For removing inorganic compounds, it may be useful using also one of the following cleaning procedures:

- Rinsing or soaking with HCl : H<sub>2</sub>O (1:1 v/v)
- Rinsing or soaking with >10% HNO<sub>3</sub>
- Soaking with a mixture of HCl : HNO<sub>3</sub> (3:1 v/v)
- Soaking in a mixture of sulfuric acid and hydrogen peroxide (H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>O<sub>2</sub>)

1.3 Rinse thoroughly with hot tap water three times.

1.4. Rinse thoroughly with deionized water three times.

(Note: New glassware must be soaked overnight in 10% HNO<sub>3</sub> or HCl. The analyst needs to determine which washing treatment would be most efficient for her glassware.)

### **2. Drying**

2.1 Allow glassware to thoroughly dry in the drying rack. If dry glassware is urgently needed, it may be dried in an oven at 60°C.

2.2 Store glassware carefully during drying operations. Do not place round or oddly shaped glassware on countertops or other flat surfaces where they might roll off and break. Drying racks are the best option for most glassware. However, ensure that the glassware is adequately supported on the rack.

2.3 Never heat volumetric class A glassware.

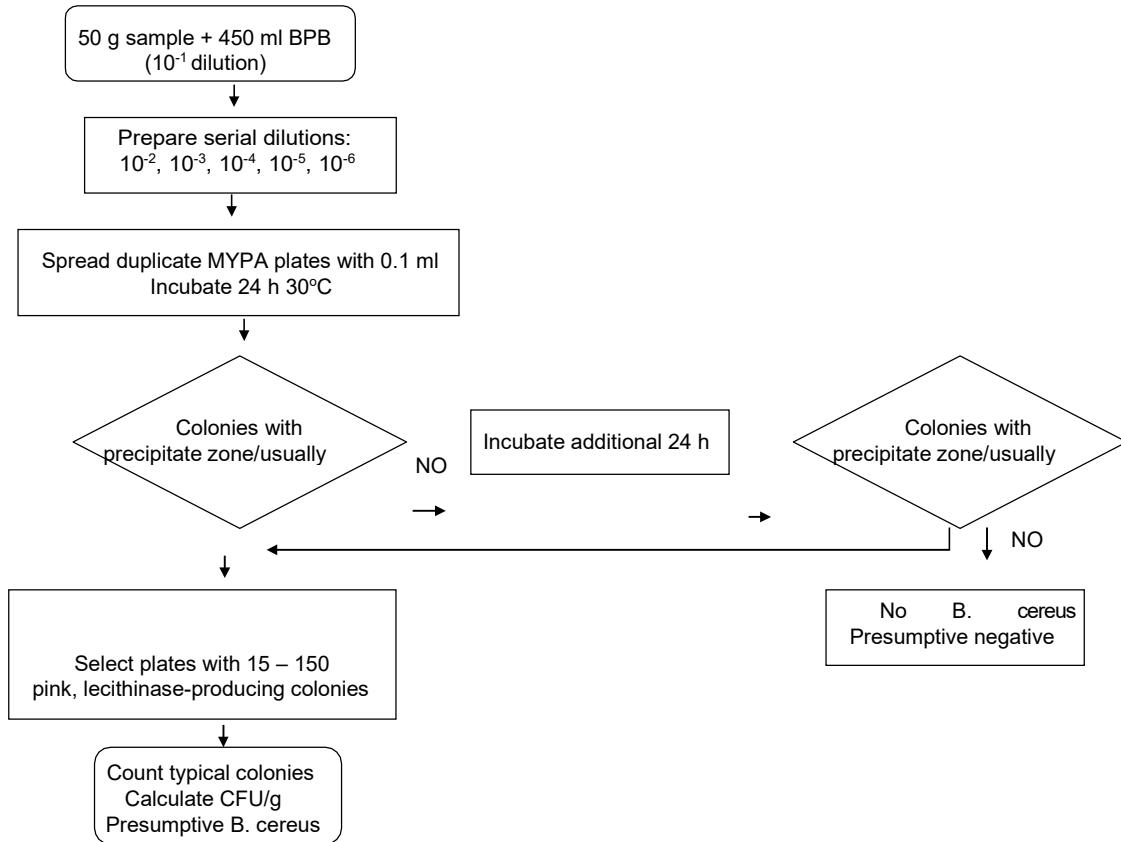
### **3. Storage**

3.1 Clean dry glassware should be sealed and stored in dust-free environment.

**APPENDIX C, EXAMPLE 2**  
**PROCEDURE FOR PERFORMING A GRAM STAIN**

1. Smear Preparation
  - a. Spread culture in thin film on slide
  - b. Air dry
  - c. Heat fix
2. Crystal Violet Stain
  - a. Cover smear – Crystal Violet
  - b. Stain – 30 sec.
  - c. Rinse
3. Gram's Iodine Stain
  - a. Cover smear – Gram's Iodine
  - b. Stain – 30 sec.
  - c. Rinse
4. Decolorization
  - a. Cover smear – Decolorizer
  - b. Decolorize – 10 sec.
  - c. Rinse
5. Counterstain
  - a. Cover smear – Safranin
  - b. Stain – 30 sec.
  - c. Rinse
  - d. Blot dry

**APPENDIX C, EXAMPLE 3**  
**DETECTION AND ENUMERATION OF PRESUMPTIVE *B. CEREUS* IN FOODS**



## **APPENDIX C, EXAMPLE 3** **DETECTION AND ENUMERATION OF PRESUMPTIVE *B. CEREUS* IN FOODS**

### **Safety Policy Variance Request Process**

Illinois Institute of Technology tries to have uniformity and accountability in its safety policies. The motivation for these traits is to help assure a safe place for students, faculty and staff across all campus activities.

It is realized, though, that there can be reasonable exceptions to blanket safety policies. These exceptions can be acceptable as long as they are properly reviewed, documented, and properly implemented. The official mechanism by which exceptions can be made is to apply for and be granted a Safety Policy Variance from the Department of Environmental Health and Safety which will make Safety Policy Variance Application Forms available on request.

Variances should be requested for a limited duration

### **Responsibilities**

**Deans** (This term also refers to non-academic Department Heads) shall establish within their own college/department an appropriate mechanism for the specification and review of variance requests before they are submitted to the Department of Environmental Health and Safety (EHS) for approval.

**Department Chairs** (This term also refers to Supervisors of non-academic units) shall review and sign all requests for variances to requirements of the IIT Safety Policies/Procedures and ensure that all documents pertaining to variance requests are maintained by their College/department in auditable form. **Department Chairs** shall further ensure that any actions varying from the requirements established at IIT have been authorized in accordance with the provisions of this document.

**The Applicant** shall obtain the Department Chair approval of a proposed variance before requesting EHS approval.

**The Department of Environmental Health and Safety** shall review all requests for variances referred to them, coordinate other reviews as required within 10 working days of receipt, and provide appropriate recommendation for approval or disapproval to the EHS Director to be provided within 5 working days after the final review. The director of EHS or a designated alternate shall approve all requests for variances prior to the implementation of the variance.

### **Requesting a Variance**

Requestors shall prepare written proposals for any variances to requirements of IIT using the attached form. EHS personnel are available to assist with the development of variance proposals. After approval by the requestor's Department Chair or designee, such requests shall be submitted to the EHS Director.

In general, a Variance for a safety policy must:

**APPENDIX C, EXAMPLE 3**  
**DETECTION AND ENUMERATION OF PRESUMPTIVE B. CEREUS IN FOODS**

- Be required in order to perform necessary work. Variances cannot be granted on the bases of convenience, comfort, nor tradition. It must be explicitly shown that compliance with one or more parts of the IIT safety policy makes it impossible to reasonably expect the necessary work to be done.
- Must specifically identify which parts of the safety policy the Variance addresses. The office of the University Safety Officer can help identify these.
- Specifically identify the area (room, part of a laboratory, etc.) in which the variance applies.
- Show the dates and/or times when the Variance applies. In many cases of research laboratories, this could be for up to a year in duration; in some cases, though, it may only be applicable during specified activities or laboratory class exercises.
- Must be reviewed and approved by the academic unit head.

Upon receipt of a request for a variance, EHS shall review the request to ensure that the variance will not impose undue risk to personnel or property and does not violate an applicable law, rule, statute, or regulation or a contractually required directive. Upon such assurance, the variance will be authorized by the EHS Director.

**If the Department of EHS determines that the request involves a variance, exemption, or exception to a law, rule, statute, or regulation, an approval must be obtained in writing from the appropriate regulatory agency**, utilizing the process prescribed to obtain relief associated with that agency. The Department of EHS will obtain this document. Requesters must note that this process will increase the time it will take to get an approved variance.

Actions or installations requiring a variance shall not proceed until the variance has been approved. In the event of a prolonged variance approval process, EHS will assist the affected organization in establishing interim procedures or measures that would allow an appropriate level of activity to continue.

It will be advisable to post the variance on or near the item, activity, or process work area; EHS will assist in making this determination.

Variances will be granted for a maximum of one year. If the variance is still necessary after one year, the initiator will submit a copy of the approved variance to the EHS Department, along with a request to extend it.

A permanent file of all requests for variances and the review and approval actions shall be maintained by the EHS Department.

Distribution of approved requests for variances shall be made by the EHS Department and shall include the affected Dean, Department Chair, the requestor and the EHS Department file.

**APPENDIX C, EXAMPLE 3**  
**DETECTION AND ENUMERATION OF PRESUMPTIVE B. CEREUS IN FOODS**

**Contractor Variances**

If a variance request is made to allow for contractor activities, the Vice President of Facilities and Public Safety must sign the variance.

**Forms**

IIT-Safety Policy Variance Application

**References**

OSHA "How to apply for a variance" <http://www.osha.gov/dts/otpca/variances/apply.html>

## **APPENDIX C, EXAMPLE 3**

### **DETECTION AND ENUMERATION OF PRESUMPTIVE *B. CEREUS* IN FOODS**

## IIT - Safety Policy Variance Application

## **Section 1 – Applicant Information**

Applicant Name: \_\_\_\_\_

Applicant office address: \_\_\_\_\_

Department: \_\_\_\_\_

Applicant Phone number: \_\_\_\_\_

Applicant email: \_\_\_\_\_

## Section 2 – Location

Location where Variance will take place:

### Section 3 – Description

List the OSHA standard(s) from which the applicant is requesting the permanent variance.

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List conditions are present that create the need for a variance.

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Describe the means to be used as an alternative for protecting employees from hazards as effectively as compliance with the standard, and how the proposed alternative would be at least as safe and healthful for employees as the existing requirements in the OSHA standard(s) from which the applicant is requesting the variance.

## **APPENDIX C, EXAMPLE 3**

### **DETECTION AND ENUMERATION OF PRESUMPTIVE *B. CEREUS* IN FOODS**

**The applicant certifies by the signature below that the information contained in the application is accurate and true to the best of the applicants Knowledge**

Signature of the Applicant: \_\_\_\_\_

Print Name: \_\_\_\_\_ Date: \_\_\_\_\_

Department Chair: \_\_\_\_\_

Print Name: \_\_\_\_\_ Date: \_\_\_\_\_

Director of Environmental Health and Safety \_\_\_\_\_ Date: \_\_\_\_\_

Other Concerned Parties – These signatures may be required depending on the topic of the variance. The Director of Environmental Health and Safety will provide guidance on this section.