Lawrence Berkeley National Laboratory

Health and Safety Plan
for the ALS User Chemistry Laboratory

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Health and Safety Plan for the ALS User Chemistry Laboratory

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SECTION 1. INTRODUCTION

The Advanced Light Source (ALS) is a national user facility funded by the Department of Energy's Office of Basic Energy Sciences. It is a third generation Synchrotron with ~40 x-ray beamlines that support approximately 2,000 users each year. It is operated by the ALS Division at the Lawrence Berkeley National Laboratory (LBNL) which also manages a range of user support functions including a variety of laboratory spaces. A subset of these is grouped together as the User Chemistry Lab (or "User Lab" hereafter mentioned). Room 2233 is a chemistry lab for users, and is composed of ~550 square feet including two fume hoods. Room 2245, with ~575 square feet, has a shared user function with one hood and a number of chemical storage lockers. Rooms 2255 and 2263, each with one hood, are used only for overflow work under special conditions. Together these labs support approximately 750 individuals performing several thousand operations each year. All of this work is supported by the ALS Environment, Health and Safety (EHS) Program Office with dedicated chemistry staff.

The purpose of this Health and Safety Plan (HASP) is to:

- provide an overview of the structure and responsibilities for how work is carried out efficiently and safely.
- translate the overall LBNL EH&S institutional programs into specific guidance for use of the User Lab.

The basis for this HASP is Integrated Safety Management (ISM). All work performed in the User Lab is identified, reviewed and authorized. Through this authorization process, the hazards (both process and environmental) are identified and control measures put in place to mitigate them. A defined review and oversight system is employed to ensure that these controls are being implemented and are effective. Clear roles and responsibilities are fundamental to this system and everyone with access to these spaces is given clear guidance of their expectations in this regard. Since there is great variation in the background and experience of the users, their training and qualification is carefully evaluated and verified.

SECTION 2. ORGANIZATION

This section describes the lines of authority, responsibility, and communication for health and safety functions at ALS with respect to its User Lab operations. The purpose of this chapter is to ensure that all individuals who work in the User Lab, as well as the support and oversight personnel, understand their roles and responsibilities. It also provides a tool to ensure that all necessary functions are identified.

2.1 SPECIFIC ROLES AND RESPONSIBILITIES

2.1.1 ALS Division Director

The ALS Division Director has the ultimate authority and responsibility over all personnel, employees and visitors working in the ALS and supporting lab.

2.1.2 ALS Environment, Health and Safety (EHS) Program Manager

The ALS Environment, Health and Safety (EHS) Program Manager (or EHS Manager hereafter mentioned) has overall responsibility for this space including the safe conduct of all operations within it. This includes:

- Staffing. Provide for appropriate level and skill set for support staff, specifically the User Lab Manager.
- Ensure coordination with other ALS support functions and the broader User community. Coordinate with the EH&S Division (Industrial Hygiene [IH], Waste Management).
- Approve this HASP and ensure its accuracy, completeness, and compliance with LBNL requirements.
- Ensure that this HASP is being executed properly and that it is effective.

2.1.3 User Chemistry Laboratory Manager

The User Chemistry Lab Manager (or User Lab Manager hereafter mentioned) reports directly to the EHS Manager. He is responsible for developing this HASP and he has the overall responsibility of implementing and overseeing this HASP. He is readily accessible on site during

all laboratory work operations and performs the individual work review and authorizations. The specific responsibilities of the User Lab Manager are:

- Implementation and development of this HASP and ensuring compliance.
- Perform the work reviews for User Lab users. Verify understanding of the proposed work packets, identify hazards and specify controls. Provide assistance and oversight to these users to ensure that their work is conducted safety and efficiently.
- Maintain effective records of the User Lab, develop and implement corrective actions for safety deficiencies. Develop, maintain, and ensure the accuracy of records of chemical inventory in the User Lab.
- Ensure that all personnel working on the site receive appropriate training in recognition, communication, and controls of physical, chemical, and biological hazards on the site, and perform work within the requirements of this HASP and PUB 3000.
- Work with the EHS Manager to ensure that health and safety issues in the User Lab are identified and appropriately addressed in a timely manner.
- Collect and maintain copies of hazard communication programs, material safety data sheets (MSDSs), and emergency telephone numbers, on site, and distribute that information to all employees and chemical laboratory users on the site as necessary.
- Ensure all safety equipments, such as safety shower, eye wash station, spill kits, Fire extinguisher, and PPE are inspected routinely, and first-aid kits are maintained and replaced at the appropriate intervals.
- Identify changing conditions and new hazards in the building, and submit recommendations for updating this HASP as necessary to address the new conditions.
- Conduct self-assessments, audits and inspections of the chemical laboratories periodically and generate quarterly reports to assess any improvements and changes.
- Provide effective means for employees, laboratory users, and guests to communicate safety issues to management.
- Determine emergency evacuation routes, establish and post local emergency telephone numbers.
- Train the hazardous waste generators and keep the satellite accumulation areas (SAA) in compliance.
- Keep track of all the incidental findings, EHS violations, and take corrective measures.
- Stop work if any unsafe conditions are identified.

2.1.4 Users

- Understand and abide by the policies and procedures in this HASP and ask for clarifications if necessary.
- Maintain appropriate training necessary for access to the User Lab.
- Make sure that all work has been reviewed and authorized by the User Lab Manager and that appropriate documentation is on file.
- Wear specified personal protective equipment (PPE) whenever entering the User Lab.
- Properly label all materials in use with clearly written chemical information and owner and contact information.
- Stop work on any unsafe conditions. Report any spills or incidents to the User Lab Manager, the contact numbers are posted in all the chemical laboratories on the wall.
- Coordinate with the User Lab Manager for the disposition of any chemicals after the experiment run is over, including shipment back to the home institution, long-term storage (coordinate with a beamline scientist) or waste disposal.
- Provide feedback to the ALS EHS Program Office to help improve the safety of the User Lab.

2.1.5 ALS Employees

- Understand and abide by the policies and procedures in this HASP and ask for clarifications if necessary.
- Maintain appropriate training necessary for access to the User Lab.
- Make sure that all work has been reviewed and authorized by the User Lab Manager and that appropriate documentation is on file.
- Wear specified personal protective equipment (PPE) whenever entering the User Lab.
- Properly label all materials in use with clearly written chemical information and owner and contact information.
- Stop work on any unsafe conditions. Report any spills or incidents to the User Lab Manager, the contact numbers are posted in all the chemical laboratories on the wall.
- Notify the User Lab Manager of any long-term transfers of chemicals into or out of the User Lab.
- Help to coordinate users' work in the Lab. Notify the User Lab Manager and/or Experiment Coordination whenever users need to use the Lab. Provide guidance to users to ensure that they understand the operational and safety requirements at the User Lab.

2.1.6 ALS Facility Manager

The ALS Facility Manager coordinates with the EHS Manager to oversee the maintenance and inspection of safety systems and equipment. The facility manager manages facility maintenance contracts with external vendors. Contracts with facilities vendors include building and building systems maintenance and upgrades, engineering and construction services, custodial services, pest control, and fire protection. The User Lab Manager is the point of contact for these services when needed by users in the User Lab. In addition, the Facility Manager provides occupants with updates of electrical, water and other service outages, scheduled shutdowns, as well as events that will affect occupants' work or commute, such as constructions and road work.

2.1.7 Experiment Coordination

The Experiment Coordination section helps to coordinate users work at the ALS. They alert the User Lab Manager about users who may require the User Lab facilities and help to coordinate those functions with those on the experimental hall floor.

SECTION 3. WORK AUTHORIZATION AND TRAINING

All work performed in the ALS User Lab must be reviewed and authorized. This is the responsibility of the User Lab Manager. Besides authorizing and reviewing experiments, the User Lab Manager is also responsible for laboratory maintenance, chemical inventory, chemical storage and waste accumulation and disposal. The basic principle is to plan the work carefully so that it can be performed both safely, and efficiently and effectively. The level of detail and formality of the work authorizations will be dependent upon the type of work to be performed, the associated hazards and the required safety controls. Some authorizations may require EHS Division reviews and approvals in addition to the ALS reviews. Examples are work with BSL-1 or 2 biological materials, radiological materials, or lasers greater than 5 mW. In these cases, advance notice is required to allow for proper routing and review.

A precondition of performing work in the User Lab is that all users must have completed the appropriate training. In general this training will consist of standard LBNL safety courses, lab-specific safety training for particular hazards if applicable, and on-the-job training for specific tasks. Most of the training courses are offered online, but some may require attendance at a regular class. The lab-specific training may consist of specialized LBNL safety courses such as Safe Handling of Engineered Nanoscale Particulate Matter (EHS0344) or specialized training given by the User Lab Manager to address specific safety issues in the User Lab (i.e., the user lab orientation). Task-specific training will, in general, be given by the User Lab Manager. The purpose of both the safety training and experimental reviews is to ensure that all users are knowledgeable about the specific hazards that they may encounter during the course of their work and the appropriate controls to mitigate those hazards.

3.1 LABORATORY ACCESS

All staff must receive authorization to gain un-escorted entry to the User Lab. To do this, they must demonstrate that they have proper training, read and understood this HASP, and received an orientation from the User Lab Manager or his designee. Training requirements are generally Chemical Hygiene and Safety (EHS0348). Upon completion of these three steps, card-key access is granted. This is documented in the ALS User Chemistry Lab Access Form. This does not yet entitle individuals to do work, only to enter the User Lab (an exception to this is

discussed below in **Section 3.3**). Further authorization is dependent upon the type of work and is described below.

Upon significant changes in policy, the User Lab Manager may need to pull access and re-authorize everyone. Otherwise, usual communication means (e-mail and signage) are used to convey smaller changes.

3.2 ONE TIME AUTHORIZATION

Typically, work is reviewed on a task-by-task basis. Each time a user wishes to perform work, he or she must submit a form describing the proposed work and the associated materials. This is reviewed by the User Lab Manager, and if necessary other subject matter experts. This process is described in more detail in the ALS 02-07, Work Review and Authorization at the ALS User Chemistry Lab.

The information required consists of a short text field description of the proposed tasks, and a comprehensive list of the materials, which includes concentrations and amounts. Some preliminary information of the hazards is also asked for – typically an MSDS, NFPA hazards categorization, or equivalent. Standard information of who will be doing the work, when, and what facilities (hoods, centrifuges, etc.) may be needed is also asked. The review will include all parts of the job including what is planned for any excess materials. There are three options for these post experiment materials – return, storage, or waste – and this must be planned and organized with the same level of care as the scientific work.

The review will evaluate these materials and processes and identify the associated hazards. Included in this will be any environmental issues (from the User Lab itself or other work going on coincidentally). Controls will generally consist of standard mitigations from the LBNL Chemical Hygiene and Safety Plan (CHSP) and PUB-3000, but will be specific to this operation. For example, PPE will be evaluated for the particular chemicals to be used to make sure that they are appropriate. For higher hazard work (NFPA toxicity 4 or pyrophorics), more detailed controls may be required and EH&S personnel may participate in the reviews. Typically, hazardous materials will require containment when outside of the hood, double containment during transfer to the beamline, spill cleanup provisions, and return to the hoods immediately after work. Exposure assessment may also be performed by IH.

Following standard ALS practice, the review typically will incorporate a discussion between the User Lab Manager and the users to verify understanding of User Lab policies and requirements, and to identify and resolve any potential issues. At this time, any job-specific training is performed and standard institutional training requirements are verified. At the discretion of the User Lab Manager, dry runs may be performed and the User Lab Manager may also restrict the operation to day shifts, enforce two-person rule, or even oversee the work himself.

At the conclusion of this process, times and locations are agreed upon for the work. This designation is a crucial control as it allows the User Lab Manager to organize all of the different and possibly conflicting tasks, and ensure the overall safety at the User Lab. This is documented in the ALS User Chemistry Lab Experiment Safety Review Form.

Once work begins, the users are expected to abide by all requirements in the authorization form. The User Lab Manager may perform periodic walkaround or directly oversee the work to verify this. In case of problems, the users are trained on whom to call as well as Stop Work. Users are expected to label all of their materials, provide their contact information, and also fill out a 'placard' identifying their work space and authorization.

At the conclusion of work, they are expected to clean up their space and to precisely identify any remaining materials for storage, return, or waste. The User Lab Manager will inspect the space within one working day to review and to initiate disposition of any remaining materials.

Routinely, users may want to perform the identical (or very similar) tasks at a later date. In these cases, they will need to notify the User Lab Manager who will then retrieve the original authorization, verify the accuracy of the original description of work, hazards, and controls, and then attach a reauthorization form with signatures.

Should there be a change in scope of the work, the users are expected to notify the User Lab Manager to reevaluate the hazards and determine if changes are needed in the controls.

3.3 BLANKET AUTHORIZATION

Some tasks are very straightforward and involve minimal EHS risks. In these cases, a blanket authorization is given at the time room access is granted. The evaluation of the hazards/controls of these tasks is incorporated into the orientation. Examples of these are: filling

a reagent bottle, retrieving a reagent bottle, obtaining a consumable item, etc. Another type of blanket authorized task is one where a procedure is used. An example of this is using the sonicator. Each sonicator has a user guide associated with it; users are instructed to read it and sign the log book indicating that they have read and understood the requirements. Only those who have read the guide and signed the log may use the sonicators without consulting the User Lab Manager.

3.4 STORAGE AUTHORIZATION

Experimental materials brought or shipped to the ALS generally are on-site only for a limited time (less than 2 weeks) and so do not need to be entered into the LBNL Chemical Management System (CMS) database. If an ALS staff person or user desires to keep these materials for a longer period, then they may apply to the User Lab to store the materials for them. The following conditions apply:

- The materials must be formally owned by an ALS staff person.
- The materials must be bar-coded and entered into the CMS.
- The owner must respond to requests to manage the inventory.
- Some types of materials will not typically be stored (peroxide-formers).
- The owner must notify the User Lab Manager whenever a material is permanently moved in or out of the User Lab storage.
- Owners must maintain current EHS0348 training status so that they are aware of Laboratory rules governing chemicals.

The User Lab Manager will periodically run inventory reports of all hazardous materials in storage in the User Lab. From time to time these will be distributed to the owners to verify that they still need the materials and can justify retaining them. These reports will also be used to:

- verify that no storage limits are being exceeded.
- inspect storage to verify proper segregation.
- verify peroxide formers and other particularly hazardous materials are within ALS and LBL guidelines.

At the time of the User Lab orientation, the User Lab Manager will verify whether or not an individual desires to store materials. At this time a printout of the individual's inventory will

be generated and reviewed by the User Lab Manager. The requirements above will be discussed and agreed upon as part of the blanket authorization, and the printout will be attached to the orientation form.

3.5 TRAINING

The ALS User Lab training program is designed to ensure that workers receive the training they need to understand the hazards and controls associated with their work. The training given for the User Lab work will meet or exceed the LBNL training requirements. The User Lab Manager is responsible for the design and implementation of this training program and is responsible for ensuring that employees, users and visitors are adequately and currently trained for all tasks they need to perform in User Lab. Employees who have not been trained to a level required by their job function and responsibility are not permitted to use the User Lab.

ALS views this training in a defined, tiered approach:

1. General
2. Lab Specific
3. Job Specific

3.5.1 General Training

Listed below are the institutional requirements to gain access to and perform work at the User Lab:

- EHS0470: GERT, General Employee Radiological Training
- EHS0348: Chemical Hygiene Safety Training

In addition, all staff working at the ALS are required to take the following courses:

- ALS 1001, Safety at the ALS
- ALS 1005, Access to the ALS

Documentation of this training is through the LBL Institutional training databases.

3.5.2 Lab-Specific Training

An orientation is provided to each individual who desires unescorted access. This is specifically focused on the ALS User Lab and its particular layout, organization, work, hazards, and controls. The basis for this training is the ALS User Lab HASP. It provides necessary work practices, procedures and policies to ensure that employees and users are protected from

potentially hazardous chemicals used in their work area. Documentation of this training is via the ALS User Chemistry Lab Access Form. Some of the typical topics are:

- Orientation and walkaround
- The location and availability of the HASP
- Hazards
  - Acids and Bases
  - Hydrofluoric (HF) Acids
  - Nano Particles
- Emergency Procedures
  - Phones (landline or cell)
  - Placards
  - Emergency Response Guide
  - Emergency reporting
  - Exits
  - Fire extinguishers
  - Safety showers/eyewashes
  - Spills
- Work review and authorization
- Personal Protective Equipment (PPE)
  - For entry (Safety eyewear with side shields, long pants or equivalent, closed-toe shoes)
  - Task based (Goggles, lab-coats, etc.)
- Chemical Storage, Transportation, and Disposal
  - Storage cabinets
  - Storage refrigerator
  - Secondary containers for transportation to beamline
  - Characterization of materials
  - SAA
- Equipment Usage
  - DI water
  - Sonicators
  - Mag-stirrers
  - Scales
  - Fume hoods

The other type of Lab-specific training that may be required are specialized LBNL safety courses that deal with a particular hazard. For example, if a user needs to work with engineered

nano materials, then EHS0344 (Safe Handling of Engineered Nanoscale Particulate Matter) must be completed. These will be identified at the time work is reviewed and authorized.

3.5.3 Job-Specific Training

In cases where the work may be particularly complex or hazardous, job-specific training may be given at the discretion of the User Lab Manager. In these cases, specific instructions or procedures will be given identifying in some details how the particular tasks will be performed. This may include dry runs.

Typically, this training will be given by the User Lab Manager, but may also be performed by subject matter experts from the ALS, EH&S, or within the research group performing the work.

Documentation of this will be done through the ALS User Chemistry Lab Experiment Safety Review Form.

SECTION 4. HAZARD ASSESSMENT

4.1 TYPE OF HAZARDS

This section of the HASP provides a list of the typical hazards likely to be encountered in the ALS User Lab and a short description of each hazard.

4.1.1 Physical Hazards

One should always be aware and be prepared to come across unanticipated work activities and conditions. Before starting any work in the User Lab, conduct a walkaround to identify and eliminate existing and potential hazards. Make sure your work areas are clean, your walking path is clear, and no slip, trip or fall hazards. Always observe the working environment for any possible hazards around you. Notice any unlabeled or unmarked containers, chemical bottles with loose caps or any material or object which can cause obstruction in your view or work.

4.1.2 Biological Hazards

Contact with animals, insects, blood, bodily fluids, and plant materials can cause injury and illness to personnel.

4.1.3 Chemical Hazards

There are operations in the ALS facility that may require wet chemistry. Wet chemistry operations may include sample preparation (titrations, extractions, plating, etc.), dispensing, storage, transportation, and disposal of chemicals. These activities may present a variety of hazards such as health, fire, and environmental. Personnel may be exposed to chemical hazards through one or more of the following routes: 1) Inhalation; 2) Skin/eye contact; 3) Skin/eye absorption; or 4) Ingestion.

Below is a listing of possible chemical hazards:

- Acids / Bases
- Particularly Hazardous Substances
- Flammable and Combustible Liquids
- Peroxide-Forming Chemicals
- Water-Reactive Chemicals

- Carcinogenic Materials
- Pyrophorics
- Laser Dyes
- Engineered Nanomaterials

4.1.4 Flame Hazards

Common operations in chemistry lab may pose risk for potential heat source hazards that could result in injury or death, equipment failure, or facility fire. Open flames from Bunsen burners or propane burners may be present and are potential ignition sources.

4.1.5 Pressure Hazards

Compressed gas cylinders are present in the facility. The energy released upon failure or rapid de-pressurization of these systems may be imparted through fragments or pressure waves. The consequences of this hazard may include injury, loss of hearing, fire and property damage.

4.1.6 Cryogenic Material Hazards

ALS User Lab users occasionally handle and use cryogenic materials such as liquid nitrogen, helium, and dry ice (CO_2). The most important hazard is the potential for cryogenic burns of the skin due to spills. In addition, explosive release of energy may result if the liquids are inadvertently stored in closed vessels and are allowed to warm up. This is due to the conversion of liquid to gas state which typically results in an expansion of 700-fold or more. If large quantities of cryogenic liquids are present, oxygen deficiency hazards may become present. For the User Lab, it is only in rare instances that the last two hazards are possible, and most typical controls are centered around proper PPE to prevent cryogenic burns.

4.1.7 Electrical Hazards

Many instruments in the User Lab operate with hazardous voltages. Some, such as non-commercial apparatus, may not be NRTL-certified and may have electrical safety features that can be defeated through direct intentions, carelessness, or neglect. These hazardous voltage sources may cause electrical shock and may result in injury or death.

4.1.8 High Magnetic Field Hazards

Large attractive forces are exerted on equipment brought in close proximity to the magnetic field. The force may become large enough to move tools or equipment uncontrollably towards the magnet system and the closer to the magnet system, the larger the force. The field may also disrupt the cardiac pacemaker in persons having a pacemaker implant. Risks come from release of any steel items/tools or equipment which are bought near the magnets. Even belt buckles, steel-toe shoes, etc. may be strongly attracted to a magnet. This might result in damage to the magnets/probes (possibly resulting in a quench) or serious injury or death to personnel working near or under a magnet.

4.1.9 Nanoparticles Hazards

The regulatory definition of nanoparticles are engineered particles that have at least one dimension smaller than 100 nm. Natural particles such as biomolecules and soot are not covered by this definition. The hazards of nanoparticles are inadequately understood and may be fundamentally different than larger particles of the same materials. Therefore, extra precautions shall be taken as standards, which include: containment, labeling, waste disposal, and training.

4.2 HAZARDS COMMUNICATIONS

Hazards communications provides information concerning the materials that may be encountered during the experimental activities. MSDSs are available on-line through the LBNL EH&S website for most materials used in the User Lab. In some cases, MSDSs may not be available, in which case some alternate form of product hazard documentation will be acceptable. In accordance with the requirements of LBNL, *Hazard Communication Program*, all personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDSs. All containers on site shall be properly labeled to indicate their contents. Labeling on any containers shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

SECTION 5. HAZARD CONTROLS

This section describes pertinent controls from PUB-3000 and other LBNL institutional requirements as they apply to the ALS User Lab. These controls provide a basis or tool-set for evaluating controls needed on individual tasks. They are not a substitute for the work planning and authorization processes described in **Section 3**.

5.1 WORKING OFF-NORMAL HOURS

The ALS facility operates on a 24/7 basis and the User Lab is open essentially all of this time. Work may be performed at any time. However, restrictions may be put in place on a task by task basis. These may include restricting hours, enforcing a two-person rule, or requiring the presence of the User Lab Manager. All staff working off hours shall be familiar with **Section 7.0** for emergency information for off-normal hours**.**

5.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Standard PPE to enter the User Lab consists of safety glasses with side shields, closed-toe shoes and long pants or equivalent. In addition, task-specific PPE may be prescribed. See **Section 6** for more detail.

5.3 NO EATING, DRINKING, SMOKING, APPLYING COSMETICS, OR STORING FOOD IN THE LABORATORIES

Employees shall follow this practice to effectively eliminate the hazard of ingesting a hazardous material or due to cross-contamination. Smoking, eating, and drinking will not be permitted inside any laboratory space at any time.

5.4 HOUSEKEEPING / PERSONAL HYGIENE

5.4.1 Good Housekeeping

Good housekeeping is important to protect workers from occupational hazards in the laboratory. Floors must be cleaned and swept regularly. All aisles must be kept clear. Benches should be clear and organized, and all chemicals shall be stored in appropriate containment and

segregation. Access to emergency equipment and exits shall be clear and unobstructed. Spill kits are available in all the User Lab and are clearly visible and marked. Both labs (Rooms 2233 and 2245) are equipped with the HF acids and Mercury spill kits.

5.4.2 Fume Hoods

Fume hoods shall not be used for storage of materials and equipment merely as a matter of convenience. Separate storage areas shall be used to store equipment, chemicals in daily use, and waste (SAAs). Fume hoods will be used for authorized work only with the permission of the User Lab Manager.

5.4.3 Personal Hygiene

Personal hygiene is an important factor in reducing or minimizing exposure. Loose hair and clothing shall be confined in work areas where potential exposure to hazardous materials exists. Employees are encouraged to wash hands frequently with water and mild soap or with an antiseptic cleanser whenever skin comes in contact with hazardous or infectious materials. Hands should always be washed before leaving the work area.

5.5 WARNING SIGNS AND DEVICES

Warning signs are placed in a manner that is clearly visible to employees, visitors, and contractors. The Health Hazard Communication (Caution) signs are posted outside the door(s) of every laboratory. These signs indicate the specific hazard information and instructions to be followed within a room; all personnel shall strictly adhere to instructions on these signs. The use of signs shall be consistent with PUB-3000.

5.6 CHEMICAL CONTROLS

In accordance with this HASP, the User Lab Manager is responsible for identifying hazards and establishing controls. Some high-risk chemical activities may come under an AHD that will have specific controls for those operations. Standard practices for all chemicals at LBNL are to minimize employee exposure to hazards by utilizing chemical substitution, engineering controls, administrative controls, personal protective equipment, work practice

controls, and emergency procedures. Operations that may generate airborne gases, vapors, dusts, fumes, and smoke shall be done in a fume hood or glovebox.

As a part of the experiment review processes, the User Lab Manager will:

- Review the hazards of the material and assess the conditions under which it will be used. This information may be obtained from the MSDS or by consultation with EH&S Industrial Hygienists.
- Determine if the chemical can be substituted with a safer chemical alternative. An EH&S Industrial Hygienist can be consulted to provide assistance to identify substitute chemicals.
- Determine if the chemical can be borrowed from someone within the research group or the Division. If the chemical must be purchased, keep working quantities of all hazardous materials to a minimum. Procure, use, and store the minimum amount of material required.
- Determine if the chemical is a restricted item. If it is, then EH&S Division notification or approval must be obtained in accordance with the Laboratory's procurement requirements.

5.6.1 Toxic Materials

Chemicals shall be used as outlined in LBNL Health and Safety Manual, Chapter 4, and the HASP. Adequate ventilation must be provided for control of toxic dust, fumes, mist, gases, and vapors that may be generated from work operations. Personal protective clothing, as prescribed in accordance with the LBNL PUB-3000, Chapter 19 shall be worn by all personnel handling toxic materials. Adequate training and information, as defined in the LBNL PUB-3000 and the HASP, must be provided to employees who handle hazardous chemicals. Application of safe work practices applies to the handling of chemicals as reagents and as waste. No mercury thermometers shall be used unless they are a component of manufactured equipment. Consult the User Lab Manager for more information.

5.6.2 Acids and Bases

Acids and bases shall be used as outlined by the LBNL Health and Safety Manual and HASP. Acids and bases are typically soluble in water, both burn organic tissues and/or inorganic materials in some cases. Both are typically corrosive. When working with acids and bases, you must wear proper PPE, which includes safety glasses, lab coat or tyvek. If you do not have the

necessary training, or whenever you are unsure of how to handle, mix, store, or dispose of these chemicals, consult the User Lab Manager. MSDSs are available online at the LBNL website (A-Z index), and also available from the manufacturer, which gives useful information about material handling, storage, disposal and spill response. Proper handling, proper storage of the chemicals will ensure everyone's safety. Also, keep in mind that chemicals usually have a shelf life. When a chemical is past its shelf life, notify the User Lab Manager and have a properly trained individual to dispose of the chemical. Never store the chemical containers anywhere except in the designated area, and make sure acids and bases are not stored in the same cabinets and the containers are properly sealed. The acid cabinets in the User Lab are marked and labeled and located under the hoods in rooms 2233 and 2245. If you are disposing of acids or bases in bottles which are being used for the first time, be sure to label each bottle with the proper chemical name, concentrations, waste generation date and generator's name. Notify the User Lab Manager to carry out the neutralization procedure or requisition for waste pick up by the Waste Management. For additional guidance, contact the User Lab Manager.

5.6.3 Flammables

Identification and control requirements for flammables and combustibles are contained in PUB-3000, Chapter 12. Flammable and combustible liquids (e.g., oils, greases, tars, oil-based paints, tars, and lacquers), are classified Class B Combustibles. Technically, flammable and combustible liquids do not burn. They can, however, generate sufficient quantities of vapors to form ignitable vapor-air mixtures. Make sure that Class B combustibles are properly identified, labeled, and stored. Use only approved containers, tanks, equipment, and apparatus for storage, handling and use of Class B combustibles. Label the contents of all containers accurately and conspicuously. Refer to PUB-3000, Chapter 12 for information on identification and control requirements for other flammables and combustibles. Consult the User Lab Manager if necessary.

5.6.4 Carcinogenic Materials

Work with carcinogenic materials shall be performed in accordance with the LBNL PUB-3000, Chapter 4, and the HASP. A carcinogen is a substance which causes cancer. Substances labeled as carcinogens may have different levels of cancer-causing potential. Some may cause cancer only after prolonged, high levels of exposure. For any particular person, the risk of developing cancer depends on many factors, including how they are exposed to a carcinogen, the

length and intensity of the exposure, and the person's genetic makeup. At the ALS User Lab, we come across of wide range of carcinogenic materials, e.g, arsenic, beryllium, benzene, cadmium, chromium, nickel. Extra controls may be prescribed for these materials, including exposure assessments by EH&S staff.

5.6.5 Chemical Reactions

Excessive pressure generated by a planned or unplanned chemical reaction shall be minimized by working with as small as practicable amounts of chemicals, using appropriate reaction vessels, and providing adequate venting or pressure relief means. Personal protective equipment such as a laboratory coat, gloves, full-face shield, closed-toe shoes and bench top shields will provide protection against flying glass and chemicals. Most of the work will be performed in the fume hood to provide adequate ventilation. Some simple operations involving low hazard materials may be performed at the work bench stations.

5.6.6 Storage Practices for Chemicals

Chemicals (both solids and liquids) shall be segregated to minimize the hazards associated with accidental mixing. Information on chemical storage and incompatibles may be obtained from MSDS or the manufacturer. The User Lab Manager can also be consulted. In general, chemicals shall be segregated according to the following categories:

- Solvents, which include flammable/combustible liquids and halogenated hydrocarbons (e.g., acetone, isopropyl alcohol, ethers, ethyl alcohol)
  Note: Treat glacial acetic acid as a flammable corrosive liquid.
- Inorganic acids (e.g., sulfuric and hydrochloric acid).
- Bases (e.g., sodium hydroxide, ammonium hydroxide)
- Oxidizers (e.g., nitric acid, nitrates, chromates and dichromates)
- Poisons (e.g., acryl amide)
- Peroxide formers (e.g., tetrahydrofuran, ether, 2-butanol).

In addition to segregation requirements, observe the following storage guidelines:

- Store all hazardous liquid chemicals in drip trays. This is to minimize the impact and spread of a spill resulting from broken/leaking containers. Tray capacity must be 110% of the largest container, or 10% of the aggregate volume of all containers, whichever is larger. Tray must be chemically resistant and unbreakable.

- Examine stored chemicals that form peroxides (see Peroxide Former Guidance) for crystal formation, deterioration, container integrity, and expiration date. Test peroxide content of designated chemicals on a prescribed schedule (as noted in the LBNL CHSP), and label with the peroxide concentration. Dispose of container that has a significant peroxide concentration (e.g., > 30 parts per million).
- Limit the amount of chemicals permitted for storage to amounts that are as small as practical.
- Avoid exposure of chemicals to heat or direct sunlight.
- Do not use fume hoods as storage areas for chemicals. Chemicals temporarily stored in hoods shall be kept to a minimum and shall not block vents or alter airflow.
- Install lips, strips, or bars across the width of reagent shelves to restrain the chemicals in case of earthquake (minimum 3-inch high as measured from the bottom of the shelf).
- Use flammable storage cabinets to store flammable liquids. PUB-3000, Chapter 12, Fire Prevention and Protection provides more information on safe handling and storage of flammable and combustible materials.
- Do not store chemicals in refrigerators used for food storage. Refrigerators used for chemical storage or food storage must be appropriately labeled.
- Store explosive or unstable reactive chemicals outdoors in flammable storage cabinets.
- Explosion proof refrigerators are required if used for storing flammable liquids. Do not store ethanol in refrigerators unless they are explosion proof.

Additional information on chemical storage is included in PUB-3000, Chapter 4, and the CHSP. Assistance may be provided by the User Lab Manager.

5.6.7 Inventory Controls for Hazardous Materials

Inventories of all hazardous materials shall be maintained for each laboratory room and used in waste minimization efforts throughout the program. Chemical inventories are updated quarterly. Also, both solid and liquid inventories are maintained separately beside the solvent inventories.

5.6.8 Transportation of Hazardous Materials

Only properly trained employees can transport hazardous materials and waste at the ALS. Consult the User Lab Manager whenever materials must be transported outside of the ALS complex.

5.6.9 Leaving the ALS

Before leaving ALS after an experimental run it is each user's responsibility to ensure that all samples and reagents are transferred to an ALS staff person. All equipment and supplies shall be returned to their storage locations. Notify the User Lab Manager prior to leaving ALS, if you are storing chemicals or have excess materials.

5.7 ELECTRICAL CONTROLS

All work with electrical and electronic equipment shall comply with the provisions of the PUB-3000, Chapter 8: Electrical Safety, and electrical safety personnel working on electrical and electronics equipment shall have Supervisory Authorization have completed appropriate LBNL electrical safety training. Personnel working with or around high voltage and having access to energized components shall comply with additional training requirements. Compliance with Lockout-Tagout procedures is required. See the ALS Facility Manager or EHS Manager for assistance.

5.8 PRESSURE CONTROLS

Pressure operations shall be in conformance with the PUB-3000, Chapter 7. Each compressed gas system shall be equipped with a pressure relief valve set at no more than MAWP (Maximum Allowable Working Pressure). Employees engaged in cylinder set-up, installation, operation, and change-out shall complete the course EHS0231, "Compressed Gas Safety". All compressed gas cylinders shall be secured, when in storage or in use. Caps must be present on all cylinders not in use.

5.9 HEAT CONTROLS

PUB-3000, Chapter 12, describes fire prevention and protection requirements. Personal protective clothing, including laboratory coat and appropriate insulated gloves, shall be worn when handling hot apparatus. Personnel will be familiar with the location and operation of fire extinguishers appropriate for the nature of the fuel and oxidizer. Exit corridors shall remain unobstructed to facilitate prompt evacuation of building occupants and access for emergency personnel. A minimum width of 36" aisle ways is required in lab, and 44" clearance is required for hallways and corridors in most office areas.

Flames: The use of open flames in the operation of standard laboratory gas burners does not require any specific approval if such flames are used in the intended fashion. Areas where burners are used must be of non-combustible construction and maintained free of combustible storage. All other operations including welding and open flame operations will require approval.

5.10 CRYOGENIC MATERIAL CONTROLS

Work with cryogenic materials shall be performed in accordance with the PUB-3000, Chapter 7.8. Follow these rules:

- Wear eye protection appropriate to the hazard. When pouring liquid nitrogen from a dewar, use safety glasses with side shields. However, when transferring liquid nitrogen from a pressurized dewar, both safety glasses and a face shield are required.
- Wear cryogenic gloves when working on systems with exposed components at cryogenic temperatures to ensure that skin will not freeze from contact with cold pipes or metal parts. Gloves need to be loose fitting so they can be thrown off readily if cryogen is spilled into them. This ensures that the cryogen will not be trapped against the skin. Small spills of liquid nitrogen on the skin will evaporate without damage unless the liquid is trapped against the skin.
- Do not use cryogens in unventilated spaces, such as closets or experimental caves, without exhaust ventilation.
- When transferring cryogen from pressurized dewars with hoses or tubing, be sure to verify that there are pressure relief devices between all valves as it is easy to trap cryogen in the transfer hose or in the tube between two valves. In such a case, the hose will rupture and whip around out of control. Ensure transfer lines are rated for cryogens.

5.11 NON-IONIZING RADIATION CONTROLS

The only significant type of non-ionizing radiation at ALS is from ultraviolet (UV) light sources. The most effective methods of controlling UV radiation are enclosing or shielding the UV source and covering walls and surfaces with UV-absorbent materials.

The potential hazards and control measures shall be discussed and approved by the User Lab Manager before working with the UV equipment in the User Lab. The User Lab Manager will ensure personnel are adequately trained before using this type of equipment.

5.12 HIGH MAGNETIC FIELD CONTROLS

Personnel working at the User Lab must be aware and knowledgeable about the magnetic field controls because of the presence of a synchrotron at the ALS facility. For further information regarding magnetic field controls, contact the User Lab Manager or EHS Manager.

5.13 SEISMIC CONTROLS

To reduce the risk of personal injury, property damage, and programmatic interruption resulting from earthquakes, all chemical storage cabinets and equipments in the User Lab are properly secured. Additionally, all objects and materials must be properly stored according to the PUB-3000, Chapter 23. Typically all chemical storage cabinets, refrigerators or equipment more than 3 feet tall must be bolted to the floor or to the structure. Furniture or equipment three feet tall or less may still require securing if it can move as a result of seismic activity and affect egress. Lips on reagent shelves must be 3 inches high (as measured from the bottom of the shelf).

5.14 ENGINEERING CONTROLS

Engineering controls, in combination with safe work practices that alter the manner in which tasks are performed, are expected to be the primary means of eliminating or minimizing the risk of occupational exposure. Engineering controls are used to isolate or remove hazards from the workplace in order to reduce the potential for exposure. Such engineering controls include, but are not limited to, mechanical aids, sharps containers, laboratory fume hoods, biological safety cabinets, and negative airflow units.

5.14.1 Mechanical Aids

Mouth pipetting of any substances is prohibited and the use of mechanical aids to transfer potentially harmful substances (i.e., bio-hazardous) is strictly enforced. Personnel shall use these devices for all pipetting in a manner that does not generate aerosols.

5.14.2 Fume Hoods

Fume hoods are commonly used in the laboratory to draw air away from the work area and away from the worker's breathing zone. Fume hoods are available in most laboratories within ALS and must not be used for storage of materials and equipment merely as a matter of

convenience. Fume hoods must be certified every two years or more frequently if the flow indicator readings (i.e., hood-mounted alarms) raise questions of adequate hood performance. Contact the User Lab Manager or EHS Manager for more information.

5.14.3 Sharps Disposal Containers

Sharps containers are used to dispose of contaminated sharps (e.g., needles, scalpels, broken glass, and broken capillary tubes) that can penetrate the skin. Sharps containers are available in the ALS User Lab, or you can order them through Waste Management. Sharps are never to be disposed of in regular waste or garbage. Contact the User Lab Manager or EHS Manager for more information on sharps disposal.

5.14.4 Interlocks

Mechanical and electrical interlocks reduce the chance of a serious exposure by preventing access to the hazardous area or material. Interlocks may be found on equipment panels and on power supplies (e.g., centrifuges). Interlocks must never be bypassed or tampered with, except under very specific conditions approved by the ALS Facility Manager or EHS Manager.

5.15 MAINTENANCE, INSPECTION AND QUALITY ASSURANCE OF SAFETY SYSTEMS AND EQUIPMENT

5.15.1 Maintenance

The ALS Facility Manager coordinates with the EHS Manager to oversee the maintenance and inspection of safety systems and equipment. The facility manager manages facility maintenance contracts with external vendors. Contracts with facilities vendors include building and building systems maintenance and upgrades, engineering and construction services, custodial services, pest control, and fire protection, etc. The User Lab Manager is the point of contact for these services when needed by users in the User Lab.

5.15.2 Ventilation System

During research operations, the air handling system must be operational to maintain a negative pressure in the laboratories relative to the halls and office spaces.

The air handling systems are maintained on a regular schedule. Within the laboratory rooms, fume hoods must operate continuously to maintain the negative air balance. The hoods are inspected and tested informally on a regular basis by the User Lab Manager and/or EHS Manager; performance testing of hoods is conducted every six months (or when a hood is moved) by LBNL EH&S or an outside agency specializing in this work. The general lab inspections are performed routinely to insure the proper working and maintenance of the fume hoods.

5.15.3 Emergency Generator

Stand-by power is available during power outages for emergency and safety systems and designated programmatic equipment (hoods and lighting).

5.15.4 Eyewash / Safety Shower

These wall-mounted systems are flushed and certified by LBNL Facilities on a quarterly schedule under the direction of the ALS Facility Manager. Sink-mounted eyewashes are flushed periodically by users, but do not require flow-testing and certification by LBNL Facilities. The general lab inspections are performed routinely to ensure that all the safety equipment is in good working condition and any findings are reported to the EHS Manager and corrective actions shall be taken immediately.

5.16 WASTEWATER MANAGEMENT CONTROLS

There are local regulations about what may be poured down the drain. No hazardous materials may be poured down the sinks. Contact the User Lab Manager immediately if any acids, bases, solvents or other toxic materials have inadvertently been poured down the drain.

5.17 WASTE CONTROLS

Various hazardous and bio-hazardous wastes are generated in small quantities on an irregular basis. All hazardous and bio-hazardous waste shall be managed according to procedures presented in PUB-3000, Chapter 20. Details are included in PUB-3092, "Guidelines for Generators to Meet HWHF Acceptance Requirements for Hazardous, Radioactive, and Mixed Wastes at Berkeley Lab" and PUB-3093, "Guidelines for Management of satellite Accumulation Areas (SAAs) at Berkeley Lab." The User Lab Manager will assist generators in complying with federal, state and local regulations and the policies of the LBNL Hazardous

Waste Management Group. Any post experimental chemicals left by the User Lab users are characterized as waste for disposal or stored for reuse by the User Lab Manager immediately following completion of the work (typically within 1 work day). These waste items are properly labeled, with constituents, date, hazard information and then put in secondary containment before placing it in SAA (Rm. 2233) for later pick up. SAAs are maintained and organized by the User Lab Manager who bears the responsibility to track, characterize and requisition for waste pick up by the Waste Management.

All medical (bio-hazardous) waste (such as contaminated paper towels, gloves, lab coat, etc.) is inactivated offsite by a licensed subcontractor. Waste generators are responsible for depositing bio-hazardous waste into sharps containers or laboratory biohazard waste containers lined with clear biohazard bags, and periodically transferring closed biohazard bags into lined pick-up containers. Sharps containers may continue to be used until full. The LBNL Waste Management Group coordinates Medical Waste pickup with the subcontractor that transports and treats the Medical Waste. The LBNL Waste Management Group signs the transportation document.

5.18 SPILL CONTROLS

Employees may clean up small spills of hazardous materials provided that ***all*** of the following conditions are met:

1. The hazards of the material(s) are known, and appropriate precautions can be taken to prevent personal exposure.
2. There is no potential of a release to the environment.
3. There are no personal injuries.
4. The clean up procedures are known and the proper equipment (e.g., PPE and spill clean up materials) is available.
5. The spill can be cleaned up safely by two people in one hour or less.
6. The spill does not involve elemental mercury. Special cleanup and air monitoring is required. Contact the EHS Manager for more information.

If any one of the above conditions is not met, call ext. 7911 (or 510-486-7911) and notify the ALS Control Room (ext. 4969 or 510-486-4969, Building 80, Room 140). Even in the case of small spills, notify the User Lab Manager, the EHS Manager, or the Control Room.

Spill clean-up kits for flammable liquids, acids, bases, HF acids, and mercury products and other hazardous materials are located within each of the User Lab rooms. Further information on spill clean-up or hazard mitigation can be found on the Emergency Response Guide flipchart posted in the User Lab.

SECTION 6. PERSONAL PROTECTIVE EQUIPMENT

The purpose of personal protective equipment (PPE) is to provide a barrier that will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. Elimination of the hazard or control through engineered means and/or work practices is always preferred, and PPE is only used as a supplement to other controls. This section gives general guidance on the typical PPE likely to be needed in the User Lab.

6.1. AREA-BASED REQUIREMENTS

Standard PPE to enter the User Lab consists of safety glasses with side shields, closed-toe shoes and long pants or equivalent.

6.2. TASK-SPECIFIC PPE

Task-specific PPE is recommended and chosen on the basis of experimental review by the User Lab Manager and will be based on the following:

- Types of physical and chemical hazards posed by the chemicals
- MSDS evaluation of the chemicals
- Chemical Protective clothing capacity (permeation rate of chemical)
- LBNL and ALS chemistry lab policies about the specific chemicals and materials handling
- Physiological requirement of the task
- Ambient temperature and humidity

6.2.1 Typical Task-Specific PPE

6.2.1.1 Gloves

Wear appropriate gloves when the potential for contact with toxic materials exists. Inspect the gloves before each use. Replace them frequently to avoid contaminating yourself and other objects such as door handles. The appropriate glove can be determined by consulting MSDSs or the compatibility lists from the glove manufacturers. A glove guide is available in the User Lab to help users determine the best choice of gloves according to chemical use and need.

Do not wear gloves out of the laboratory area. One hand must be clean to open doors. Typically, the appropriate gloves for this work area are:

- Nitrile when working with xylene, acetone and acids;
- Latex for other materials.

6.2.1.2 Lab Coats and Aprons

Most lab operations require lab coats, and several types are available. Contaminated lab coats shall not be worn out of the laboratory. Remove laboratory coats immediately upon significant contamination. Non-permeable aprons are required when working with formaldehyde.

6.2.1.3 Personal Apparel

Closed-toe shoes are required in the laboratory area. Steel-toe shoes are not necessary in this work area. Confine long hair and loose clothing. Avoid wearing contact lenses.

6.3. PPE MAINTENANCE AND STORAGE

The User Lab Manager is responsible for providing and maintaining PPE in the proper condition. Generally, user responsibilities are limited to inspecting the PPE before use to verify that it is still functional and returning it to its proper location.

SECTION 7. EMERGENCY RESPONSE

Although the potential for an emergency to occur is remote, all users should be familiar with emergency response. The significant type of onsite emergency that may occur is physical injury, illness or exposure to chemicals. These emergencies can happen in various different ways, such as spill, splash, inhalation, absorption or ingestion. Emergency preparedness will be reviewed by all personnel prior to the start of any experiment or chemical related use in the lab.

Three major categories of problems can occur that require immediate action and notification:

1. Catastrophic events (fire, explosion, or large chemical spill)
2. Illnesses and minor injuries (including injury-causing chemical exposure)
3. Safety equipment problems.

7.1 EMERGENCIES

7.1.1 Emergency Reporting

Emergency Response Requests are directed through an emergency dispatch center that operates on a 24/7 schedule. From the lab phone:

1. **DIAL 7911.**
2. Give **YOUR NAME** and the **PHONE NUMBER** you are calling from.
3. State the **LOCATION OF THE EMERGENCY**.
4. Describe **WHAT HAPPENED** and your estimate of the situation (i.e., number of injuries, spill of hazardous material, fire, etc.).
5. Answer any questions asked by the emergency dispatcher (**STAY ON THE LINE** until the dispatcher hangs up).

7.1.2 Notify the ALS

Contact the ALS Control Room (ext. 4969 or 510-486-4969, Building 80, Room 140) which is operated on a 24/7 schedule. The on-duty operator in the Control Room is trained on emergency response and can also help direct the responders.

7.1.3 While Waiting for Emergency Responders

Take remedial action, but only if you do not endanger yourself:

1. Give emergency aid to the injured, but remove them only if there is threat of further injury.
2. Isolate the affected area, and prevent fire or spills of hazardous materials or waste from spreading if this can be done safely.
3. Standby to meet emergency response personnel at the building entrance; be prepared to assist them if requested.

7.2 ILLNESSES AND MINOR INJURIES

7.2.1 During Day Shift Hours

1. **If the illness or injury is serious, DIAL 7911** and follow the steps listed in **Section 7.1.1.** Otherwise, contact the LBNL Health Services located in Building 26 (ext. 6266 or 510-486-6266). You will be instructed on whether to report to them or to another medical services provider. If deemed necessary, the operator will dispatch an ambulance or fire truck. The nearest 24-hour medical services provider is: Alta Bates Hospital (510-204-4444), 3001 Colby Street, Berkeley, CA 94705.
2. Inform the User Lab Manager, EHS Manager, or the ALS Control Room (ext. 4969 or 510-486-4969, Building 80. Room 140).
3. Send someone to the building entrance so he/she cans lead the responders to the sick or injured.

7.2.2 All Other Times (After Day Shift Hours or Weekends)

1. **For Urgent/Immediate Care, DIAL 7911** and follow the steps listed in **Section 7.1.1.** If your condition permits, go straight to the Alta Bates Hospital Emergency Room or contact your Health Care Provider directly.
2. Inform the User Lab Manager, EHS Manager, or the ALS Control Room (ext. 4969 or 510-486-4969, Building 80, Room 140).

7.3 SAFETY EQUIPMENT FAILURES

In the event that a fume hood or other important safety equipment fails, contact the User Lab Manager or the Control Room (ext. 4969 or 510-486-4969, Building 80, Room 140).

Place your experiment in a safe and stable condition and do not continue work until the problem has been resolved.

7.4 BUILDING EVACUATION

In the event that a major event occurs requiring evacuation of the entire building, follow instructions for evacuation and go to the nearest assembly area (for the User Lab, the parking lot outside the Building 6 main lobby). Do not stop to secure unfinished work or personal belongings.

SECTION 8. ASSURANCE

Assurance is a key function in the overall operations of the User Lab. Various inspections and reviews are performed to verify that individual user operations, overall lab facility functions, as well as targeted risk areas are all within accepted standards. An explicit principle behind these is to continuously enhance the safety and effectiveness of the User Lab.

8.1 EXPERIMENT REVIEWS

At the discretion of the User Lab Manager, certain operations may be evaluated while the tasks are being performed. The purpose of these inspections is to verify the accuracy, effectiveness, and implementation of the experimental reviews. Unless gross violations are found (which would generate Stop Work), the primary intention is to lead to continuous improvement in the overall process and treat these as learning opportunities.

8.2. FACILITY INSPECTIONS

Periodic inspections are performed in the User Lab by the User Lab Manager. This is a physical inspection of the facility including a review of all the safety equipment, PPE, spill kits, chemical inventory, chemical waste inventory, and hazard controls. Any findings or changes observed will be noted to improve the working and safety conditions in the User Lab.

8.3. CHEMICAL INVENTORY

The main function of this is to control and manage the chemical inventory in the chemical lab. This review consists of a check of CMS database reports against physical inventory. If any chemicals have been added or removed during that period, it is updated in the chemical management systems. Some specialized reports and verifications may include:

- Peroxide-formers
- Pyrophorics and air reactives
- Nano materials
- Total quantities by hazard category (to verify NFPA requirements)

8.4. POST-RUN INSPECTIONS

Typically these inspections are performed within twenty-four (24) hours of completion of every experiment. These are conducted by the User Lab Manager, who will make sure that all the post experimental chemicals are labeled, concentrations are noted, pH is measured, chemicals are stored in secondary containment, and work areas (fume hood or workbench) are clean. Any contaminated debris or chemical left for disposal shall have proper labels, chemical concentration or composition, generator's name and contact information posted on the containers and bags.

Perform general visual inspection of the workbenches, fume hoods, aisles, and storage cabinets, and inspect waste bins for any contaminated waste debris or chemical waste. Note any findings and take corrective actions before requisitioning the waste and moving it to SAA.

8.5 WASTE

Waste inspections are conducted routinely by the User Lab Manager. The main purpose of these inspections is to inspect SAAs for any violations and unusual findings. Waste inventories must be maintained in the User Lab. Waste generated during that period and requisitioned waste must be inventoried to keep track of the disposal progress. Waste must be stored and segregated from each other according to hazards class. Ensure that each waste is labeled with complete and accurate information. Notify the EHS Manager immediately if any open, bulging, or damaged container is found. Nanoparticles waste should be handled with care. Nanoparticles containers or bags must be tightly sealed and properly marked. Ensure that nanoparticles waste is stored in the designated area allocated for nanoparticles waste, and it is stored in secondary containers posted with yellow nanoparticles labels on the secondary containment.