



# Faculty Safety Handbook

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A PI/Supervisor Guide to Managing Health and Safety in Laboratories, Classrooms, and Research Groups.  
*Stanford University Environmental Health & Safety*



Dear Faculty Member,

Stanford is committed to extending the frontiers of knowledge and solving real-world problems in ways that value human welfare, and are infused with ethical and societal considerations<sup>1</sup>. This commitment extends to creating and maintaining a safe and healthy work environment. If accomplishing these goals were as simple as following the rules or being in-compliance, then safety wouldn't be that difficult, but it's more than that. Safety requires making critical decisions in the face of uncertainty that may impact not only your well-being, but that of the students, staff, and researchers under your supervision.

We recognize that this is not always easy. This faculty handbook is one part of the support Environmental Health and Safety can provide to help you manage these challenges and excel in this critical area. Designed for both new and existing faculty, it is intended to help you understand your responsibilities, provide streamlined information on the various requirements for performing research, and offer guidance on best practices for health and safety management. This document also gives a high-level overview, but does not replace, the content from several other safety manuals such as the Chemical Hygiene Plan, Biosafety, and Radiation Safety Manuals.

Handbooks and guides only have value if the users find them helpful. We hope you will take the time to review and reflect on this initial version. We welcome any feedback you may have about this guide, or suggestions in regards to how EH&S can best support your endeavours.

Sincerely,

Russell Furr  
Associate Vice Provost for Environmental Health & Safety

1. <https://ourvision.sites.stanford.edu/vision-initiatives/mission-values>



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# Safety Expectations for PIs at Stanford

As a Principal Investigator (PI), you are responsible for the overall culture of your laboratory. You set the tone, create the expectations, determine the standards, and build an environment where your students, postdoctoral scholars, and research staff can reach their full potential.

Stanford University is committed to providing a safe research environment for our PIs, postdocs, students, and staff. During the course of establishing their research group, many PIs successfully build a culture of excellence surrounding research and scholarship, but can fall short when it comes to health and safety. At Stanford, we strive for excellence in both research and research safety.

The Stanford Task Force for Advancing the Culture of Laboratory Safety found that the single most important element for developing a strong, proactive safety culture is the commitment of the principal investigator to safety. You, as the PI, are expected to cultivate a positive culture of safety in your lab. Safe environments are developed through your demonstrated commitment to safety on a daily basis in all aspects of research.

As the leader of your research group, you are expected to incorporate safety into your scientific process rather than treat it as merely an administrative task. You are accountable for safety in your lab. It is also your responsibility to instill ownership of safety among your researchers by empowering them to take initiative and holding them accountable for actions that create positive results for themselves and the University. Safety should be a proactive rather than reactive endeavor. Your commitment to safety will translate to your researchers. The health and safety practices they learn under your mentorship will form part of their educational foundation, prepare them for future careers as skilled scientists, and advance laboratory safety culture for future generations of researchers.

Safety is a core value at Stanford and the University is committed to continued advancement of an institutional safety culture with strong programs of personal safety, accident and injury prevention, wellness promotion, and compliance with applicable environmental and health and safety laws and regulations.

[University Safety Policy](#)

Principal Investigators are the single most important element for developing and sustaining a strong, proactive laboratory safety culture. A strong laboratory group safety culture should be developed and actively supported by the PI.

*[Advancing Safety Culture in the University Laboratory: A Report of the Task Force for Advancing the Culture of Laboratory Safety at Stanford University, 2014](#)*

## Putting Safety into Action:

### How to Develop a Positive Safety Culture

#### Demonstrate a Commitment to Safety

Take ownership of safety in your research group and advocate for your researchers to do the same. Lead by example. Adhere to the health and safety rules that you, your department, school, and the University establish, and speak up if you see unsafe practices. Put safety on the agenda and incorporate it into the way your group works and thinks.

#### Promote Continuous Learning

Research is not a static endeavor. Managing safety requires ongoing feedback, reassessment, and reinforcement. Encourage researchers to report concerns to you for both safety and teaching opportunities. Involve all lab members when identifying and reviewing lessons learned after incidents and near-misses.

#### Assess and Plan for Hazards and Risks

Take the time to systematically assess risks and plan for the hazards identified. Conduct risk assessments, incorporating safety into all experiments. Teach your researchers to think about risk by discussing with them the safety implications of their experiments.

#### Implement Controls

Take action to control risks in your laboratory. Make sure that you and your researchers are using the correct protective equipment, appropriate engineering controls are working correctly, and researchers are trained to safely perform their duties. Don't take shortcuts and unnecessary risks.



# PI Responsibilities

As a Principal Investigator, you are responsible for protecting the health and safety of employees, students, and visitors working under your supervision.

## Hazard Identification and Control

You must evaluate the hazards in your lab, communicate the associated risks, and train personnel on proper procedures and controls for working with those hazards.

- ✓ Ensure that laboratory hazards are identified and controlled.
- ✓ Develop written protocols for high-hazard materials and operations, repeat operations, and equipment use.
- ✓ Determine, provide, and train on the required personal protective equipment (PPE) for laboratory operations.
- ✓ Correct unsafe or unhealthy work conditions or procedures as soon as they are discovered. This may require stopping procedures until appropriate control measures can be put in place.
- ✓ Conduct required self-inspections.
- ✓ Respond to and take corrective actions related to external, internal, and self-inspections.

## Approvals

Certain higher-hazard activities or agents are carefully regulated and require institutional review prior to starting work.

- ✓ Obtain required institutional approvals.
- ✓ Ensure that high-risk operations are conducted only with PI/Lab Supervisor approval.

## Communication

Two-way communication is essential. Talk to your researchers and visitors about how to work safely and encourage them to bring any concerns to you.

- ✓ Encourage researchers to bring safety concerns to you without fear of reprisal.
- ✓ Ensure that newly identified safety issues are communicated to lab personnel in a timely manner.
- ✓ Inform non-lab personnel of potential lab-related hazards when they are in your lab.

## Training

Train researchers so that they understand the hazards of their work and how to work safely.

- ✓ Ensure all research personnel receive appropriate general safety trainings and [laboratory-specific safety training](#).
- ✓ Provide additional training to workers whose safety performance is inadequate.

## Promoting Safe Practices

Enforce the safety rules of your lab and follow them yourself.

- ✓ Ensure that personnel follow all safety policies and procedures.
- ✓ Include lab personnel's health and safety practices when evaluating performance.
- ✓ Model correct lab practices by wearing your PPE and following all safety rules.

## Minors in the Laboratory

Minors require more oversight due to their limited laboratory experience and protected legal status.

- ✓ If minors (< 18 years old) will be visiting or working in your lab, comply with [additional requirements](#).



## Institutional authorizations are needed for activities involving:

- [Biosafety Level 2, 3, or 4 agents](#)
- [Non-exempt recombinant DNA or synthetic nucleic acid molecules](#)
- [Prions and prion-like proteins](#)
- [Live or dead vertebrate animals](#)
- [Human subjects research](#)
- [Select agents and toxins](#)
- [Controlled substances and precursor chemicals](#)
- [Toxic gases and other restricted chemicals](#)
- [Class 3b or Class 4 lasers and laser systems](#)
- [Sealed or unsealed radioactive material](#)
- [Ionizing radiation-generating devices \(including x-rays and accelerators\)](#)

For more information on fulfilling your responsibilities, please see pages 14-19.



# I Work With...

## Biological Agents

EH&S provides [Guidance and Resources](#) for working safely with biohazardous materials and conducts periodic visits to ensure safety and regulatory compliance.

Agents categorized as BSL-2 or above require [Administrative Panel on Biosafety \(APB\)](#) review and approval, which are submitted via [eProtocol](#).

Online training is available for: [Biosafety](#), and [Shipping Biological Goods and Dry Ice](#).

[Biological Waste](#) and [Sharps Waste](#) is managed through a medical waste vendor.

### Additional Resources

- 🔗 [Biosafety Manual](#)
- 🔗 [Assistance with Certification of Biosafety Cabinets](#)
- 🔗 [Material Transfer Agreement](#)
- 🔗 [Bloodborne Pathogens Institutional Exposure Control Plan](#)

✉ [biosafety@lists.stanford.edu](mailto:biosafety@lists.stanford.edu)

## Human Subjects

Research involving human subjects (or some types of human samples, such as stem cells) requires institutional approval to protect research participants' rights and welfare. At Stanford, this research is reviewed and approved by the [Institutional Review Board \(IRB\)](#). [Human Subject Research](#) applications are submitted through [eProtocol](#).

### Additional Resources

- 🔗 [Cancer Clinical Trials Office](#)
- 🔗 [ClinicalTrials.gov Resources](#)
- 🔗 [Stem Cell Research Oversight \(SCRO\)](#)

## Animals

Work with vertebrate animals requires approval through the [Administrative Panel on Laboratory Animal Care \(APLAC\)](#). There are additional hazards when using rDNA, biohazardous agents, or chemicals with animals (see Chemicals and Biological Agents sections), which may require [Administrative Panel on Biosafety \(APB\)](#) approval. Approvals are managed via [eProtocol](#). The [Stanford Veterinary Service Center \(VSC\)](#) requires [training](#) for working with animals.

### Additional Resources

- 🔗 [Laboratory Animal Occupational Health Program](#)
- 🔗 [Research Policy Handbook \(Chapter 6\)](#)
- 🔗 [Animal Research Involving Hazardous Chemicals](#)
- 🔗 [Use of Anesthetic Gases](#)
- 🔗 [Animal Research Occupational Health & Safety](#)
- 🔗 [Working Safely with Animals](#)

## Controlled Substances, Precursor Chemicals, and Select Agent Toxins

[Controlled Substances \(Schedule II-V\)](#), as defined by the US Drug Enforcement Administration (DEA), are purchased through EH&S. EH&S will advise on purchase of Schedule I substances, which requires an individual registration. [Online training](#) is required for all PIs and authorized researchers who work with controlled substances. [Disposal](#) is managed by EH&S. EH&S conducts periodic visits to ensure recordkeeping and regulatory compliance.

[Precursor Chemicals](#) are purchased through EH&S. These materials are disposed of as chemical waste.

[Select Agents and Toxins](#) are federally regulated and have limits on the amount of these materials you can possess. EH&S will help you manage the use and security of select agents and toxins in your lab, which includes periodic visits.

### Additional Resources

✉ [cs-program@lists.stanford.edu](mailto:cs-program@lists.stanford.edu)

## Chemicals

Nearly all labs at Stanford use chemicals. Certain chemicals (i.e., [toxic gases](#) and [restricted chemicals](#)) require a PI-approved Standard Operating Procedure (SOP) and/or EH&S review for purchasing. EH&S is available for consultation on SOPs/procedures.

Regulations require that researchers keep their chemical inventories up-to-date (Stanford uses the online system [ChemTracker](#)), materials are [stored](#) and labeled properly, and [self-inspections](#) are completed regularly.

Online training is available on [Chemical Safety](#), [Compressed Gases](#), [Cryogenic Liquids and Dry Ice](#), and [Shipping Chemicals](#). [Chemical Waste](#) is managed by EH&S through the online program [Waste Tag](#), and [Chemical Waste Containers](#) are available through the [EH&S Safety Store](#).

### Additional Resources

- 🔗 [Chemical Hygiene Plan](#)
  - 🔗 [General Use SOPs](#)
  - 🔗 [Safety Fact Sheets](#)
  - 🔗 [Obtaining or Donating Surplus Chemicals](#)
- ✉ [toxicgases@lists.stanford.edu](mailto:toxicgases@lists.stanford.edu)

## Lasers/X-Rays

Radiation-generating equipment (e.g., x-rays, CTs, irradiators) and Class 3b and 4 lasers require registration with EH&S. Before use of these lasers in a laboratory, a [Laser Registration Form](#) must be submitted, a hazard evaluation of the laser work area conducted, and a [Controlled Laser Authorization \(CLA\)](#) issued by EH&S. [A Controlled Machine Authorization \(CMA\)](#) and online training is required for any electronic device that emits ionizing radiation.

### Additional Resources

- 🔗 [Laser Safety Manual](#)
- 🔗 [Radiation Safety Manual](#)

## Radioactive Materials

Radioactive materials are strictly regulated by federal and state law. A [Controlled Radiation Authorization \(CRA\)](#) is required through EH&S to work with radioactive materials. [Ordering, shipping, and disposal](#) of radioactive materials is managed through EH&S. EH&S also provides calibration of radiation measurement devices and [dosimetry](#) monitoring for personnel. Contact EH&S for [Radioactive Waste Containers](#) and [Radioactive Waste Pickup Requests](#).

Combined online and in-person radiation safety training is required for working with [sealed](#) and [unsealed](#) radiation sources. Online training is available for [personnel who do not use radioactive materials](#) but work in labs or buildings where radiation is used.

### Additional Resources

- 🔗 [Radiation Safety Manual](#)

## Other hazards

EH&S is available for consultation on any hazards encountered in your work. EH&S can provide information on equipment, projects, or other hazards. Examples:

- 🔗 [Unmanned Flying Vehicles](#)
- 🔗 [Forklifts](#)
- 🔗 [Soldering](#)
- 🔗 [Electrical Systems](#)
- 🔗 [Loud Noises/Hearing Conservation](#)
- 🔗 [Shop Equipment and Tools](#)
- 🔗 [Confined Spaces](#)

- Cranes
- Welding
- Ladders

### Additional Resources

✉ [healthandsafety@stanford.edu](mailto:healthandsafety@stanford.edu)

# I Need...

## ...to assess hazards and risks in my lab.

EH&S provides a variety of tools for assessing hazards, communicating risks, and creating written protocols. Technical staff are available to consult on any procedure and review protocols. Please note that certain lab work requires written protocols and/or EH&S/institutional review or approval, for more information see pages 8 and 9.

### Additional Resources

- 🔗 [Safety Fact Sheets](#)
- 🔗 [Lessons Learned](#)
- 🔗 [Standard Operating Procedures \(SOPs\)](#)
- 🔗 [Risk Assessments](#)

## ...information on conducting self-inspections.

Monthly self-inspections of hazardous materials storage areas and where radiation is used (i.e., has an active Controlled Radiation Authorization) are required, and are conducted in [BioRAFT](#).

Quarterly self-inspections are required for all general laboratories using [BioRAFT](#). [Select agent toxin inspections](#) and [controlled substance inspections](#) also require self-inspections on a quarterly basis.

Annual [laser safety inspections](#) for Class 3b and 4 lasers are required.

### Additional Resources

- ✉ [biorafthelp@lists.stanford.edu](mailto:biorafthelp@lists.stanford.edu)

## ...PPE and safety equipment.

PIs are required to provide appropriate personal protective equipment (PPE) and other safety equipment for all individuals working in their lab.

PPE and other safety equipment are available from various vendors. Certain items may be available from EH&S or your department/school. A list of common items with links to purchase or acquire is available through the [EH&S Safety Store](#).

Specialized safety kits and supplies may be required for working with certain high hazard materials (e.g., toxic gases, hydrogen fluoride, cyanide). EH&S can provide assistance in selecting these items.

Please note that certain PPE requires EH&S consultation prior to use. Please call 650-723-0448 if you believe your lab members will need respirators (masks) or ear plugs/muffs.

### Additional Resources

- 🔗 [Laboratory PPE Assessment Tool](#)
- 🔗 [Selecting gloves](#)
- 🔗 [Fire extinguishers](#)
- 🔗 [Fume hood use](#)

## ...a work-related medical consultation/visit.

Some research requires vaccinations, medical surveillance, or medical consultations. The [SU Occupational Health Center](#) can provide:

- Minor injury medical visit
- Required vaccinations
- Medical surveillance
- Medical clearance for respirator (face mask) use
- [Travel medicine](#)
- [Reproductive & developmental health consultation](#)

## ...to set-up/move my lab.

Setting up, moving, or closing a lab requires special considerations. EH&S can provide additional services and materials at that time. See pages 22 and 23 for more information.

### Additional Resources

- 🔗 [Seismic Restraint \(ProtectSU\)](#)
- 🔗 [Laboratory Design Guide](#)
- 🔗 [Laboratory Deactivation and Move guidelines](#)
- 🔗 [SafetyStore.Stanford.edu](#)
- 🔗 [Lab Cleanout for Chemicals](#)

## ...to address an injury/incident in my lab.

Injuries and incidents (e.g., spills, near-misses) are relatively rare in labs, but are important to report and discuss to prevent future incidents.

EH&S has many resources to aid your response and follow-up. For more information on addressing injuries, incidents, and near-misses, please see pages 16 and 17.

### Additional Resources

- 📞 **For EH&S emergencies call: (650) 725-9999**
- 🔗 [SU-17: Incident Investigation Report for Employees](#)
- 🔗 [SU-17B: Incident Investigation Report for Non-Employees](#)
- 🔗 [SU-17 Incident Investigation – Tips for Supervisors](#)

# I Want Additional Info on...

## ...training.

As the supervisor of your lab, select the appropriate safety trainings for your researchers to take in STARS based on the type of work the individual will conduct and provide laboratory specific trainings. [Lab Specific Training](#) is developed and delivered by you or a designee. Training documentation must be retained for at least one year.

EH&S offers several hands-on training courses by request. These types of trainings help researchers learn proper technique under the supervision of experts, ensuring safe and consistent work practices.

Please note that most departments and schools require new researchers to turn in training documentation prior to being issued a key or keycard access. Contact your building manager for further information.

### Additional Resources

- 🔗 [STARS - Axxess Training Database](#)
- 🔗 [Biosafety Specialized Info Sessions](#)
- ✉️ [ehs-training@stanford.edu](mailto:ehs-training@stanford.edu)

## ...ergonomics.

Computer work and certain lab procedures frequently require repetitive motions, increasing the risk of musculoskeletal injury. Simple adjustments to equipment or work practices can decrease the risk of injury without sacrificing productivity. Online training for [office workstation ergonomics](#) and [laboratory ergonomics](#) is available in STARS.

EH&S can provide personalized ergonomic assessments for [office](#) and [laboratory](#) work. Stanford offers a [matching fund](#) to research groups to purchase ergonomic laboratory equipment.

### Additional resources

- 🔗 [Safe Lifting](#)
- 🔗 [Request Ergonomic Services](#)

## ...working with minors.

All Stanford employees, students, volunteers and affiliates who work with minors are required to comply with [SU's Protection of Minors policy](#). Information on administrative requirements for working with minors can be obtained from the [Office of Science Outreach](#). There are additional [health and safety requirements for minors](#) participating in laboratory research.

## ...field research/travel.

Similar to working in a laboratory, [field research](#) has inherent hazards. Risk can be greatly reduced through planning, awareness of potential hazards, following best practices, and exercising good judgment. EH&S can assist with identifying training resources, pre-trip planning, permits for collecting/shipping field samples, and travel medicine.

### Additional Resources

- 🔗 [Office of International Affairs](#)
- 🔗 [Travel Info](#)
- Occupational Health Center for Travel Medicine
- ✉️ [ehs\\_field\\_safety\\_support@lists.stanford.edu](mailto:ehs_field_safety_support@lists.stanford.edu)

## ...waste.

Nearly all research activities generate [hazardous waste](#), which must be handled and labeled properly to protect both researchers and the environment. Waste is regulated by federal, state, and local laws.

### Additional Resources

- 🔗 [Waste Tag](#)
- 🔗 [SU Hazardous Waste Poster](#)
- 🔗 [Medical Waste Poster](#)
- 🔗 [Sharps Waste Poster](#)
- 🔗 [Empty Container Decision Tree](#)
- 🔗 [Unknown Chemical Waste Determination](#)
- 🔗 [Electronics, Used Lamps, Used Batteries](#)

## ...working at SLAC.

SLAC National Accelerator Laboratory is a Department of Energy (DOE) National Laboratory operated by Stanford. SLAC has its own [Environmental Safety & Health](#) program with required safety [training](#).

### Additional Resources

- ☎️ [650-926-4554](tel:650-926-4554)

## ...emergency preparedness.

Emergencies or disasters can happen at any time and usually without warning. Protecting your laboratory research from damage or loss can prevent major setbacks. EH&S can assist with continuity planning and identifying mitigation measures to protect your operations.

Preparedness is essential both at work and at home. [Emergency response guidelines](#) are available on the EH&S webpage. In-person training for [Personal Emergency Preparedness, CPR, First Aid, and AED training](#) can be requested through STARS.

### Additional Resources

- ✉️ [preparedness@lists.stanford.edu](mailto:preparedness@lists.stanford.edu)
- ✉️ [protectsu@lists.stanford.edu](mailto:protectsu@lists.stanford.edu)

# Lab Management

A well-run research program requires management of many different elements. In particular, effective management of your spaces, people, and laboratory culture influences behavior and determines safety outcomes.

## Policies & Framework

*Reducing uncertainty around policies and expectations gives researchers a framework to work within and the freedom to focus on other aspects of their research.*

- 🔦 Have clear laboratory policies on topics such as working alone/after hours, ordering materials, and work that needs your prior approval.
- 🔦 Institute cross-training, plan overlaps in staffing to allow for transfer of knowledge, and promote clear communication/documentation to ensure continuity.
- 🔦 Create a checkout procedure to ensure that hazardous materials are properly disposed, labeled, or stored, and that notebooks or digital files are archived to prevent loss of data/records.

## Mentorship

*Your success and your students' success go hand-in-hand. Effective mentoring takes time and effort, but it is one of the keys to long-term student achievement. Strong working relationships with your researchers allow your group to better address challenges head-on.*

- 🔦 Provide time and opportunities for your researchers to connect with you.
- 🔦 Tailor your mentoring approach to each researcher's individual needs and experience/knowledge level.
- 🔦 Spend time in your lab to advise researchers in real time and evaluate lab techniques.
- 🔦 Arrange for more senior lab members to mentor incoming researchers or allocate more of your time to junior researchers.



Research Advisors set the tone. We create the expectations. We establish the standards. We try to build an environment where students feel like they can reach their potential. Communication is critical, both to encourage students to do science well, but also to encourage them to do it safely.

*Professor Robert Weymouth, Robert Eckles Swain Professor of Chemistry at Stanford University Department of Chemistry, [Fostering a Safety Culture in Stanford Labs Video](#)*



## Delegation

*As a PI, you have a finite amount of time available to dedicate to individual group members. While you bear the ultimate responsibility for what happens in your lab, delegating some management tasks to competent researchers allows you to increase your span of control.*

- 🔦 Assign a Lab Safety Coordinator (LSC) to assist in managing routine safety tasks. Give them authority to enforce the safety policies and lab rules. (Many larger labs hire a professional lab manager).
- 🔦 Intra-lab communication can be challenging for large lab groups or groups spread across several buildings. Assign one or more LSCs for each main area or building.
- 🔦 LSCs should meet regularly with each other and the PI.

## Stewardship

*How spaces and equipment are maintained is a physical manifestation of a laboratory's culture. Clean, well-organized work environments and well-maintained equipment improve workflow, safety, and quality of products and results.*

- 🔦 Establish and enforce good housekeeping policies. Everyone should be responsible for cleaning their own and shared spaces. Researchers should be trained on how to clean spaces and what a clean, orderly workspace looks like.
- 🔦 Schedule regular lab clean-ups.
- 🔦 Meet regularly to discuss safety concerns and the management of spaces or equipment.
- 🔦 In shared lab spaces, labeling is especially critical. Write names on equipment, chemicals, and research samples to indicate ownership.
- 🔦 Assign responsibility for equipment (training, scheduling, maintenance).

## Leading by Example

*Set the tone for your research group by enforcing safety rules and modeling exemplary safety behaviors, and being transparent about safety and lessons learned.*

- 🔦 Follow rules and policies yourself (e.g., wearing your proper personal protective equipment (PPE) every time you are in the lab).
- 🔦 Address safety in your own work (e.g., talks and publications).
- 🔦 Share personal stories about your own experiences.

## Trust

*To instill a strong and positive safety culture within your research group, it is important that safety be discussed freely. Create an open and safe environment for dialogue.*

- 🔦 Talk about safety when planning experiments, make safety discussions part of your group meetings, and encourage researchers to consult with EH&S.
- 🔦 Encourage researchers to bring up safety concerns.
- 🔦 Encourage your researchers to speak with you about deadlines or workloads that may lead to fatigue or stress that could hinder their ability to work safely.



## Consider the Individual Needs of Your Researchers

Students and postdocs come to Stanford with varying backgrounds, competencies, and needs. Every researcher will respond to the rigors and demands of academic life differently. As a faculty member, you are on the front lines to recognize distress. Consult with student Counseling and Psychological Services (CAPS) if you identify signs of distress in students and researchers (650-723-3785).

# Preventing Injuries & Accidents

With careful planning, sufficient training, proper controls, and continuous learning, nearly all injuries and accidents in the laboratory are preventable.

When it comes to preventing incidents and injuries in your research group, your approach should be to strive for perfection and settle for excellence. Fortunately, incidents and injuries are relatively rare at Stanford (about 1 per 100 graduate students and postdocs per year); nearly all are preventable. Keep in mind that over time, any work environment can be subject to the laws of entropy: without continuous input of energy, the system reverts to a more haphazard state. A lab can start off in good shape, but through complacency, turnover, overconfidence, shortcuts, lack/loss of attention, poor housekeeping, and/or neglect, can slowly migrate to a state of higher risk.

Additionally, as a research program grows and develops, new avenues of pursuit can shift the risk level in the lab. By regularly reviewing procedural plans, training needs, and controls, you can preserve a well-thought-out safety program. Deliberate risk assessment is a valuable method to analyze a plan, identify hazards, review training needs, familiarize yourself with controls, and realize continuous learning.

The table to the right lists some of the most common accidents and injuries in research in academic, governmental, and commercial laboratories. Review the list to identify incidents you may anticipate to occur in your own lab. To help you prepare yourself and your researchers to work safely, typical causes and effective preventive actions are provided.

## Laboratory Risk Assessment Methodology

A framework for risk assessment that maps onto the scientific method, melding with the process researchers already use to answer scientific questions. The Risk Assessment Tool uses a four-part framework that can be used for an experiment, analytical process, or series of tasks:



**1. Explore** | Think broadly to determine the scope of your work, beginning with your research objective.



**2. Plan** | Outline your procedure/tasks by taking a deeper dive into specific topics in the literature. Determine hazards associated with each step/task and the control measures for reducing risk. This step helps identify necessary training and controls.



**3. Challenge** | Question your assumptions and ask yourself, "What could go wrong?" Seek advice from others to challenge your thinking.



**4. Assess** | Implement a model, prototype, or trial run. Run your experiment and monitor how your controls perform. Learn from mistakes both in research and in safety. Use this step to promote continuous learning.

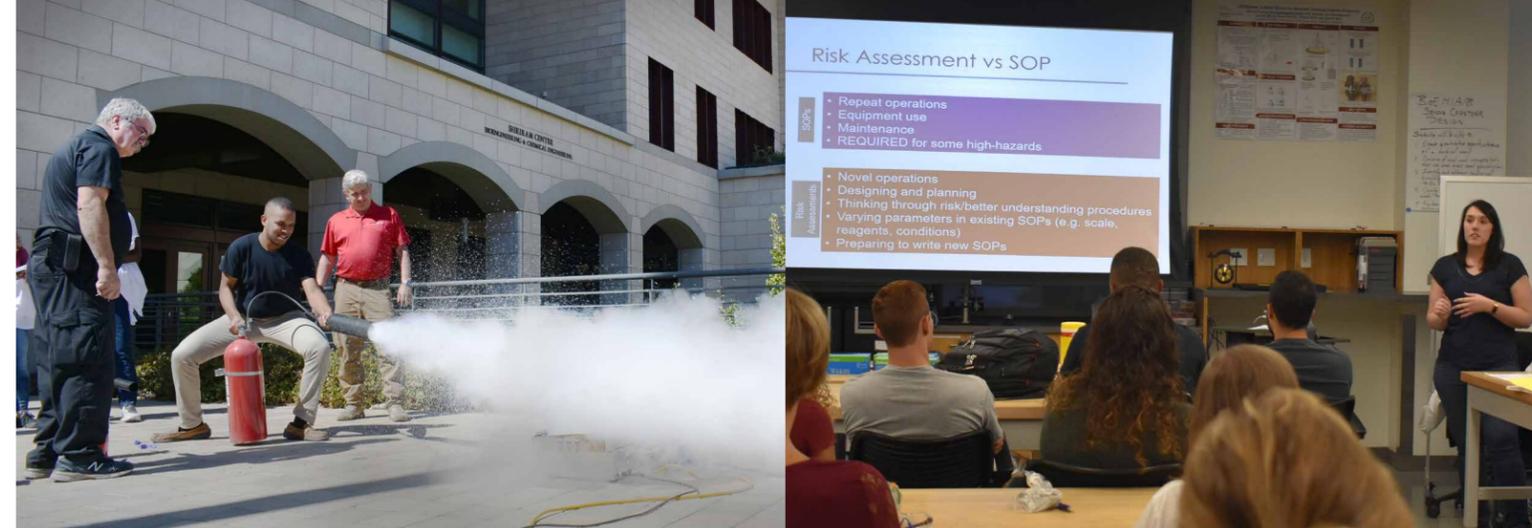
## Accidents & Injury Types, Causes, and Preventative Measures

Injury / Accident	Cause	Preventative and Risk Reduction Measures
Needlestick	<ul style="list-style-type: none"> <li>✓ Recapping needles</li> <li>✓ Unrestrained animals</li> <li>✓ Placement of uncapped needle on a bench</li> <li>✓ Incorrect needle choice</li> </ul>	<ul style="list-style-type: none"> <li>💡 Never recap needles</li> <li>💡 Properly restrain animals</li> <li>💡 Use safety sharps</li> <li>💡 Use blunt sharps for most chemistry applications</li> </ul>
Cuts	<ul style="list-style-type: none"> <li>✓ Razor blades</li> <li>✓ Broken glass</li> <li>✓ Microtomes</li> <li>✓ Scalpels</li> </ul>	<ul style="list-style-type: none"> <li>💡 Clean broken glass with forceps/broom and pan</li> <li>💡 Wear cut-resistant gloves</li> <li>💡 Cover microtome rotary blades when not in use</li> <li>💡 Use safety blades</li> </ul>
Chemical Spills & Chemical Exposures	<ul style="list-style-type: none"> <li>✓ Lack of proper PPE</li> <li>✓ Inadequate understanding of chemical properties</li> <li>✓ Poor housekeeping/improper chemical storage</li> </ul>	<ul style="list-style-type: none"> <li>💡 Wear correct PPE at all times in the lab</li> <li>💡 Select the correct chemically-resistant glove for the chemical(s) used</li> <li>💡 Work in a chemical fume hood</li> <li>💡 Keep storage spaces and benches clean and tidy</li> <li>💡 Store chemicals upright in secondary containers</li> </ul>
Animal Bites & Scratches	<ul style="list-style-type: none"> <li>✓ Unrestrained animals</li> </ul>	<ul style="list-style-type: none"> <li>💡 Properly restrain animals</li> <li>💡 Practice experimental procedures using non-infected animals</li> </ul>
Slip, Trips, & Falls	<ul style="list-style-type: none"> <li>✓ Water on floor (frequently from freezers and sinks)</li> <li>✓ Uneven ground</li> </ul>	<ul style="list-style-type: none"> <li>💡 Install non-slip mats</li> <li>💡 Wear appropriate footwear</li> </ul>
Musculoskeletal Injuries	<ul style="list-style-type: none"> <li>✓ Repetitive use</li> <li>✓ Awkward postures</li> </ul>	<ul style="list-style-type: none"> <li>💡 Purchase and use ergonomically-designed equipment</li> <li>💡 Take microbreaks</li> <li>💡 Correct workstation setup</li> </ul>
Vehicle Accidents	<ul style="list-style-type: none"> <li>✓ Lack of attention/fatigue</li> <li>✓ Poor road conditions</li> </ul>	<ul style="list-style-type: none"> <li>💡 Slow down</li> <li>💡 Carry safety equipment (e.g. spare tire, tire chains, flares)</li> </ul>
Field Work Injuries (Strains and Sprains)	<ul style="list-style-type: none"> <li>✓ Strenuous physical activity</li> </ul>	<ul style="list-style-type: none"> <li>💡 Take breaks, get help lifting/carrying heavy equipment</li> </ul>
Laser (Skin or Eye Exposure)	<ul style="list-style-type: none"> <li>✓ Misaligned lasers</li> </ul>	<ul style="list-style-type: none"> <li>💡 Align lasers with lower power laser</li> <li>💡 Wear correct laser eyewear</li> </ul>
Fires	<ul style="list-style-type: none"> <li>✓ Improper handling of flammable/pyrophoric chemicals</li> <li>✓ Use of open flame near flammable chemicals</li> <li>✓ Exposed wiring</li> </ul>	<ul style="list-style-type: none"> <li>💡 Carefully review chemical incompatibilities</li> <li>💡 Keep open flames away from flammable materials</li> <li>💡 Avoid crushing and severe bending of electrical cords</li> </ul>

# Accident & Injury Follow-Up

Reacting to an accident or injury follows three steps: Respond, Report, and Review. The “Review” step requires analysis, process improvements, and sharing of the conclusions.

If an accident or injury occurs in your research group, respond by following “The 3 R’s,” a three-step process to guide you through incident response. An incident can be an accident, injury, spill, property damage, or a near-miss. EH&S will support you in all aspects of reviewing an incident.



## How to Conduct a Review of an Incident

Action	Description	How-To
<b>Respond</b>	Actions taken immediately following an accident or injury are critical to controlling the magnitude of the incident. When taking action, the highest priority is always the life and health of all involved. Once safety and health is secured, the next priorities are protection of the environment and preventing property damage.	For work-related medical injuries: <b>Emergency:</b> Call 911 and/or go to the Stanford Hospital Emergency Department <b>Non-emergency:</b> Visit SU Occupational Health Center. Phone: 650-725-5308. (After hours or on weekends, go to the Stanford Hospital Emergency Department, if needed.  24/7 spill clean-up service: (650)-725-9999.
<b>Report</b>	Certain types of accidents and injuries must be reported to regulators. By reporting accidents and injuries to EH&S, these regulatory compliance needs will be managed for you.  Timely reporting also allows an opportunity for organizational learning. EH&S will assist you in analyzing and learning from incidents.	<b>Serious Injury:</b> Call 650-725-9999, within 8 hours. <b>Accident, Injury, and Near Miss Reporting:</b> Fill out a <a href="#">SU-17 form</a> , within 24 hours.
<b>Review</b>	This can be the most challenging step, because it requires creativity and deep thinking to determine causes and follow-up actions. However, reviewing an incident with the entire lab group is particularly important as it is an opportunity for improving safety and for teaching and learning.	Follow the instructions on the next page, EH&S will assist you with all the proper steps.

### Gather all information

Who was involved? What were they doing? When did it happen? Where did it happen? What personal protective equipment (PPE) was used? What procedure was being followed?

### Determine the immediate cause(s)

The immediate cause is that which directly led to the incident, such as an unexpected chemical reaction, incorrect use of a tool, or lack of PPE.

### Think about underlying cause(s)

When determining the cause of an incident, **the objective is not to assign blame**, but rather to understand how the system<sup>1</sup> had a loss of control and to correct the issues. Further analyze the immediate cause(s) by asking why. For example, by asking why wasn't the student wearing appropriate PPE, the answer may be that the student wasn't adequately trained on PPE selection and use, that there was inadequate assessment of the risk of the procedure, correct PPE was not available, and/or that the lab culture at this time does not prioritize PPE use. Continue asking why for each successive cause in order to determine improvements in management and enforcement that will improve the safety culture of your group.

### Correct any deficiencies

Identify and implement any corrective actions that could have prevented the incident. Also consider larger changes that can be made to reduce the likelihood of occurrence or the severity if the incident recurs.

### Discuss and share lessons learned

Hold a group meeting to discuss causes, corrective actions, and other operations that need re-evaluation. Exchange information with colleagues with the goals of learning from the incident and preventing future occurrences.

### Document corrective actions

Write down what you've learned: what went wrong, why, and what changes will be made. Keep for internal reference and consider sharing outside of your group.

#### Defining a Near Miss:

*An event in which an injury did not occur, but could have. These events are indicators that the existing hazard controls may not be adequate and deserve more scrutiny. Review all near-misses as they are often precursors to an accident or injury.*

1. The system includes the physical apparatus or equipment, the planning process for an experiment, the controls in place to ensure a good outcome, the training and oversight of researchers, the social and political environment they work in, etc.



# Teaching Safety

You have an opportunity and responsibility as an educator to ensure your students and researchers are equipped with an understanding of how to think critically about risk and the knowledge of how to perform their work safely.

One of many hats you will likely wear as a PI at Stanford is that of educator, tasked with helping train the next generation of scientists and engineers with the skills necessary to succeed in future careers. Increasingly, an understanding of how to conduct work safely is being recognized as one of the key competencies for researchers<sup>1</sup>. Safety skills and safety education also reinforce scientific research skills such as information analysis, planning, and critical thinking<sup>2</sup>.

Teaching occurs formally in a classroom setting as well as informally in the research laboratory. As a Stanford PI, you may give lectures, design courses, or mentor students and researchers. All are important opportunities to help your students and researchers develop their safety skills and knowledge.

## Learning Goals

As with all course content, the safety knowledge you share with students will lay the foundation for their future learning. Introductory courses should teach students the basic terminology and hazards associated with the subject area, how to control for

the hazards, and where to look for further information (e.g., how to read safety data sheets). Once students and researchers understand the hazards, they must learn how to apply that information to mitigate the risks. Through hands-on experience in laboratory courses or field research, they learn critical skills for working safely in a workplace.

As they progress in their studies, students and researchers should learn how to conduct a risk assessment, the proper use of hazard controls, why controls are used, and the strengths and weaknesses of controls. Risk assessments are key to teaching students and researchers how to think through their processes critically in terms of safety. In a risk assessment, one explores the hazards of an experiment or procedure, plans how to control for them, challenges assumptions, and judges the level of risk. The [Stanford Laboratory Risk Assessment Tool](#) can serve as a teaching aid and a framework for assessing risk and making informed decisions about hazards and controls.

## Strategies for Integrating Safety into Your Teaching

*You want to establish a culture of curiosity and learning in your laboratory and classroom. Bringing up and encouraging discussions around safety will signal to your students and researchers that it's an important topic that is worthy of their attention.*

### Classrooms & Teaching Labs

- ✓ Establish formal safety learning goals for your course.
- ✓ Integrate safety discussions into lectures, pre-lab assignments, and demonstrations.
- ✓ Consider adding a safety element to grades by including safety in assignments, student-led presentations, and exams. Grading students on safety indicates to them that safety, like other graded course elements, is an important concept.
- ✓ Use the risk assessment methodology as part of pre-lab assignments.
- ✓ Create a culture of accountability by not allowing students without proper PPE to enter the lab.
- ✓ Invite EH&S staff to teach or give demos to your class.
- ✓ Help students understand not just the “hows” and “whats” of safety, but also the “whys” (e.g., explain why the PPE chosen for the experiment is appropriate and what its benefits and limitations are).
- ✓ Cite and discuss journals and articles that include safety considerations in their write-ups.
- ✓ Direct teaching assistants to complete any pre-lab assignments, conduct a risk assessment, and perform the lab/experiment themselves before teaching it.
- ✓ Encourage teaching assistants to document common questions and errors they observe in assignments, lab/experiments, and discussions to help improve safety and learning in future iterations of the course.

### Research Laboratory

- ✓ Set clear expectations and rules around safety.
- ✓ Avoid blame. Use mistakes as learning opportunities.
- ✓ Discuss safety when meeting with researchers individually or in small groups.
- ✓ When planning experimental procedures, use risk assessment as a framework for conversation about safety and hazard controls.
- ✓ When a researcher is presenting at group meeting, ask them questions not only regarding the science behind their work, but also about the safety controls and practices they used.
- ✓ Consider making safety a required topic for a group meeting presentation.
- ✓ Walk through your lab regularly to observe how work is being done (e.g., safe practices, PPE use, good housekeeping). Praise positive safety behavior and redirect negative safety behavior.
- ✓ Leverage EH&S as a resource. Invite EH&S staff to give personalized hand-on training or demonstrations at your research group meetings.



## Training and Demonstrations Available Through EH&S

EH&S staff are available to help develop or deliver course content on hazards, controls, and safety practices to your researchers, or class.

1. NPA Core Competencies Committee. *The NPA Postdoctoral Core Competencies*. (2007).

2. McEwen, L., Stuart, R., Sweet, E. & Izzo, R. Baseline survey of academic chemical safety information practices. *J. Chem. Heal. Saf.* 25, 6–10 (2018).

# Establishing Your New Lab

Welcome to Stanford! Establishing a new laboratory can be an exciting and busy time. Your “to-do” list will include a number of health and safety tasks that must be completed before laboratory work can begin. EH&S staff will meet with you to go over your responsibilities and requirements as a PI at Stanford, provide you with resources to implement many of these tasks, and answer any questions that arise.

## Prior to Arrival

- Work with local departmental and school contacts for facilities needs (e.g., space, electrical, ventilation, seismic restraint).
- [Submit](#) research protocols (if applicable).

## When you Arrive

- Schedule a meeting with EH&S to help navigate safety at Stanford.
- Complete your own safety training in STARS, the system used at Stanford to provide and document online training. STARS can be found in [Axess](#).
- Set up the following laboratory management programs:
  - [ChemTracker](#), the program used at Stanford for chemical inventory management.
  - [BioRAFT](#), the program used at Stanford for general laboratory safety management (including self-inspections).
- Determine training needs for staff/researchers using the Training Needs Assessment Tool.
- Develop the [lab-specific training](#) that new members of your lab will receive.
- Complete the [Laboratory PPE Assessment Tool](#) based on your anticipated laboratory procedures.
- Purchase PPE based on the results of the Laboratory PPE Assessment Tool (talk to your department safety contact about obtaining lab coats and prescription inserts for safety glasses).

## After Arrival

- Appoint a Lab Safety Coordinator (a member of your laboratory who may take on some routine safety duties) and select safety tasks to delegate.
- Write/review [standard operating procedures](#) (SOPs) for repeat and high-hazard operations.
- Designate chemical storage areas.
- Designate locations for chemical waste in your lab.
- Purchase secondary containers for all hazardous materials and waste.
- Request hazardous waste containers from EH&S.
- Set up your lab [continuity plan](#).

## If Applicable:

- Set up biological/medical waste pickup .
- Apply for a [Controlled Radiation Authorization](#) from EH&S.
- Start medical surveillance.
- Receive required vaccinations.
- File [Material Transfer Agreements](#).
- Enroll in the [Controlled Substances program](#).
- File for a Controlled Laser Authorization.
- File for a [Controlled Machine Authorization](#).

# Relocating or Closing Your Lab

At some point in your tenure, you may relocate your lab to a new location or permanently close your lab. In addition to accounting for your academic and research property such as lab notebooks and computers, the hazardous materials in your lab must be properly managed. You are responsible for ensuring proper removal and disposal of all chemical, radiological, and biological materials and their residues from work surfaces and equipment in all areas where your research was conducted. EH&S can assist in the planning and coordination activities with you and your building manager/department. For detailed information, see [EH&S Laboratory Deactivation and Move Guidelines](#).

## Prior to Move

- Establish a firm stop-work date (at least 5 days prior to move/shutdown date).
- Assign duties to lab members and communicate timing/scheduling.
- Contact EH&S at least sixty days prior to stop-work date for scheduling lab cleanouts, decontamination, radiological deactivation, and EH&S support for APB or APLAC approvals.
- Arrange with EH&S for transfer/disposal of equipment, samples, chemicals, biological agents, radiological materials, controlled substances, etc.
- Complete training for [shipping chemical](#) or [biological materials](#) or arrange for a certified hazardous materials shipper to complete these tasks. (Note: Radiological materials can only be shipped through EH&S).
- Contact EH&S to update ChemTracker and BioRAFT information.
- Decontaminate equipment, lab benches, fume hood surfaces, biosafety cabinet surfaces, etc.
- Pack personal items and pack/arrange for packing of your lab.

- Request pick-ups of waste or surplus items. Contact EH&S for chemical, radiological, or e-waste pickups. Contact your department property administrator for cataloging, surplus, and/or disposing of capital equipment and devices containing data.

## During Move

- Provide emergency contact numbers to vendors responsible for transporting hazardous materials.
- Update your [chemical inventory](#) to reflect new lab location and/or disposal.

## After Move

- Arrange for disposal of any remaining items or surplus.
- Make sure previous space(s) are clean and free of contamination.
- Arrange with department for official checkout of space(s). You are responsible for your old areas, including completing any required self-inspections, until this step is complete.
- Ensure your chemical inventory is correct in ChemTracker and assigned spaces are correct in BioRAFT.
- Contact EH&S if you need assistance with signage, earthquake restraints, etc., for your new space.



# Emergency Contacts

For emergencies contact **911** or from a campus phone **9-911**

## Emergency Response

### *EH&S 24-Hour Hotline*

☎ **650-725-9999**

*For large spills and/or serious injuries  
(EH&S includes an Occupational Health Center)*

### *LBRE Buildings and Ground Maintenance*

☎ **650-723-2281**

*For immediate facilities issues (non-SOM facilities)*

### *Are you in the School of Medicine?*

☎ After 911, call Security Services at 286,  
or from a cell phone, 650-723-7222.

☎ For immediate facilities issues,  
call 650-721-2146.

### *Stanford Hospital Emergency Department*

☎ **650-723-5111**

🏠 900 Quarry Rd. Ext., Palo Alto, CA 94304

*For information on waiting times or directions.  
No medical advice is provided via phone.*

## Emergency Info Sources

### *Alert U*

During large-scale emergencies, the AlertSU system will be activated, sending alerts by email and text message, as well as postings to [emergency.stanford.edu](https://emergency.stanford.edu).

### *Additional Resources:*

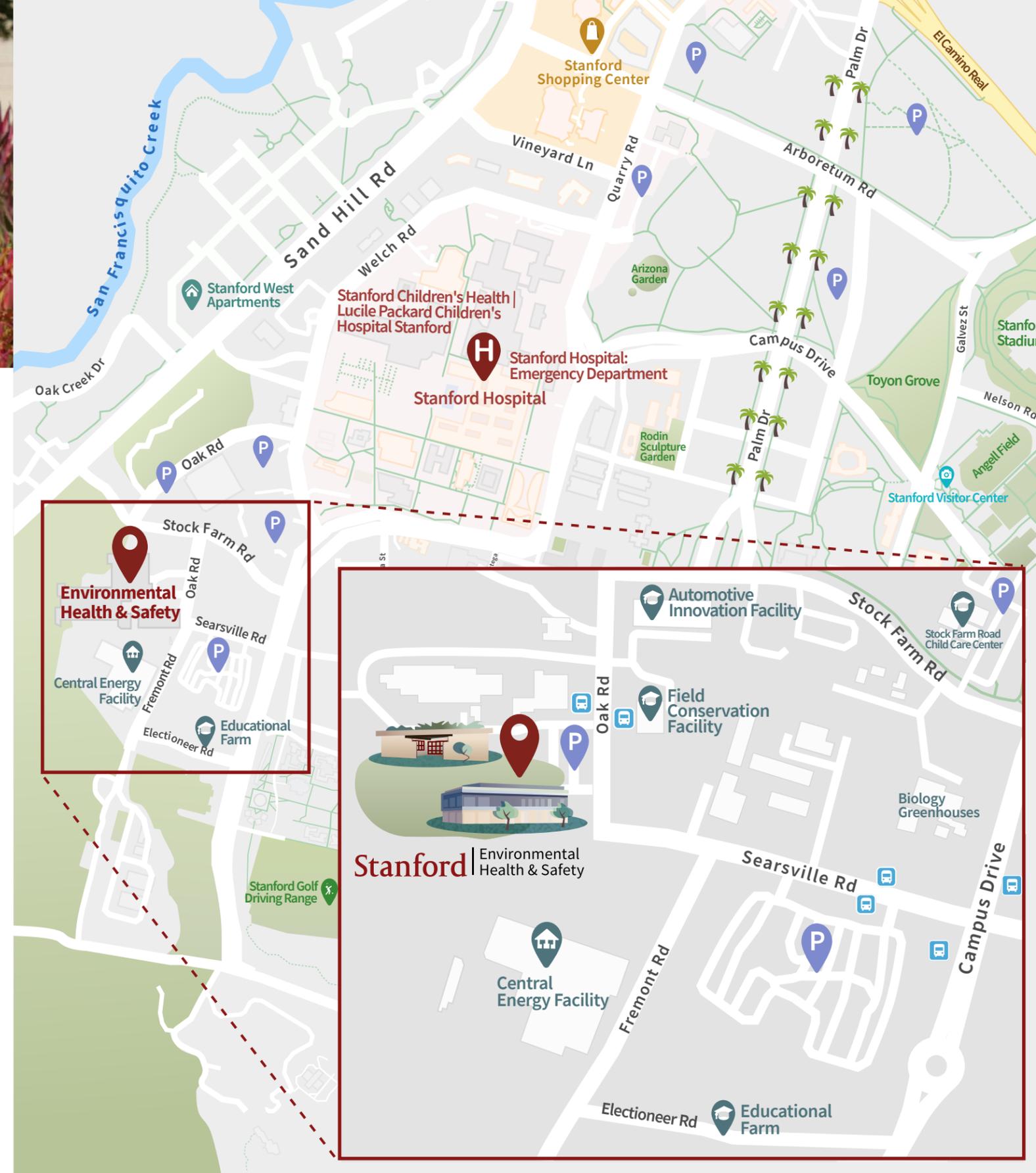
#### *Stanford Emergency Hotline*

☎ **650-725-5555** provides details  
via a voice recording.

🌐 [emergency.stanford.edu](https://emergency.stanford.edu)

📻 FM Radio: KZSU FM 90.1

☎ Local hotlines: [https://ehs.stanford.edu/  
topic/emergency-preparedness/emergency-  
information](https://ehs.stanford.edu/topic/emergency-preparedness/emergency-information)



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484 Oak Rd Stanford, CA 94305 | Main Line: (650) 723 - 0448 | OHC: (650) 723 - 2300 | [ehs.stanford.edu](https://ehs.stanford.edu)

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