

Laboratory Safety Reviews

University of Tennessee Safety Procedure LS-002

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Purpose

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

Offices, computational laboratories, teaching laboratories, or other laboratories that do not employ hazardous materials or dangerous equipment (e.g. high-pressure, high-voltage, high-speed, furnaces, etc.) are excluded.

Abbreviations and Definitions

Abbreviations

EHS: Environmental Health and Safety

LSA: Laboratory Safety Advocate

LSC: Laboratory Safety Committee

LSS: Laboratory Safety Services

ORIED: Office of Research Innovation and Economic Development

OSHA: Occupational Safety and Health Administration

PI: Principal Investigator

TDEC: Tennessee Department of Environment and Conservation

UTK: University of Tennessee Knoxville (Main Campus)

Definitions

Commendation: A benchmark practice and/or a notable safety accomplishment.

Best Practices: Practices that reflect 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 that poses a substantial safety or compliance risk, or an escalated unmitigated minor finding.

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

Serious Finding: A condition or practice that poses an immediate risk to life and health, or an escalated unmitigated major finding.

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 or any related operations when a perceived unsafe condition or behavior is immediately dangerous to life or health (i.e. imminent danger).

Recommendation: A condition or practice that is in compliance but is not best practice and has the potential to become a safety and/or compliance finding.

Risk Coding: Level of severity, ranking from no concern (0) to serious concern (4), which may be used for inspection data logging and tracking.

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 procedure 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.
- d. 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 risks.

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 scheduled. LSS will honor scheduling requests within the prescribed timeline whenever feasible. Unannounced safety reviews may occur under certain circumstances such as a reported safety complaint/violation, ongoing/recurring safety issues, or inspection by a regulatory agency such as OSHA or the Tennessee Department of Environment and Conservation (TDEC). In such cases, the timeline and frequency is at the discretion of LSS or regulatory inspector.

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 types of materials and controls/procedures used, the people working in the laboratory, and any safety concerns or barriers to best practices. As described above, this meeting may be during or after the laboratory safety review. 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 criteria outlined in the safety review announcement. The review checklist, or focused variations, will be completed and reported electronically (e.g. email or inspection management system). Findings, observations, and respective corrective actions will be explicitly stated in the report. 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, recommendations, or corrective actions.

Safety Findings, Significance, and Response

Safety findings, weighted significance, and response requirements are summarized in **Table 1**.

Table 1. Safety Review Findings, Significance, and Response Requirements

Finding Significance	Response Requirements
<p>Serious Finding (Risk Code 4) Immediate risk to life and health. Examples include: high-risk hot work; working with particularly hazardous/reactive chemicals without proper controls; conductor exposed on power cord; poor housekeeping that poses an immediate risk of injury or exposure; other activities or processes at the discretion of the LSS reviewer.</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 serious risk is mitigated. • A written corrective action plan is required within 3 business days. • Completion of corrective action plan (or a written progress) report is required within 10 days of the initial notification. • 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 (Risk Code 3) Significant safety/compliance finding. Examples include: blocked fire egress; incompatible chemical or chemical waste storage; hazardous waste mismanagement; labels missing from chemicals; unsecured compressed gas cylinders; poor housekeeping that may create a serious hazard; other activities or processes at the discretion of the LSS reviewer.</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.

Table 1 (cont.). Safety Review Findings, Significance, and Response Requirements

Finding Significance	Response Requirements
<p>Minor Finding (Risk Code 2) Minor safety/compliance finding. Examples include: cord with damaged outer coating; inadequate chemical labeling; outdated door signs; incomplete training (or other) documentation; poor housekeeping that doesn't pose an immediate hazard; other activities or processes at the discretion of the LSS reviewer.</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>Recommendation (Risk Code 1) Evaluated condition or practice is in compliance but is not best practice and has the potential to become a safety and/or compliance finding.</p>	<ul style="list-style-type: none"> Evaluated during the next review cycle.
<p>Commendation (Risk Code 0) Benchmark practice and/or a notable safety accomplishment.</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. Benchmark practices may be communicated to the lab community to promote safety culture.

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. Department (institute/center), college, Office of Research Innovation and Economic Development (ORIED), and/or EHS leadership may be copied on safety reports (and subsequent documentation) at the discretion of the LSS reviewer or upon request (see **Escalation** below).

Escalation

The procedure 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 LSS program leader will notify the EHS director as well as department (institute/center), college, and ORIED leadership (sequentially or collectively at discretion). 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 unresponsive or uncooperative, the laboratory may be closed and secured at the discretion of campus leadership (as defined above).

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. Major findings that persist or recur will be escalated to a serious finding, which may include 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 to a major finding as previously described.

Recommendations (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 laboratory community and posted to the UT System Lessons-Learned website to foster UT safety culture.

Departmental Summary

At the completion of each department, institute, or center review cycle, a summary report will be sent to the department head or institute/center director, LSA, affected PIs, college associate dean for research, and EHS director. The summary will include, at a minimum, a synopsis of frequent findings, findings by risk code, resolution status, and any commendations. Selected metrics from departmental summaries may be compiled and reported to the LSC or other stakeholders as necessary.

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
- ORIED
- Safety training provided by EHS
- Listserv postings
- Direct emails to affected parties
- Other methods at the discretion of LSS

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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