

California Institute of Technology

FACULTY GUIDE ON LABORATORY SAFETY PRACTICES



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PURPOSE

The [Caltech Institute Policy for Environmental Health and Safety](#) states:

- It is the responsibility of each Division Chair and Department Head to ensure that their units conduct operations in accordance with applicable laws and regulations and implement Caltech's environmental, health, and safety policies and procedures.
- Division Chairs and Department Heads maintain responsibility for day-to-day management and implementation of their Environmental Health and Safety programs.
- Supervisors, including Faculty, with guidance and assistance from the Environmental Health and Safety Office (EH&S), are responsible for:
 - implementing Environmental Health and Safety policies, practices, and programs.
 - ensuring that workplaces, including laboratories and equipment, are safe and well-maintained.
 - training and informing employees, students, and visitors about workplace-specific hazards and safety procedures.
 - providing personal protective equipment.
 - correcting violations.
 - investigating incidents and complaints.
 - overseeing proper storage and disposal of hazardous materials.
 - enforcing policies (including appropriately disciplining employees and students who violate environmental or safety requirements); and
 - appropriately documenting activities and processes.
- Faculty are responsible for the safety of work undertaken in their laboratories. Faculty members may designate a qualified individual, identified as a Safety Coordinator, and empower that individual to assist in the day-to-day safety activities within their research groups, however Faculty members remain fully responsible for the safe conduct of work in their laboratories.

This document, issued by EH&S, provides guidance and assistance to Division Heads and their Faculty for the implementation and management of the day-to-day activities related to safety practices within their research group.

EH&S Safety Engineers have leveraged their expertise and working knowledge of day-to-day research laboratory operations to provide a framework designed to support a robust safety culture in research laboratories.

This Guide also includes suggestions for appointing a Safety Coordinator, should the Faculty choose to appoint one, along with information that may be helpful in supporting and empowering that individual to successfully assist the Faculty member.

LAB SAFETY REQUIREMENTS

The following Environmental Health and Safety requirements applicable to a safe research laboratory operation are outlined below and managed by the EH&S Office:

- [Biosafety Manual](#)
- [Chemical Hygiene Plan](#)
- [Emergency Response Guide](#)

- [Hazardous Waste Management Guide](#)
- [Injury Illness and Prevention Plan](#)
- [Laser Safety Manual](#)
- [Non-Ionizing Radiation Manual](#)
- [Radiation Safety Manual](#)
- [X-Ray Safety Manual](#)

ONBOARDING NEW LAB MEMBERS

All new lab members must be properly on-boarded to understand Caltech's safety and emergency policies and procedures and follow safe laboratory-specific practices. Faculty are not required to administer the actual elements of onboarding, but they must ensure that the process is completed.

The on-boarding process entails:

- General and Workplace-Specific Emergency Procedures
- Laboratory-Specific training
- General Safety Training
- Documentation of Training

EH&S has developed several resources Faculty may utilize to assist with the above on-boarding topics, as described below.

GENERAL AND WORKPLACE-SPECIFIC EMERGENCY PROCEDURES

Caltech's [Emergency Management](#) and [Security](#) have developed campus-wide emergency procedures in case of fire, earthquake, or any other unsafe conditions. These general emergency procedures are covered in the Lab Safety Orientation training module, which is administered and documented by EH&S.

In addition, each building and each laboratory will have specific procedures that need to be introduced to new lab members (exit route, evacuation assembly point, lab communication methods, etc.). The Emergency Procedures section of the [Workplace Specific Safety Orientation Checklist](#) can be utilized by laboratories to administer and document this training.

LABORATORY-SPECIFIC TRAINING

Each specific laboratory activity, especially if it is a high-risk procedure, should be introduced to new lab members prior to their attempting to perform the task. The level of training, from awareness-introduction to in-depth hands-on training, will depend on the initial knowledge of the new lab member and on their need to perform hands-on, the hazardous procedures in the lab.

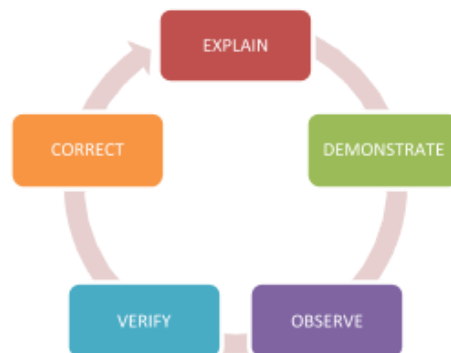
Maintaining current Safe Operating Procedures (SOPs) in the lab provides a basis for the lab-specific training. Clear and detailed explanation of the expected experimental steps – verbally for simple tasks, and more descriptive of more complicated procedures, and applied *consistently* to all new members, leads to successful training.

Writing and regularly reviewing the steps allows researchers to evaluate each step carefully prior to conducting the experiment. In addition, when the lab has personnel turnover, well written procedures maintain basic and practical knowledge of these procedures.

A hazard assessment needs to be performed in the laboratory to develop SOPs. By identifying the chemical, physical, biological, and/or radiological hazards present in the lab, the hazard assessment acts as a guide to determining what tasks in the lab need a written procedure.

The Faculty should also make sure new lab members are proficient in performing high-risk tasks before they are allowed to perform the task on their own. Training for high-risk tasks should generally follow the basic training steps:

- 1) **Explain** – Provide SOP
- 2) **Demonstrate** – Show how it is done
- 3) **Observe** – Watch them do the task
- 4) **Verify** – Note and point to improper/unsafe techniques
- 5) **Correct** – Show proper technique until done right



New high-risk tasks must be assessed by the Faculty prior to anyone in the lab performing them. Procedures for new high-risk tasks must be approved by the Faculty; EH&S is available for assistance in developing the procedures.

GENERAL SAFETY TRAINING

In addition to the lab-specific training performed by the Faculty and/or laboratory personnel, training by EH&S is also required for certain work. In general, research activities comprise various risks, consequently EH&S has developed a [Safety Training Matrix for Laboratory Personnel](#) to help Faculty and lab personnel identify the required EH&S training modules.

TRAINING DOCUMENTATION

Documenting onboarding and training of new laboratory members is essential for several reasons: (1) Verifies the training occurred; (2) Matches the training to the relevant lab risk; and (3) Validates training with regulatory agencies when they assess the type of training appropriate and relevant to personnel. EH&S-based training is documented and recorded by the EH&S Office, **but it is the Faculty's responsibility to document, record, and maintain laboratory-specific training.**

To help Faculty document and record lab member onboarding and lab-specific training, you may want to use this dedicated form: [The Workplace Specific Safety Orientation Checklist](#), which provides instruction and a harmonized template to identify and document onboarding and specific training for each lab member.

As each lab member starts working in the lab, the form allows a date and signature at the time of initial onboarding. As new lab activities are introduced, the form can be updated to document and record training that occurs throughout the time of employment in the laboratory.

Faculty should keep a hard copy or electronic lab training folder with all lab member's lab-specific training in case a review of records is needed.

ONBOARDING OF STUDENT-FACULTY PROGRAMS (SFP) STUDENTS OR MINORS

A higher level of attentiveness is required in onboarding Caltech educational programs students, volunteers, and minors, especially laboratory-specific training. Generally, basic safety orientation and EH&S-based training is organized globally for each program, but Faculty should always verify that their SFP or minor students have completed the required safety training, and such training is documented.

NOTE: Minors (under 18 years old) performing research-related activities at Caltech fall under the purview of the [Caltech Minors Policy](#) and should be registered with Human Resources prior to starting work in the laboratory.

In addition, minors working, interning, or volunteering in laboratories must be approved by the Division Chair in consultation with the supervising Faculty. Minors working in areas with restricted access must also be approved by the supervising Director.

Consideration for approval should be on a case-by-case basis taking into account potential hazards associated with the specific research, the types of equipment to be used, and any potential chemical, biological, and/or other exposures.

REVIEW OF LABORATORY OPERATIONS

A key component of ensuring safe laboratory operation is a regular review of the laboratory safety features and safety equipment and an on-site assessment that the laboratory space is suitable for the scope of work being performed by the laboratory personnel. This is achieved at various levels with Caltech internal reviewers (i.e. - EH&S, Office of Research Policy) but also with the involvement of external agencies such as the California Department of Public Health, the Pasadena Fire Department, the US Department of Agriculture, the US Drug Enforcement Administration, etc.

Reviewing the laboratory space and conditions with knowledgeable laboratory personnel is EH&S's preferred option, therefore, as much as possible, inspections are scheduled in advance.

ROLE OF THE SAFETY COORDINATOR

Per the [Institute Environmental Health and Safety Policy](#), a Faculty member may designate a lab member as a Safety Coordinator to assist with the day-to-day aspects of the safety practices outlined in this Guide. While the detailed duties and daily functions of a Safety Coordinator remain at the discretion of the faculty, in general, the main role of the Safety Coordinator is to:

- Facilitate the on-boarding of lab members; and
- Act as a point-of-contact as it relates to lab safety operations.

This may involve interactions with offices outside of EH&S. Potential examples include the Division, the Office of Research Policy, the Radiation Safety Committee, the Office of Laboratory Animal Resources, and/or others.

EH&S conducts a Safety Coordinator Orientation on an as-needed basis, so please inform EH&S at safety@caltech.edu or safety.training@caltech.edu whenever a new Safety Coordinator has been appointed.

In addition to the EH&S orientation, we suggest choosing an individual in the lab who is experienced with lab-specific techniques and practices. This is usually a senior graduate student or a postdoctoral scholar, but regardless of who is chosen, it should be clearly communicated to the other members of the lab that the Safety Coordinator acts on behalf of the Faculty member. EH&S has seen that such Faculty empowerment makes a great difference in the effectiveness of the Safety Coordinator.

RESOURCES

EH&S is dedicated to supporting research laboratory activities by providing safety expertise and in-lab consulting. Any lab member can request consultation for a specific risk assessment (new biohazardous item, new hazardous chemical reaction, use of laser or radioactive material, etc.). Tailored training, review of SOPs, and interactive discussions with lab members are just some of the options available to Caltech researchers.

ONLINE RESOURCES

- [Safety Office website](#)
- safety@caltech.edu
- [Office of Laboratory Animal Resources \(OLAR\)](#)
- [Office of Research Policy](#)

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