

NRES Procedures for Lab-based Projects and Research

Listed below are the steps you must complete in order to acquire space or materials for your project. You can find all necessary forms on the NRES Forms web page. The steps are first listed below in checklist form, and then presented in an expanded form, providing additional information. Any specific questions can be answered by your advisor or NRES Staff.

This document outlines the rules for use of NRES project spaces, the general safety rules you are required to follow, steps in obtaining project space access, and expectations of you in using and maintaining project space. Additionally, information outlining the proper handling of hazardous waste that may be generated as part of your project is presented here.

____ 1. To obtain project or research space in NRES labs, you must be a currently enrolled student at Cal Poly, and have a designated NRES faculty Project Advisor or Principal Investigator (PI).

____ 2. **Standard Operating Procedure** – You must have a written Standard Operating Procedure (SOP) developed in consultation with and approved by your Project Advisor or PI. A template for developing SOPs can be found on the NRES Forms webpage.

____ 3. **Project Space Request Form** - This form must be submitted to the NRES Lab Technician to secure access to your space under the terms described on succeeding pages. Your Project Advisor or PI will determine how long you will maintain access to project space.

____ 4. **Documented Safety Training** - At a minimum, this requires successful completion of 1) online safety training (NRES Lab Technician will enroll you), and 2) training on the project-specific SOP (provided by your Project Advisor or PI), and 3) general laboratory orientation to safety equipment and rules (provide by Faculty Advisor/PI or Lab Technician).

____ 5. **Chemical Hazard Assessment Form** - If your project requires the use of laboratory chemicals, it is necessary to submit this completed form to the NRES Lab Technician as early as possible. You must have this form on file before you can obtain chemicals from the NRES stockroom.

____ 6. **Project Room Safety Card** - This card identifies your space and gives a summary of the materials in use in the lab. This card should be posted outside of your primary research space or on the inside door.

____ 7. **Checking Out** - You must check out of your research space every academic year to avoid charges and/or holds. Upon completion of your project or at the end of the academic year, schedule a time to meet with your Project Advisor or Lab Technician to review your space and to arrange for the return of laboratory chemicals, equipment and proper removal of any hazardous waste.

PROJECT SPACE REQUEST FORM

The assignment of your particular space is determined by the nature of your research, existing assigned spaces, and the wishes of your research advisor.

To have NRES space privileges, you must have a completed and current Project Space Request Form on file in the NRES Technician's office, 180-252A.

STANDARD OPERATING PROCEDURE

A Standard Operating Procedure (SOP) is a set of step-by-step instructions developed to assist laboratory workers in performing a routine operation. SOPs assist in achieving efficiency, quality output and enhanced safety performance, while minimizing opportunity for miscommunication and failure to comply with University Chemical Hygiene Plan (CHP). A template for developing SOPs can be found on the NRES Forms webpage.

WORKSPACE ACCESS, PROCEDURES, AND POLICIES

A. GETTING STARTED

1. Student fills out Project Space Request Form and obtains signature from Project Advisor.
2. Student works with Project Advisor and NRES Lab Technician to develop SOP.
3. Student submits signed Project Space Request Form and SOP to Lab Technician.
4. Student completes online safety training and successfully passes associated quiz, and completes project-specific SOP training and general laboratory orientation to safety equipment and rules.
5. Access is granted and **paperwork explaining access policy is issued**. Access may involve issuing a key card or key to the student.

B. END OF PROJECT ACTIONS

1. At the end of your project, you must check out of your project space with your Project Advisor and NRES Lab Technician. This includes organization and/or disposal of all remaining samples (described below).
2. Your Project Advisor will designate when your access to project space expires. At that point, you must check out of your project space with your PI **and NRES Lab Technician**.
3. You must then turn in any key cards or keys you may have.

YOU MUST NOTIFY YOUR PROJECT ADVISOR AND COMPLETE THE PROJECT CHECKOUT PROCEDURE BELOW:

4. Set-up a time for your Project Advisor to check out of your lab space, **no later than**

Final's week. At the minimum the checkout procedure includes the following:

- a) Clear and wipe down all bench spaces.
- b) Wash all glassware and put away. No glassware to be left in sinks or hoods.
- c) Make sure any Hazardous Waste containers you generated are properly labeled and ready to hand over to technical staff, (IN PROPER CONTAINERS WITH PROPER LABELS).

Attached to this package is a sample of proper waste chemical labeling.

- d) Empty refrigerators, cabinets, drawers, etc. of all associated reagent bottles and media that will not be used in the future

Note: This is not an onerous or a very time consuming task. It takes only a few minutes and saves technical staff days of cleaning out used vials, unlabeled bottles, etc. accumulated in project spaces over time. Proper labeling and routine organization and lab cleanup go a long way toward preventing a dangerous accumulation of unlabeled chemicals and unknown hazardous waste buildup in the laboratory.

5. If lab is checked out as cleaned, student returns key card to NRES Lab Technician.
6. If student does not properly check out of lab space with technical staff and/or fail to return their key card, then the fee of \$95.00 is charged to student through student accounts- no exceptions.

PROJECT SPACE ACCESS POLICIES

A. LEVEL 1 Access

1. Your working hours are limited to 8 am to 6 pm, Monday through Friday.
2. *If you need additional hours in your project lab, you must fill out the appropriate papers **before** working outside the 8 am to 6 pm accepted hours.* "Extended Use Key Card Access" forms allowing overnight, Monday – Friday, or weekend access are attached to this package and available on the NRES Forms web page. These must be signed by your Project Advisor.

3. If you fail to return the Extended Use key card on time, your regular key card privileges will be suspended for one week for the first offense. Additionally, violation of safety protocols will result in your key card privileges being suspended for one week for the first offense. At this time, your Project Advisor will be contacted. A second offense will result in loss of your key card privileges for the remainder of the quarter. Your research advisor will then be solely responsible for providing you with access to the lab.
4. Faculty who allow facilities access to students should supervise the students and area.
5. Faculty research space and equipment will not be disturbed or moved without approval of the faculty concerned.
6. Key card privileges expire at the end of the last day of finals academic year. Your key card must be returned to the stockroom to avoid a \$95 key card non- return fee.

B. LEVEL 2 Access

1. If you meet **all** of the following requirements, you may be eligible for Level 2 Key Card access:
 - a) You are enrolled as a student in the NRES Department
 - b) You have completed at least one quarter or one summer of research with your advisor
 - c) You are continuing research with your same advisor
 - d) Your advisor approves your Level 2 Key Card Access
2. With Level 2 Key Card Access, you will be granted additional privileges, which come with several stipulations, not limited to those listed below:
 - a) Your standard working hours are limited to 7am to 9pm, Monday through Friday.
 - b) You must receive written permission from your advisor and submit appropriate paperwork if working outside of standard working hours. To do this, complete and return to the stockroom the “Extended Use Key Card” form **before** you plan to work outside of the hours listed above.
 - c) You must always work with a buddy before 8 am or after 6 pm on weekdays and all day on the weekends. A **“buddy” is defined as someone who must be conversant in the processes and materials being used and be able to render assistance in case of an accident.** Your buddy must be within hailing distance from your work area. That is, they must be able to hear you yell for help in the event of an emergency.

- d) Project students must follow NRES departmental safety rules included in this document, safety protocols defined in Standard Operating Procedures (SOPs), as defined by your Project Advisor, and policies of the Cal Poly Chemical Hygiene Plan. It is the Project Advisor's responsibility to ensure that project students are aware of and follow these policies.
- e) You must follow protocols and research approved by your Project Advisor or PI and may not do **any** lab work outside of these.
3. Violation of any of these policies will result in the revocation of your Level 2 Access for the rest of the quarter. A second violation will result in permanent revocation of Level 2 Access.
 4. Your Project Advisor/PI is responsible for your compliance with these policies. However, other faculty and staff will report violations to your Project Advisor/PI and the department head.

C. GRADUATE STUDENTS

1. NRES Department graduate students must follow all the same rules as the Level 2 Key Card Access. An exception is that graduate students may keep their key cards in their possession until they graduate. Your working hours are the same as Level 2 Key Card holders: 7 am – 9 pm, Monday – Friday. See 2b. above.
2. Graduate students from departments other than NRES cannot obtain Level 2 Key Card Access.

PROJECT ROOM SAFETY CARD

A Project Room Safety Card is mounted by the door of your research area(s). This information assists first responders (police, fire) in case of an emergency – use complete chemical names only, not structures or chemical symbols. You may indicate any acronyms you are using on small vials on this card by putting the acronym in parenthesis next to the complete chemical name. Acronyms may not be used unless the size of the vial prohibits complete chemical name. We have been forewarned by public safety personnel that they may decide to not enter a laboratory in the event of an emergency if there is not a clear indication what chemicals or reagents are present in the room.

LABORATORY WORK RULES

A. EYE PROTECTION

While you are doing laboratory work at NRES Department, you must wear some form of eye protection **AT ALL TIMES**. Your Project Advisor/PI is responsible for determining the correct level of safety eye wear according to the rules below. Failure to wear appropriate eye protection will result in a reprimand with the first offense; a subsequent lapse will jeopardize your project privileges.

1. SAFETY GOGGLES

You **must** wear splash protection goggles if there is any possibility of hazardous liquid splash or spill or flying particles. Only goggles that conform to ANSI Z87.1-1989 and provide a complete seal around the eye area are authorized. **If you are in the same room with a person handling hazardous liquids, you must also wear goggles, not safety glasses.**

2. SAFETY GLASSES

a) Safety glasses must meet ANSI Z87.1-1989 standards for this work environment. This means that the safety glasses must have side shields and brow guards.

b) Ordinary prescription glasses are not acceptable as eye protection in this department.

c) Safety glasses provide only a minimum eye protection for regular use. Again, if you are in the same room with a person handling hazardous liquids, you also must wear your goggles, not safety glasses.

d) The safety glasses must be worn whenever you are NOT exposed to the hazard of chemical splash. For example, you must wear safety glasses when washing glassware, tidying up labs or handling sealed chemical and waste containers. If you are not sure whether an assigned task requires eye protection, ask your supervisor - 99% of the time, the answer will be "Yes!"

3. CONTACT LENSES

The ANSI Z87.1 standard does allow for the wearing of contact lenses if approved chemical splash **goggles** are worn over the eyes at the same time.

B. ADDITIONAL RULES

1. Students must never work in laboratories alone. There must be a "buddy" at least within hailing distance. (He/she can hear you and aid you in case of an accident.) A buddy is defined as a person conversant in the processes and materials being used and be able to render assistance in case of an accident.

2. Other persons present in the laboratory may not perform lab work without separate authorization. You, as a key card holder may not admit others into the laboratory to perform laboratory work or to socialize. The door may not be blocked open or left unlocked when you leave the room.
3. The laboratory must be left in a clean and orderly condition. Dirty apparatus and glassware must be cleaned and stored in appropriate locations. *Figure 1 displays what NOT to do.* Large amounts of chemicals not currently being used, especially solvents, must not be accumulated in the laboratory. Return this material to the Stockroom.



Figure 1. Messy, cluttered hood area

4. All chemicals or reagents must be properly labeled with complete chemical name, your name, and the date it was transferred to reaction vessel, bottle, or jar.
5. Doors and windows must be closed and locked when the laboratory is unattended.
6. Windows are not to be opened to sweep noxious fumes into the hall. Instead, turn on the fume hood, leave the laboratory, and close the door.
7. An experiment to be left operating unattended must meet the following criteria:
 - a) Experiments to be left unattended must first be discussed with the research advisor.
 - b) Reasonable care must be exercised to prevent the development of hazardous situations in case of unexpected occurrences such as electrical power interruption or equipment failure.
 - c) All running water connections must be wired securely.
 - d) Apparatus must be tagged indicating its contents, the name and home number of both the student and the project advisor, and the dates of start-up and shut-down.
 - e) All services left on (gas, water, electricity) must have a tag on the valve or switch,

reading “DO NOT TURN OFF”.

8. Equipment, glassware, or chemicals may not be removed or borrowed from other labs or other projects unless specific permission has been obtained from the original user or the NRES staff (not student assistants).
9. Current NRES Safety Policies must also be adhered to.
10. Failure to adhere to either SOP guidance or current department Laboratory Safety Rules will result in revocation of key card privileges for the remainder of the quarter.

DRAFT

Hazardous Waste

Research students, under the supervision of research advisors, are responsible for proper handling and disposal of any hazardous waste that is generated. Regulation of laboratory hazardous waste is governed by a complicated web of intersecting federal, state and local codes. Nevertheless, every generator of hazardous waste (including every research student) is expected to know and comply with waste regulations; Cal Poly is subject to inspection by hazardous waste regulating agencies and substantial fines can be assessed against the NRES Department for violations. The following sections will define hazardous waste and describe basic handling and labeling procedures.

WHAT IS HAZARDOUS WASTE?

Title 22 of the California Code of Regulations contains several extensive lists of hazardous materials. If a material does not appear as a “listed waste”, it can still be qualified as “hazardous” if it exhibits any of the following characteristics, whether or not it is listed in Title 22: **ignitability, corrosivity, toxicity or reactivity**. The criteria for determining whether a waste falls into one or more of these hazard classes is detailed in the regulation. Note that a hazardous waste may exhibit more than one of the qualifying characteristics. A mixture must be evaluated according to the criteria for the hazardous waste characteristics, including calculating an oral LD50 value based on the LD50s of the components of the mixture.

Since the number of materials used in our department that qualify as hazardous waste far outnumbers materials that can be flushed down the drain and since the fines that can be levied are huge, the safest bet is to assume that your waste materials are regulated as hazardous waste. The NRES Lab Technician will help you and your Project Advisor assess and categorize your waste stream.

PROPER HANDLING AND DISPOSAL OF HAZARDOUS WASTE

1. All hazardous waste must go into a labeled waste container. **Never leave waste in an open container in the hood to evaporate!** Hazardous waste containers must be in good condition, compatible with the waste contained therein and bearing no label other than the hazardous waste label described in #3 below.
2. In addition, **all waste containers must have secondary containment in case of spills or leaks** – either placed in another container or stored in a basin that is capable of holding all of the contents. Suitable containers and basins are available from the NRES Lab Technician. (Figure 2)

3. Every container must have a Cal Poly NRES Department “Hazardous Waste” label. Non-specific labeling, such as “solvent waste” is unacceptable and subject to substantial fines. Hazardous waste labels are available at the stockrooms. (Figure 3)



Figure 2. Secondary containment of Hazardous Waste



Figure 3. Improperly labeled Hazardous Waste container

4. Every container must have the chemical constituents clearly written on the Hazardous Waste label; trade names, chemical symbols and chemical structures are unacceptable and subject to substantial fines. In addition, the percent composition of the container must be listed for each chemical constituent (including water).
5. Every container must have the accumulation date written on the label. The accumulation date is the first day that you start adding waste to the container. Do not accumulate waste beyond 90 days. Your name must also appear on the hazardous waste label.
6. Containers of hazardous waste must remain sealed except when waste is being added to the container. The container must have a tight-fitting screw cap lid that will not leak if the container is tipped over. Do not leave funnels in the containers, unless it is an Eco-funnel that can be closed and latched and is considered a cap.

EXAMPLES OF HAZARDOUS WASTE LABELING

These labels are available (blank) from the NRES Lab Technician.

CORRECT: Itemized lists of chemical names, concentrations, date, name of generator. AMPLE INFORMATION!

HAZARDOUS WASTE		
START DATE: <u>3-26-16</u>		
CONTAINS: (List constituents <u>and</u> concentrations as %, M, or ppm)		
Chemical Name	Concentration	Amount
<u>hexanes</u>	<u>neat</u>	<u>100 mL</u>
<u>acetone</u>	<u>neat</u>	<u>20 mL</u>
<u>sulfuric acid</u>	<u>3 M</u>	<u>10 mL</u>
<u>potassium bisulfate</u>	<u>0.1 M</u>	<u>125 mL</u>
PHYSICAL STATE : liquid		
HAZARD TYPE : <u>flam</u> corr <u>toxic</u> reac (circle)		
GENERATOR : NRES Dept. Room <u>180-241</u> Name: <u>Stubler</u> Cal Poly State University, San Luis Obispo, CA		

INCORRECT: No date - no names. Who made this and what is it?

HAZARDOUS WASTE		
START DATE : _____		
CONTAINS : (List constituents <u>and</u> concentrations as %, M, or ppm)		
Chemical Name	Concentration	Amount
_____	_____	_____
_____	_____	_____
<u>ORGANIC WASTE</u>		
PHYSICAL STATE : _____		
HAZARD TYPE : flam corr toxic reac (circle)		
GENERATOR : NRES Dept. Room _____		