

Laboratory Safety Reviews

University of Tennessee Safety Procedure LS-002

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Purpose

This protocol is intended as a guide for planning, conducting, and responding to safety reviews conducted for laboratories, maker spaces, studios, and academic shops ('laboratory' hereafter).

Scope and Applicability

This protocol shall apply to all personnel and stakeholders in laboratories or other support areas where hazardous materials and/or processes are employed.

Computational laboratories, teaching laboratories, or other laboratories that do not employ hazardous materials are excluded.

Abbreviations and Definitions

Abbreviations

EHS: Environmental Health and Safety

LSA: Laboratory Safety Advocate

LSC: Laboratory Safety Committee

LSS: Laboratory Safety Services

OSHA: Occupational Safety and Health Administration

PI: Principal Investigator

UTIA: University of Tennessee Institute of Agriculture

UTK: University of Tennessee Knoxville (Main Campus)

Definitions

Commendation: A written assessment denoting benchmark practices and/or notable safety accomplishments.

Best Practices: Culture that reflects critical thinking about safety and implementation of appropriate safety and/or risk mitigations strategies.

Finding: Any item or process assessed to be an unmitigated safety and/or compliance risk.

Laboratory: Wet laboratory, dry laboratory, maker space, academic shop, studio, or other applicable space, individually or in combination.



Major Finding: A condition or practice exists that poses a substantial safety or compliance risk.

Minor Finding: A condition or practice exists that poses a minor safety or compliance risk.

Serious Finding: A condition or practice exists that poses an immediate risk to life and health.

Stakeholders: Individuals, departments, and/or colleges on campus that may be impacted by this procedure.

Stop work order: The responsibility and obligation to stop work when a perceived unsafe condition or behavior is immediately dangerous to life or health (i.e. imminent danger).

Suggested Improvement: A statement in the written safety review that highlights prudent safety measures that address an item or process that has the potential to become finding.

Roles and Responsibilities

EHS Department-Laboratory Safety Services

EHS LSS ('LSS' hereafter) is responsible for maintaining and implementing the Laboratory Safety Review Procedure. To accomplish this, LSS will:

- a. Maintain a current checklist reflecting applicable safety standards and best practices. The checklist may also include elements to assess laboratory safety culture.
- b. Conduct safety reviews throughout the year. At the discretion of LSS, safety reviews may be unannounced or scheduled in advance.
- c. Stop work when hazards or conditions exist that pose an immediate risk to the life or health of the laboratory (or other nearby) occupants.
- d. Complete and distribute written reports and/or other applicable documentation to the persons outlined in this document based on noted risks and responses from laboratory leadership.
- e. Communicate facility-related issues identified during the safety review to Facility Services.
- f. Track safety review findings to timely closure.
- g. Maintain documentation and records.
- h. Review and revise this protocol as the laboratory safety review program evolves and as constructive feedback is received from stakeholders.

Principal Investigator

The principal investigator (PI) is a faculty member, research scientist, or other appointed supervisor overseeing a laboratory and has the primary responsibility for attaining and maintaining a safe work environment. The PI is expected to be a leader and spokesperson for mitigating risk and developing a beneficial safety culture that results in staff, students, and visiting scholars receiving the appropriate training, instruction and mentorship necessary to work safely. In addition, the PI shall ensure that equipment and supplies are in place so that work can be conducted safely. Finally, the PI is responsible for taking the actions necessary for his/her laboratory to comply with the University of Tennessee policies as well as with applicable federal, state, and local regulations.

Regarding the conduct of laboratory safety reviews, the PI is required to:

- a. Meet with LSS personnel to discuss the safety review and any associated findings. The meeting may take place in person at the time of the review (preferred), or in person or virtually (e.g. video conference) subsequent to the review. Where appropriate, laboratory personnel may participate.

- b. Review written laboratory safety reports and implement corrective actions within the prescribed timeline.
- c. Stop work and report hazards or conditions that pose an immediate risk to the life or health of the laboratory (or other nearby) occupants.
- d. Communicate the steps taken to mitigate or eliminate identified safety or compliance risks.
- e. In partnership with LSS, train laboratory personnel on any findings and corrective actions such that safety is attained and maintained.
- f. Maintain laboratory-specific safety/compliance records, including safety reports

Laboratory personnel

Regarding laboratory safety reviews, laboratory workers are expected to:

- a. Assist LSS staff by answering questions regarding laboratory hazards and/or associated operations.
- b. Report unsafe acts or conditions, as well as accidents, injuries (or illnesses), or near misses to laboratory leadership and LSS as appropriate.
- c. Stop work and report hazards or conditions that pose an immediate risk to the life or health of the laboratory (or other nearby) occupants.
- d. Participate in the creation and implementation of measures to resolve safety findings and contribute to attaining and maintaining a safe work environment.

Department Head or Institute/Center Director

The department head, or institute/center director, is responsible for communicating, upholding or enforcing measures to ensure safety and regulatory compliance within the department, center, or institute. Regarding laboratory safety reviews, the department head or institute/center director shall:

- a. Review any escalated findings, safety reports, or unit summaries issued by LSS.
- b. Provide departmental assistance and oversight to ensure that escalated findings are resolved in a timely fashion.
- c. Stop work and report hazards or conditions that pose an immediate risk to the life or health of the laboratory (or other nearby) occupants, or support a stop work order issued by LSS or other stakeholders. Appoint a laboratory safety advocate (LSA) and empower that individual to assist with department, institute, or center directives or initiatives, including assistance with laboratory safety reviews as necessary.

Laboratory Safety Advocate

The LSA is appointed by the department head or institute/center director to assist the unit in attaining and maintaining safety and regulatory compliance. While the department head, or institute/center director, has discretion in assigning LSA responsibilities, the LSA shall, at a minimum, meet the following expectations relative to laboratory safety reviews:

- a. Disseminate and communicate information from LSS to unit personnel as necessary, including pertinent safety requirements, common findings, and mitigation measures.
- b. Communicate unit information to LSS as necessary, including updated lists of PIs and associated space assignments, ongoing safety challenges or concerns, and any other information that may be necessary to support safety reviews.
- c. Liaise or participate in laboratory safety reviews for common or shared spaces controlled by the department (or unit), e.g. teaching laboratories that do not have a designated PI/supervisor.

- d. Stop work and report hazards or conditions that pose an immediate risk to the life or health of the laboratory (or other nearby) occupants, or support a stop work order issued by LSS or other stakeholders.
- e. As necessary, escalate unit-specific safety challenges, findings, and resolutions/best practices to the Laboratory Safety Committee (LSC).

Associate Dean for Research

The associate dean for research, is responsible for communicating, upholding or enforcing measures to ensure safety and regulatory compliance within the respective college. Regarding laboratory safety reviews, the associate dean for research shall:

- a. Review any escalated findings, safety reports, or unit summaries issued by LSS.
- b. Provide college assistance and oversight to ensure that escalated findings are resolved in a timely fashion.
- c. Stop work and report hazards or conditions that pose an immediate risk to the life or health of the laboratory (or other nearby) occupants, or support a stop work order issued by LSS or other stakeholders.

Procedures

Introduction

Because laboratories are areas where workplace hazards are reasonably anticipated, they are subject to regular laboratory safety reviews as promulgated through the Occupational Safety and Health Act (OSHA). Additionally, safety reviews serve as key elements of UT policy to ensure that a safe, healthy working environment is provided for students, faculty, staff and visitors. PIs/supervisors have the responsibility of maintaining their laboratory(-ies) in a manner that identifies and controls hazards and minimizes risk.

Notice of Laboratory Safety Review & Scheduling

Prior to the department (or institute/center) laboratory safety reviews, a notice will be sent to the department head (or institute/center director) and all affected PIs. College leadership (e.g. associate dean for research) will be copied on the notice. The notice will indicate an approximate timeline and include the evaluation criteria. Generally, safety reviews will be unscheduled; *however*, to accommodate special needs or circumstances, LSS will honor scheduling requests within the prescribed timeline whenever feasible. Under certain circumstances, such as a filed complaint, OSHA violation, or ongoing/recurring safety issues, unannounced safety reviews may occur. In such cases, the timeline and frequency is at the discretion of LSS.

Laboratory Safety Review

The laboratory review will involve:

- a. LSS review of previous laboratory safety reviews and accidents/incidents that occurred within the previous year.
- b. Meeting with the PI to discuss the specific work performed in the laboratory, the people working in the laboratory, and the types of materials and controls/procedures used. As described above, this meeting may be during or after the laboratory safety review. In addition to the objective assessment of conditions, a discussion of barriers to best practices will take place. If the PI is unavailable, he/she may designate a knowledgeable staff member, though the PI is ultimately responsible for reviewing written reports, implementing corrective actions, and resolving findings.

- c. Surveying the laboratory based on the pre-set criteria outlined in the safety review announcement. The review checklist, or focused variations, will be completed and reported electronically (typically by email). Findings, observations, and respective remedial actions will be explicitly stated in the report (see **Table 1** below). The digital platform and associated format(s) will be at the discretion of LSS.
- d. Answering any questions the PI or designated staff member may have regarding the laboratory review, findings, or recommended remedial actions.

Report

Each review will be documented in a written report, which will be maintained to identify hazards, recurrent problems, completed hazard/risk remediation, or other safety elements as appropriate. Copies of the report will be sent to the PI as well as any laboratory personnel assisting in the review, with courtesy copies provided to Department (institute/center), college, Office of Research & Engagement, and/or EHS leadership may be copied on safety reports at the discretion of the LSS reviewer or upon request (see **Escalation** below).

Escalation

The protocol for escalation of safety reviews is as follows:

Serious Findings (Risk Code 4)

If serious findings have been discovered, the LSS reviewer shall initiate a stop work order and immediately notify the appropriate LSS supervisor and/or program leader. The PI is expected to cooperate with the stop work order and follow the response plan outlined in the table above until the serious finding is resolved. If the PI is absent or uncooperative, the LSS program leader will notify the EHS director, department (institute/center), college, and Office of Research & Engagement leadership (sequentially or collectively at discretion), who may implement an escalation process, up to and including securing the laboratory. Copies of the safety report and any associated documentation will be sent to appropriate levels of administration based on the escalation process.

Major Findings (Risk Code 3)

Major findings and required actions will be communicated in writing to the PI by the close of the next business day. Resolution or a written progress report is required within 5 business days of the written notification. LSS will confirm resolution of major findings through a laboratory revisit at the conclusion of the response window. Unresolved findings and/or unresponsiveness by the PI will result in escalation, including a stop work order as previously described.

Minor Findings (Risk Code 2)

Minor findings and required actions will be disclosed in the laboratory safety report within 5 business days. Resolution or a written progress report is required within 15 days of the issued safety report. At discretion of the LSS reviewer, resolution may be confirmed through email communications and/or a laboratory revisit. Minor findings that persist or recur may be escalated as previously described.

Suggested Improvements (Risk Code 1)

Not escalated.

Commendations (Risk Code 0)

Commendations will be acknowledged in the report issued to the PI. These may also be shared with the campus community and posted to the UT System Lessons-Learned website to foster UT safety culture.

Table 1. Safety Review Findings, Significance, and Remedial Actions

Finding Significance	Response to Finding
<p>Serious Finding Immediate risk to life and health. Examples include: high-risk hot work; high inhalation hazard from chemicals being worked with outside the fume hood; conductor exposed on power cord; high risk use of pyrophoric chemicals; reaction scale-ups without the proper risk assessment and controls; Poor housekeeping that poses an immediate risk of injury or exposure; other activities or processes at the discretion of the LSS reviewer Risk Coding = 4</p>	<ul style="list-style-type: none"> • Immediate corrective action is <i>required</i> • High risk work is suspended up to and including a stop work order on the entire laboratory until a solution is implemented and the high risk is mitigated • LSS will revisit serious findings at the conclusion of the prescribed timeline to document progress or confirm resolution • Resumption of work is contingent upon full resolution of the serious finding(s) and LSS program leader approval
<p>Major Finding Significant safety/compliance finding. Examples include: multiple damaged power cords; open containers of waste; incompatible chemical storage; labels missing from chemicals; improper chemical waste storage; poor housekeeping that may create a serious hazard; other activities or processes at the discretion of the LSS reviewer Risk Coding = 3</p>	<ul style="list-style-type: none"> • Major findings and required actions will be submitted in writing to the PI by the close of the next business day • Resolution of major findings or a written progress report is required within 5 business days of the written notification, at which time LSS will confirm resolution of major findings through a laboratory revisit
<p>Minor Finding Minor safety/compliance finding. Examples include: cord with damaged outer coating; inadequate chemical labeling; poor housekeeping that doesn't pose an immediate hazard; other activities or processes at the discretion of the LSS reviewer Risk Coding = 2</p>	<ul style="list-style-type: none"> • Resolution of minor findings or a written progress report is required within 15 business days of the issued safety report • At the discretion of the LSS reviewer, resolution of minor findings may be confirmed through email communications and/or a laboratory revisit
<p>Suggested Improvement A prudent safety measure to address an item or process that has the potential to become finding. Risk Coding = 1</p>	<ul style="list-style-type: none"> • Evaluated during the next review cycle
<p>Commendation Benchmark program element</p>	<ul style="list-style-type: none"> • Commendations will be explicitly acknowledged in the safety report • Practice will be re-evaluated for sustainability during next review cycle

Departmental Summary

At the completion of each department, institute, or center review cycle, a summary report will be sent to the department head, institute/center director, LSA, college associate dean for research, the assistant vice-chancellor of research, affected PIs, LSC, and EHS director. The summary will include, at a minimum, a synopsis of findings by risk code, resolution status, and any commendations.

Recordkeeping

Safety reports, transmission emails, and any documentation of follow up activities will be kept by LSS and the respective PIs.

Training and Information

No specific training is required by this procedure; however, all attempts shall be made to communicate the procedure to the impacted community. Communication pathways may include:

- LSC or other safety/compliance committees
- Laboratory Safety Advocates
- Office of Research and Engagement
- Safety training provided by EHS
- Listserv postings
- Direct emails to affected parties
- Other methods at the discretion of EHS

References

29 CFR 1910.1200 OSHA Hazard Communication Standard

29 CFR 1910.1450 OSHA Exposure to Hazardous Chemicals in Laboratories Standard

Association of Public & Land-Grant Universities' *A Guide to Implementing a Safety Culture in Our Universities*; 2016.

National Research Councils' *Prudent Practices in the Laboratory*, National Academy Press; 2011.

U.S. Department of Health & Human Services' *Biosafety in Microbiological and Biomedical Laboratories*, 6th ed.; 2020

UT System Safety Policy SA0100 - Safety and Environmental Health Program

UT System Safety Policy SA0150 – Environmental Health and Safety Records

UT System Safety Policy SA0450 – Biological Safety and Select Agents

UT System Safety Policy SA0600 – Reporting Safety and Health Concerns

UT System Safety Policy SA0700 – Safety and Environmental Health Responsibilities

UTK Bloodborne Pathogens Program – HM-010

UTK Chemical Hygiene Plans – LS-020

UTK Chemical Inventories Procedure – EC-004

UTK Electrical Safety Plan – GS-070

UTK Flammable & Combustible Liquids Guide – FS-020

UTK Hazard Communication Plan – HM-001

UTK Hazardous Waste Management Plan – EC-001

UTK Imminent Danger Procedure – AD-023

UTK Laboratory Door Placard Policy – LS-10

UTK Laboratory Health & Safety Program – LS-001

UTK Laboratory Safety Advocate Program – LS-020

UTK Laboratory Security Guide – LS-004

UTK Local Exhaust Ventilation Guide – IH-001

UTK Safety Showers and Eyewashes Guide – HM-020

Appendices

Lab Inspection Guide

Laboratory Safety Visits: Report & Response Flowchart

Disclaimer

The information provided in these guidelines is designed for educational use only and is not a substitute for specific training or experience.

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