This chapter was last reviewed for currency 6/1/2021.
The next thorough review is due 6/1/2024.

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 53: Chemical Safety

Quick Start Summary

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1 Who needs to know about these requirements

The requirements of Chemical Safety apply to workers (as *chemical workers*) in non-laboratory settings, supervisors, area and building managers, ESH coordinators, the chemical safety program manager, and Occupational Health, ESH, and Facilities and Operations.

2 Why

The handling and use of *chemicals* and other *hazardous materials* may pose a risk to the health and safety of workers and the environment. These hazards must be communicated to all potentially exposed persons and adequately mitigated. This chapter satisfies Cal/OSHA requirements for a written hazard communication program (8 CCR 5194).

3 What do I need to know

- Workers must complete training, know the location and proper use of hazard control and emergency equipment in their work areas, and comply with all hazard controls.
- Supervisors of workers who may be exposed to chemicals and other hazardous materials must ensure the hazards are communicated to workers through safety data sheets (SDSs), inventories, labeling, and training.
- Area and building managers must ensure their areas and buildings meet chemical safety and related requirements, such as for eyewash/ emergency shower stations, hazard ventilation equipment, and chemical storage.

4 When

These requirements take effect 1 June 2021.

5 Where do I find more information

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 53, “Chemical Safety”

Or contact the program manager.

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 53

Chemical Safety

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1 Purpose

The purpose of this program is to protect workers in non-laboratory *work areas* from the hazards associated with handling and using *hazardous chemicals.* (Specific requirements for chemical safety in research laboratories are covered separately in Chapter 58, "Laboratory Safety".)

This program covers hazard communication requirements in manufacturing and other non-research areas, as well as hazardous materials use for non-research purposes within SLAC. It applies to workers (as *chemical workers*), supervisors, area and building managers, ESH coordinators, the chemical safety program manager, and Occupational Health, ESH, and Facilities and Operations.

This chapter satisfies Cal/OSHA requirements for a written hazard communication program (8 CCR 5194).

Procurement, storage, handling, and use of chemicals and other hazardous materials are covered in Chapter 40, "Chemical Lifecycle Management". Transportation, on-site and off, is covered in Chapter 52, "Hazardous Materials and Waste Transportation". Storage and disposal of chemicals no longer needed are covered in Chapter 17, "Hazardous Waste".

1.1 Exemptions

The work environments listed below are exempt from part or all of these hazard communication program requirements.

1.1.1 Warehouse Operations

Warehouse operations, where employees handle hazardous substances only in sealed containers, are exempt from hazard communication program requirements.

However, warehouse operations must

- Ensure that labels in incoming containers are not removed or defaced
- Maintain safety data sheets (SDSs) and ensure that SDSs are available to employees

1.1.2 Office Work

Office work is exempt from hazard communication requirements providing that work with hazardous substances is limited to consumer products used in typical home consumer quantities and exposure levels.

1.1.3 Excluded Substances

The following substances are excluded from hazard communication requirements:

- Hazardous wastes regulated by the Environmental Protection Agency (see Chapter 17, "Hazardous Waste")
- Tobacco products
- Natural wood or chemically untreated wood products for retail sale
- Manufactured items – articles that are handled/processed in a way that does not result in employee exposure via inhalation, ingestion, or skin absorption, such as items for immediate use or retail sale
- Food, drugs, and cosmetics consumed or used by the employees on the job site
- Retail trade establishments, except for processing and repair work areas
- Pesticide use regulated by the California Department of Food and Agriculture
- Consumer products, unless quantities used or exposures are greater than ordinary home consumer quantities or exposures (for example, white out, copy machine toner, household surface cleaners)

2 Roles and Responsibilities

Functional roles and general responsibilities for each under this program are listed below. More detailed responsibilities and their application are provided in the procedures and requirements.

The roles may be performed by one or more individuals and one individual may play more than one role, depending on the structure of the organizations involved. Responsibilities may be delegated.

2.1 Chemical Worker

- Complies with the requirements of this program
- Complies with work planning and control (WPC) practices (see Chapter 2, "Work Planning and Control"), and hazard-specific ESH requirements
- Is familiar with safety data sheets (SDSs) and follows chemical safe handling guidelines where applicable
- Knows the location and proper use of hazard control and emergency equipment in *work area*
- Uses personal protective equipment (PPE) properly, as described in Chemical Safety: Personal Protective Equipment Requirements
- Follows the Chemical Safety: Emergency Eyewash/Shower Use Procedure
- Complies with Chemical Safety: Accidental Exposure Requirements
- Promptly reports incidents in the workplace
- Notifies area manager immediately when unlabeled chemical containers are discovered
- Reports problems with local exhaust ventilation systems

2.2 Supervisor

- Holds line management responsibility for workers, as defined in Chapter 1, "General Policy and Responsibilities", and provides the necessary tools, equipment, PPE and other resources to work safely
- Sponsors safety meetings, including review of training and non-routine tasks involving chemicals.
- Fully implements integrated safety and environmental management system (ISEMS) requirements and ensures ESH performance standards, as defined in Chapter 1, "General Policy and Responsibilities", are met
- Assigns training and authorizes work in accordance with Chapter 2, "Work Planning and Control", and hazard-specific ESH requirements
- Ensures appropriate measures for controlling work area hazards associated with chemicals are selected, implemented, and maintained
- Ensures the use of valid JSAs or SOPs
- Ensures workers on all shifts have access to relevant *safety data sheets (*SDSs*)*

Note *Subcontractors are responsible for maintaining SDSs for chemicals they bring to SLAC and for making these available to supervisors of SLAC workers who may be exposed to those chemicals. For hazards located in SLAC areas where subcontractors will be working, the project manager or field construction/service manager must provide hazard communication information.*

- Is recommended to request an exposure assessment from ESH if there is potential for exposure exceeding 10 percent of either the *action level* or, if no action level exists, the *occupational exposure limit (OEL),* or if an overexposure has occurred
- Reports chemical overexposure, unsafe conditions, and near misses (see Incident Reporting and Investigation Process)
- Ensures hazard communication requirements, for safety data sheets, inventories, labeling, and training, are met (Chemical Safety: Hazard Communication Requirements)

2.3 Area Manager

- Ensures functioning of work area
- Performs walkthroughs to assess success of work area policies and practices, and solicits feedback from workers
- Releases work in accordance with Chapter 2, "Work Planning and Control", and hazard-specific ESH requirements
- Works closely with the ESH coordinator and supervisors to develop and oversee administration of work area specific safety program and work planning and control processes, including access policies, work area specific training, and operational protocols consistent with the directorate policies
- Assists workers and supervisors in the development of job safety analyses (JSAs) and standard operating procedures (SOPs) that address hazards and controls
- Ensures proper maintenance of equipment and work area infrastructure, including coordination with internal facilities groups and/or external vendors for maintenance and repair

- Ensures that, if required, appropriate emergency eyewash and shower equipment is available in the work area and that local exhaust ventilation is properly operating
- Knows the location of hazard control and emergency equipment, inspects the equipment, provides for equipment maintenance, and notifies appropriate workers to repair or replace the equipment if it is missing, defective, or inoperative
- Works closely with the ESH coordinator to ensure compliance with regulatory and ESH requirements, including hazardous waste and chemical storage requirements
- Coordinates with the ESH coordinator, ESH, and area users to properly manage chemicals, hazardous or radioactive materials, and waste streams. May perform routine inspections, maintain hazardous material inventories, and signage posting as a chemical storage asset custodian or hazardous waste storage area custodian.
- Coordinates work area moves, modifications, or renovations as needed with the building manager

2.4 Building Manager

- Ensures eye wash/emergency showers are in operational condition, clearly labeled, and meet routine inspection and activation requirements, as described in Chemical Safety: Emergency Eyewash/Shower Requirements
- Complies with requirements for emergency exits, lighting, and fire extinguishers, as described in Chapter 12, "Fire and Life Safety"
- Ensures oxygen deficiency monitors (ODMs) are monitored and repaired and are tied to the fire alarm panel, as described in Cryogenic and Oxygen Deficiency Hazard Safety: ODH Requirements
- Ensures gas cylinder seismic restraints are in good condition and adequate and that cylinders are properly labeled, as described in Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements
- Determines and authorizes locations for storage of chemical/flammable cabinets, hazardous/radioactive storage areas, waste storage areas, and equipment storage areas for their building, in accordance with requirements in Chapter 17, "Hazardous Waste", and Chapter 40, "Chemical Lifecycle Management"

2.5 ESH Coordinator

- Serves as primary ESH primary point of contact within line organization, as defined in Chapter 1, "General Policy and Responsibilities"
- Supports line management to meet responsibilities under institutional and directorate policy, plans, procedures, and in review of all ISEMS and ESH matters and work plans in accordance with in Chapter 1, "General Policy and Responsibilities"
- Supports line management in identification, analysis, and control of hazards; reviews and approves work plans, and releases work in accordance with Chapter 2, "Work Planning and Control"
- Consults with subject matter experts (SMEs) and ESH program managers to resolve any outstanding technical questions in new protocols
- Performs routine inspections and walkthroughs to ensure compliance and to interface with workers regarding challenges or assistance needed
- Discusses selection, procurement, installation, and balancing of all local exhaust ventilation systems

- Reviews requests for discharge of non-hazardous substances into sanitary sewer

2.6 Occupational Health Center

- Provides medical consultations and examinations for workers when the following conditions are met:
  1. Baseline medical surveillance is required based on worker potential or actual exposure to certain chemicals.
  2. Worker exposure levels to chemicals are found to be in excess of legal limits or action levels.
  3. Worker shows symptoms of overexposure.
  4. A spill or other event is likely to have resulted in overexposure.

2.7 ESH Division

- Ensures documented annual testing of ventilation rates for all laboratory-type fume hoods and other hazard control mechanical ventilation systems, as described in 8 CCR 5143. Maintains test record database.
- Inspects eyewash and shower performance annually, as described in 8 CCR 5162, and provides a written report to the owner
- Provides industrial hygiene surveys, exposure assessments, and other risk-based evaluations and control recommendations upon request from line managers or ESH coordinators

2.8 Facilities and Operations Division

- Coordinates and/or performs installation, balancing, and testing all new ventilation systems
- Maintains and repairs facility-owned building infrastructure, including HVAC and other building utilities up to the point of connection with program-owned scientific equipment. Program-owned scientific equipment includes fume hoods, gas cabinets, biosafety cabinets, chillers, chemical storage cabinets and other equipment dedicated to program needs.
- Ensures maintenance and proper functioning of fire and life safety systems in work areas, as described in Chapter 12, "Fire and Life Safety"
- Ensures facility-owned oxygen deficiency monitors (ODMs) are monitored and repaired

2.9 Chemical Safety Program Manager

- Fulfills ESH program manager responsibilities, as defined in Chapter 1, "General Policy and Responsibilities"
- Develops the chemical safety program, including training
- Develops or makes available labeling guides and resources
- Provides technical assistance and assists line organization with implementation
- Conducts program assessments triennially and revises as necessary
- Communicates program needs to line and ESH Division management

3 Procedures, Processes, and Requirements

These documents describe the detailed requirements for this program and how to implement them:

- Chemical Safety: Hazard Communication Requirements (SLAC-I-730-0A09S-042). Describes requirements for hazard communication, including safety data sheets, inventories, labeling, and training
- Chemical Safety: Hazard Control Ventilation Requirements (SLAC-I-730-0A09S-021). Describes requirements for installation, use, performance, and monitoring of hazard control ventilation equipment (including laboratory fume hoods, biosafety cabinets, gas cabinets, glove boxes and other hazard control ventilation devices)
- Chemical Safety: Emergency Eyewash/Shower Requirements (SLAC-I-730-0A09S-043). Describes requirements for emergency eyewash and shower stations: their availability, selection, installation, inspection, and maintenance
- Chemical Safety: Emergency Eyewash/Shower Use Procedure (SLAC-I-730-0A09C-008). Describes how to use an emergency eyewash/shower
- Chemical Safety: Personal Protective Equipment Requirements (SLAC-I-730-0A09S-017). Describes minimum required personal protective equipment for working in chemical work areas
- Chemical Safety: Accidental Exposure Requirements (SLAC-I-730-0A09S-041). Describes actions to take in case of an accidental exposure

These documents provide useful guidance; their use is not mandatory:

- Chemical Safety: Safe Handling Guidelines. A collection of guidelines for working with various classes of chemicals

These are the forms and tools for this program:

- Chemical Management System. System used for ordering and tracking chemicals and storing safety data sheets

These are other program documents and resources:

- Chemical Safety Program Site (SharePoint)

4 Training

4.1 Chemical Worker

A *chemical worker* is required to take the following course:

- ESH Course 103, Hazard Communication (ESH Course 103). This course is taken when the worker is first assigned to a chemical worker job.

Following completion of ESH Course 103, all chemical workers are required to take the PPE course:

- ESH Course 255, Personal Protective Equipment (PPE) (ESH Course 255)

In addition, chemical workers must receive on-the-job training. This training is to familiarize chemical workers with the hazards, controls, and procedures specific to their work area. Workers will complete both types of training before working in areas containing hazardous chemicals. Supervisors are responsible for ensuring on-the-job training for new workers and when either the hazards change (for example, new chemicals are introduced), the worker's job tasks change, or if the supervisor becomes aware of new hazards (for example, new information about the chemicals, results of an accident investigation).

Supervisors must ensure that the on-the-job training includes, at a minimum, the following topics:

1. How to access the SDSs for materials in that particular work area
2. Physical and health hazards of the specific chemicals in the work area
3. Measures staff can take to protect themselves from relevant chemical hazards, including the use and limitations of PPE
4. Methods used to detect the presence or release of hazardous chemicals in the work area

Note *User and subcontractor personnel are expected to receive hazard communication training provided by their home institution or employer before starting work at SLAC.*

5 Definitions

action level. A concentration for a specific substance, "calculated as an eight (8)-hour time weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance" (8 CCR 5191). For chemicals, SLAC uses Cal/OSHA action levels.

area manager. Person designated by line management who is responsible for a defined area of a given building. These areas generally contain experimental and/or industrial equipment and are associated with special hazards. Not all buildings have an area manager, and other buildings, such as the linac accelerator housing and klystron gallery, may have several.

chemical. Any element, chemical compound, or mixture of elements and/or compounds

chemical worker. Person whose job responsibilities or tasks include the transportation, dispensing, disposal, or other handling of hazardous materials for non-researcher purposes, or whose work environment provides for a reasonable probability of exposure to a hazardous material

container. Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, , or the like of less than 60 gallons (227 liters) in size that contains a hazardous chemical

hazard control ventilation. An industrial exhaust system that captures and removes contaminants emitted from local sources before dilution into ambient workplace air can occur; includes chemical fume hoods, soldering bench hoods, extractor arms, glove boxes, and biological safety hoods or cabinets

hazardous material. Any chemical or material that, due to its physical or chemical properties, poses a risk to the health or safety of humans, environment, or the physical plant

label. Any written, printed, or graphic material displayed on or affixed to containers of chemicals

occupational exposure limit (OEL). A limit for exposure of a worker to a chemical substance or physical agent. OELs are typically set by national agencies and safety and health organizations to prevent adverse health effects from workplace exposures. OELs may be mandatory, as with the *permissible exposure limits (PELs)* set by the Occupational Safety and Health Administration, or recommended, as with *threshold limit values (TLVs)* set by the American Conference of Governmental Industrial Hygienists (ACGIH) or *recommended exposure limits (RELs)* set by the National Institute for Occupational Safety and Health (NIOSH). For chemicals, SLAC uses Cal/OSHA PELs as its OELs.

nanomaterial. Material with at least two dimensions between one and 100 nanometers

permissible exposure limit (PEL). "The maximum permitted 8-hour time-weighted average concentration" (8 CCR 5155) for a specific substance. Workers may not be exposed to concentrations over this limit.

safety data sheet (SDS). A document produced by chemical manufacturers and importers to relay chemical, physical, and hazard information about specific substances

tank. Container larger than 60 gallons (227 liters)

threshold limit value (TLV). Recommended guideline for occupational exposure published by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs represent the average concentration for an eight-hour workday and a 40-hour workweek to which nearly all workers may be repeatedly exposed without adverse effect.

work area. A room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present. A work area is often controlled by one person or work group, but may be used by one group or many.

6 References

6.1 External Requirements

The following are the external requirements that apply to this program:

- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders"
  - Group 1, "General Physical Conditions and Structures Orders, Introduction", Section 3202, "Application" (8 CCR 3202)
  - Group 2, "Safe Practices and Personal Protection", Article 10, "Personal Safety Devices and Safeguards (8 CCR 3382)
- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 107, "Dusts, Fumes, Mists, Vapors and Gases" (8 CCR 5139–5155), including
  - Section 5143, "General Requirements for Mechanical Ventilation Systems (8 CCR 5143)
  - Section 5154.1, "Ventilation Requirements for Laboratory-Type Hood Operations (8 CCR 5154.1)
  - Section 5154.2, "Ventilation Requirements for Biological Safety Cabinets" (8 CCR 5154.2)

  - Section 5155, Table AC-1, "Permissible Exposure Limits for Chemical Contaminants" (8 CCR 5155)
- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 109, "Hazardous Substances and Processes" (8 CCR 5160–5199), including
  - Section 5194 "Hazard Communication" (8 CCR 5194)
- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 110, "Regulated Carcinogens" (8 CCR 5200–5220)
- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 20, "Flammable Liquids, Gases and Vapors"
  - Articles 134 through 146 (8 CCR 5415–5612)
- National Fire Protection Association (NFPA) 704, "Standard System for the Identification of the Hazards of Materials for Emergency Response" (NFPA 704)
- National Fire Protection Association (NFPA) 30, "Flammable Liquids and Combustible Liquids Code" (NFPA 30)
- National Fire Protection Association (NFPA) 55, "Compressed Gases and Cryogenic Fluids Code" (NFPA 55)
- National Fire Protection Association (NFPA) 400, "Hazardous Materials Code" (NFPA 400)

The following are external guidance documents that apply to this program; their use is not mandatory:

- Cal/OSHA Consultation Service, California, Department of Industrial Relations, "Guide to the California Hazard Communication Regulation"

6.2 Related Documents

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 1, "General Policy and Responsibilities"
- Chapter 2, "Work Planning and Control"
- Chapter 12, "Fire and Life Safety"
- Chapter 16, "Spills"
- Chapter 17, "Hazardous Waste"
- Chapter 36, "Cryogenic and Oxygen Deficiency Hazard Safety"
- Chapter 40, "Chemical Lifecycle Management"
- Chapter 52, "Hazardous Materials and Waste Transportation"
- Chapter 56, "Respirable Crystalline Silica"

- Chapter 58, "Laboratory Safety"

Other SLAC Documents

- Chemical Management Services (CMS)
- SLAC Occupational Health Center
- Gas Cabinet Guidance
- Incident Reporting and Investigation Process (SLAC-I-701-O03-006-00)

Other Documents

- American Society of Mechanical Engineers (ASME) A13.1, "Scheme for Identification of Pipelines" (ASME A13.1)
- American National Standards Institute (ANSI) Z87.1, "Occupational and Educational Personal Eye and Face Protection Devices" (ANSI Z87.1)
- American National Standards Institute (ANSI) Z358.1, "Emergency Eyewashes and Safety Equipment" (ANSI Z358.1)
- Stanford University, Department of Environmental Health and Safety. Chemical Safety
- Stanford University, Department of Environmental Health and Safety. Chemical Safety Toolkit. SOPs
- Stanford University, Department of Environmental Health and Safety. Hazard Communication
- Lawrence Berkeley Laboratory, Department of Environmental Health and Safety. Incompatibilities by Hazard Class Chart

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 53: Chemical Safety

Hazard Communication Requirements

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1 Purpose

The purpose of these requirements is to ensure workers are properly informed of chemical hazards they may encounter. Hazard communication requirements are mandatory for workers who may be exposed to *chemicals* and other *hazardous materials* in their *work area*. These requirements apply to workers (as *chemical workers*), supervisors, area and building managers, and *chemical storage asset custodians*.

2 Requirements

Supervisors of *chemical workers* must ensure that hazards are communicated to them. Hazard communication will include

1. Ensuring a *safety data sheet (SDS)* on each chemical used or stored in their work areas is available
2. Ensuring that lists of chemicals known to be present in their work areas are available. This can be accomplished through local inventories and/or SLAC-wide inventory maintained in the Chemical Management System.
3. Ensuring chemicals are properly labeled
4. Ensuring training is provided on all classes of chemical hazards that *chemical workers* may reasonably be exposed to in their work areas

2.1 Safety Data Sheets

A current safety data sheet (SDS) for each chemical used or stored will be available to all personnel through the Chemical Management System. Supervisors will ensure all workers, in areas where chemicals are used or stored, have ready access.

Note *Subcontractors are responsible for maintaining SDSs for chemicals they bring to SLAC and making these available to supervisors of SLAC workers who may be exposed to those chemicals. For hazards located in SLAC areas where subcontractors will be working, the project manager or field construction/service manager must provide hazard communication information.*

2.2 Inventories

A hazard communication inventory is a list of all hazardous chemicals present in a work area or workplace, and is used to ensure that an SDS is available for each. They can be generated using the Chemical

Management System or manually. Individual work areas should maintain local inventories of hazardous chemicals. Contact the chemical coordinator for more information on how to create and maintain a work-area specific inventory. (See Chemical Lifecycle Management: Management and Use Requirements.)

Important The inventory is particularly important if hazardous chemicals are moved from the storage area indicated at the time of delivery or if the area has materials obtained outside the CMS system, such as legacy materials obtained before 2006 or research samples.

2.3 Container Labeling

Chemical *containers* will be labeled meeting the following requirements:

- Every container will be clearly labeled with the material name and hazard information. Required (8 CCR 5194) label elements on shipped containers include the following:
  - Product identifier
  - Signal word
  - Hazard statements
  - Pictograms
  - Precautionary statements
  - Name, address, and telephone number of the manufacturer, importer, or other responsible party
- Manufacturer-affixed labels must not be removed or defaced on the primary chemical container if it still contains the chemical. If a container label is missing or illegible, or if the chemical is transferred into a secondary container, a secondary label must be affixed. These are available through the CMS Coordinator.
- Samples and small secondary chemical containers must be labeled with the chemical name or product identifier, and hazard information, where words, pictures, symbols, or combination thereof, provide general information about the hazards of the chemicals. Abbreviations on sample containers are accepted as long as a reference is readily accessible with the full chemical name for each abbreviation.
- Supervisors will be immediately notified when unlabeled chemical containers are discovered. Unlabeled containers that may contain chemicals should be assumed to be hazardous. An attempt should be made to determine the contents of the container and a correct label should be affixed to the container. If a determination cannot be made about the contents, the chemical lifecycle management program manager should be contacted.
- All piping containing chemicals must be labeled. All new installations of hazardous material pipes and tubes will be labeled in accordance with ASME A13.1 requirements.

2.3.1 Exemptions

Portable secondary containers for immediate use during a single shift, by a single worker who performs the transfer himself/herself, are exempt from the labeling requirements above.

2.3.2 Tanks, Stationary Containers, and Permit-required Work Areas

Chemical storage asset custodians will ensure *tanks* and other *stationary containers* are labeled in accordance with requirements in Chemical Lifecycle Management: Chemical Storage Asset Requirements. Labels must include the following elements:

- Name and concentration of the materials contained within the tank or stationary container
- NFPA 704 hazard diamond indicating the health, flammability, reactivity, and any special hazards of the material

Entrances to areas using or storing hazardous materials in quantities requiring a permit or designated by the SLAC fire marshal must be labeled with hazard identification signs as specified in NFPA 704.

2.4 Proposition 65 Warnings

Businesses are required to provide exposure warnings about Proposition 65 listed chemicals that cause cancer, birth defects or other reproductive harm. SLAC provides exposure warning signs near campus entrances. Proposition 65 warning labels are typically found on chemical containers and product safety data sheets. An inventory of Proposition 65 chemicals found at SLAC can be obtained by contacting the chemical coordinator.

2.5 Training

For training requirements, see Chapter 53, "Chemical Safety".

3 Forms

The following forms and systems are required by these requirements:

- Chemical Management System. System used for ordering chemicals, tracking inventory, and storing safety data sheets

4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- A current safety data sheet (SDS) for each chemical used or stored will be available to all personnel through the Chemical Management System. Supervisors will ensure all workers in areas where chemicals are used or stored have ready access.
- A hazard communication inventory listing all the chemicals present in the workplace will be maintained through the Chemical Management System. Individual work areas should maintain local inventories of hazardous chemicals.

5 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 53, "Chemical Safety"
- Chapter 40, "Chemical Lifecycle Management"
  - Chemical Lifecycle Management: Management and Use Requirements (SLAC-I-730-0A09S-038)
  - Chemical Lifecycle Management: Chemical Storage Asset Requirements (SLAC-I-730-0A09S-018)
- Chapter 58, "Laboratory Safety"

Other SLAC Documents

- Chemical Management Services

Other Documents

- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 109, "Hazardous Substances and Processes", Section 5194, "Hazard Communication" (8 CCR 5194)
- Title 24, *California Code of Regulations,* "California Building Standards Code", Part 9, "California Fire Code", Chapter 50, "General Provisions", Section 5003, "General Requirements", Subsection 5, "Markings" (24 CFR 5003.5)
- American Society of Mechanical Engineers (ASME) A13.1, "Scheme for the Identification of Piping Systems" (ASME A13.1)
- National Fire Protection Association (NFPA) 704, "Standard System for the Identification of the Hazards of Materials for Emergency Response" (NFPA 704)
- Unidocs. Marking Requirements and Guidelines for Hazardous Materials and Hazardous Wastes (UN-016)
- California Department of Industrial Relations, Cal/OSHA Consultation Service, Education Unit. Guide to California Hazard Communication Regulation
- California Office of Health Hazard Assessment. Proposition 65 Warnings
- California Office of Health Hazard Assessment. Proposition 65 Warnings. Sample Warnings and Translations for Businesses
- Stanford University, Department of Environmental Health and Safety. Proposition 65

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 53: Chemical Safety

Hazard Control Ventilation Requirements

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1 Purpose

The purpose of these requirements is to protect workers from airborne concentrations of potentially harmful contaminants. They cover the installation, use, performance, and monitoring of hazard control ventilation equipment. They apply to workers (as *chemical workers*), supervisors, *principal investigators*, *laboratory managers*, ESH coordinators, area and building managers, the chemical safety program manager, Occupational Health, ESH, and Facilities and Operations.

These requirements comply with regulatory standards for mechanical ventilation systems (8 CCR 5143 and 8 CCR 5154.1). They are to be reviewed annually by the chemical safety program manager.

2 Requirements

Hazard control ventilation systems are commonly relied on as a primary engineering control in industrial operations, maintenance activities, and laboratory operations. Local exhaust ventilation hoods and points for operations must be used to ensure sufficient reduction of airborne concentrations of contaminants that could pose a risk to personnel. Local exhaust points include fume hoods, extractor arms, glove boxes, biological safety cabinets, and other exhausted equipment enclosures that perform a safety or health function.

2.1 Activities Requiring Local Exhaust Ventilation

Activities requiring local exhaust ventilation include

- Using particularly hazardous substances (such as acutely toxic, carcinogenic, or reproductive toxins)
- Performing operations that could expose workers to more than 10 percent of either an *action level* or, if no action level exists, an *occupational exposure limit (OEL)*
- Handling toxic substances in an enclosed area
- Handling volatile, flammable liquids that could generate a flammable atmosphere
- Conducting procedures that generate airborne particulates (dust) or liquid aerosols of even moderately toxic chemicals
- Using pungent or noxious odiferous compounds
- Handling concentrated acids or bases

Note *Operations involving heating or evaporating perchloric acid must be evaluated by the ESH coordinator and lab manager to determine whether special controls (such as using an acid fume hood with wash-down systems to prevent the accumulation of explosive perchlorate crystals) are needed.*

- Discharging gases/vapors from vacuum pumps and distillation columns
- Discharging harmful gases and vapors from drying ovens and muffle furnaces
- Discharging an oxygen-displacing gas or liquid into a space at levels that create an *oxygen deficiency hazard (ODH)*, as described in Chapter 36, "Cryogenic and Oxygen Deficiency Hazard Safety"
- Handling biohazard agents or biohazardous materials per Chapter 34, "Biosafety"

Important Self-contained (ductless) hoods that recirculate air back into the workspace have *extremely* limited applications, and are not an acceptable means to control exposure to hazardous materials.

Figure 1 Laboratory Fume Hood

2.2 Installation and Use

When hazard control ventilation systems are planned for installation, ESH must be consulted to ensure proper selection and installation. Ventilation performance criteria will be defined by ESH based on regulatory requirements. The selection, procurement, installation, and balancing of all ventilation systems must be discussed with the ESH coordinator, area or lab manager, and building manager before making a decision on the appropriate selection. Each hazard control ventilation system must have a designated custodian (see Chemical Lifecycle Management: Chemical Storage Asset Requirements, and Ventilated Lab Hoods).

2.3 Ventilated Laboratory Fume Hoods

A ventilated laboratory hood is designed to protect workers from the hazards of airborne contaminants. Hoods also help protect people and property against small fires and explosions. (For an inventory of ventilated lab hoods at SLAC, see Ventilated Lab Hoods.)

The following precautions should be taken to ensure fume hood function is not compromised:

- Prior to installation, consider cross-drafts associated with proximity to traffic, supply air diffusers, windows and doors.
- Do not place large equipment in front of ventilation hoods or system intakes as this could restrict air flow and reduce ventilation efficiency.
- Ensure the ventilation system is rated for the intended operation.
- Confirm the system is operational before using; check that fan is powered on and airflow conforms to required parameters.
- Keep the hood sash or slide gate damper set at the approved level or set point to maintain adequate ventilation rate.
- Do not block airflow to baffles with equipment or chemicals; restricting air flow or creating a fire hazard.
- Ensure all open chemical handling is positioned at least 6 inches from the sash opening.

2.4 Biosafety Cabinets

Biosafety cabinets are ventilated cabinets that are required for the containment of biohazard agents or biohazardous materials and may be used to control harmful exposure to aerosols and particulate matter. (See Chapter 34, “Biosafety”.)

2.5 Gas Cabinets

Gas cabinets are typically required for flammable, toxic, corrosive, or pyrophoric gases. Guidance on procurement and installation of gas cabinets can be found at Gas Cabinet Guidance. Fume hoods may be used for this purpose as well, based on review and concurrence from the ESH coordinator.

2.6 Other Ventilation Systems

Other hazard control ventilation systems may include local exhaust points, soldering bench hoods, extractor arms, ventilated chemical storage cabinets, snorkels, canopies, glove boxes, and equipment enclosures. Typical face velocities for ventilation systems can be found in *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards*.

For facilities-related ventilation systems, such as those in use in the electroplating, welding, and paint shops, Industrial Hygiene evaluates equipment for adequate contaminant control and ventilation performance. Ventilation performance for many of these systems is subject to state regulatory requirements.

Figure 2 Glove Box

2.6.1 Inert Atmosphere Equipment

Glove boxes and Schlenk lines that provide a non-reactive atmosphere are typically required for operations involving moisture- or air-reactive substances, such as pyrophoric materials. Fume hoods may also be used provided that measures are taken to control moisture and/or air.

2.6.2 Chemical Storage Cabinets

New flammable storage cabinets must comply with Chemical Lifecycle Management: Chemical Storage Asset Requirements. Existing flammable storage cabinets showing signs of interior corrosion or whose contents produce strong odors during storage should be ventilated.

New corrosive storage cabinets should be connected to the building's exhaust system. Existing cabinets may also need to be connected if they show signs of corrosion or produce odors.

2.7 Ventilation System Performance Standards

Figure 3 Quantitative Airflow Monitor and Testing Record Sticker

New local exhaust ventilation systems and hoods must meet the requirements of building and fire codes and regulatory standards. Facilities and Operations is responsible for ensuring proper installation, balancing, and function testing all new ventilation devices that are part of a construction project. ESH ensures documented annual testing of all fume hoods, biosafety cabinets, and gas cabinets.

2.7.1 All Ventilation Systems

2.7.1.1 Testing

The ventilation rate of all hazard control ventilation systems that prevent harmful exposures must be tested annually and after installation, modification, or maintenance (8 CCR 5143(a)(5)). Additionally, ventilation system owners can request a performance check on the unit when there is a change in operation, or when there is a suspected air flow issue. Performance checks can be obtained by contacting the ESH coordinator or Industrial Hygiene.

2.7.1.2 Labeling

The technician performing the tests records the results of the ventilation tests by updating the sticker attached to the system, usually at the point of use. The information on the sticker includes the name or initials of the tester, the test date, the measured flow rate, and the pass/fail result of the qualitative test. A sticker or other marking must also indicates the proper alignment of the sash or slide gate damper (as applicable) to ensure adequate airflow. The results of calibrations, tests, and certifications are recorded in a database maintained by Industrial Hygiene and the chemical safety program manager.

2.7.1.3 Failure

If the airflow sensor alarm is activated (red light, warning sound) or the airflow rate falls below the indicated set point, work in that system must be discontinued and the custodian and/or ESH coordinator contacted to report the condition.

Warning Do not simply mute the alarm and continue working: the alarm indicates that something is not operating correctly.

Upon testing, if a ventilation system fails to meet the minimum performance standard, ESH will send a report to the system's custodian. It is the responsibility of the custodian to ensure that the deficient ventilation system is repaired and is not used until that time. Until the deficiency is corrected, the custodian will mark the system with a warning sign and effectively restrict activities as needed to prevent personnel over-exposure to contaminants.

2.7.2 Laboratory Fume Hoods

2.7.2.1 Ventilation Rates

All laboratory fume hoods must maintain an average face velocity of at least 100 feet per minute (fpm) with a minimum of 70 fpm at any point (8 CCR 5154.1(c)).

When no employee is present in the work area, fume hood average face velocity may be reduced as low as 60 fpm, provided following additional conditions are met:

1. Face velocity is decreased and increased via an automated system.

2. Each fume hood has undergone and passed ASHRAE 110 testing at the reduced flow rate.
3. ASHRAE 110 testing records and configuration are maintained for the life of the hood and five years thereafter.

2.7.2.2 Airflow Monitoring and Testing

Each hood must have a quantitative airflow monitor that continuously displays the hood's performance to the user. The monitor may either display the inward flow rate or provide an alarm that signals when airflow has dropped under 80 fpm. The alarm may be audible or visual (8 CCR 5154.1(e)(3)(A)).

Qualitative tests must be performed that demonstrate the hood's ability to maintain an inward flow, such as smoke tests. Tests must to be performed after installation and annually. Alternatively, qualitative testing frequency may be reduced to every two years if there is a calibration and maintenance program in place for the quantitative monitor or alarm system (8 CCR 5154.1 (e)(3)(B)).

2.7.3 Biosafety Cabinets

Biosafety cabinet (BSC) types are classified as Class I, Class II type A, Class II type B1, Class II type B2, Class II type B3, and Class III. (See Chapter 34, "Biosafety".)

2.7.3.1 Ventilation Rates

Each class of biosafety cabinets is subject to ventilation operational requirements as outlined below (8 CCR 5154.2(e)):

- Class I and Class II type A must provide a minimum inward average face velocity of 75 linear fpm at the work opening.
- Class II type B1, B2, and B3 must provide a minimum inward average face velocity of at least 100 linear fpm at the work opening.
- Class III must provide sufficient air flow to constantly purge the work area of hazardous vapors, gases or particulate generated within the cabinet. The air change rate must be at least one air change per three minutes or sufficient to dilute flammable dusts, gases, or vapors to below 20 percent of the *lower explosive limit (LEL)*, whichever is greater. The BSC must maintain a minimum negative pressure inside the cabinet of 0.5 inches of water.

2.7.3.2 Additional Testing Requirements

For Class I and Class II BSCs, a qualitative test must be performed that demonstrate the BSC's ability to maintain an inward flow, such as smoke tests.

For all BSCs, a quantitative aerosol challenge test must be performed on each high-efficiency particulate air (HEPA) filter. The test must be capable of detecting penetrations exceeding 0.005 percent of particles 0.3 micrometers or larger. Penetrations exceeding 0.03 percent constitute test failure.

2.7.4 Gas Cabinets

As described in Gas Cabinet Guidance, "the minimum average face velocity shall not be less than 200 feet per minute (fpm) or 150 fpm at any point across the access port".

2.7.5 Laboratory Room Exhaust

In *chemical laboratories*, laboratory heating, ventilating, and air conditioning (HVAC) systems should provide 100 percent outside air to laboratory spaces; recirculation of air should not be permitted. The HVAC systems should be balanced to keep laboratory spaces at a negative pressure relative to adjacent offices and hallways. This ensures that vapors, gases, fumes, and particulates do not migrate to non-laboratory spaces. A minimum of 6–12 air changes per hour in laboratory areas is recommended.

Laboratories may operate at positive pressure if their research function is adversely affected by ambient air drawn into the workspace and the risks posed by hazardous material release from the laboratory to adjacent areas are low. Clean rooms and laser laboratories are common examples of laboratories that operate at positive pressure.

2.8 Exceptions

Existing installations that were in compliance prior to the effective date of new safety orders are exempt from the performance standard requirements listed in this document, unless otherwise determined due to hazard severity (8 CCR 3202(b)).

2.9 Training

All personnel must receive equipment training on hazard control ventilation devices that includes

- Safe use of the equipment and its features, including an understanding of airflow, monitor readings, alarms, and relevant signage and postings
- Consequences of improper use, including hazardous material release and personnel exposure
- Procedure in the event of a power outage or other system failure

Supervisors ensure these training requirements are met.

3 Forms

The following forms and systems are required by these requirements:

- A test record sticker must be attached to each system, and include the name of the tester, the test date, the measured flow rate, and the pass/fail result of the qualitative test.
- Ventilated Lab Hoods. A database listing fume hood and biosafety cabinets and their performance testing records

4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- Each hazard control ventilation system must have a designated custodian, the names of whom are maintained in the Ventilated Lab Hoods database by Industrial Hygiene and the chemical safety program manager.
- The technician performing the ventilation and airflow tests records the results by updating the sticker attached to the system, usually at the point of use. The information on the sticker includes the name of the tester, the test date, the measured flow rate, and the pass/fail result of the qualitative test. A sticker or other marking must also indicates the proper alignment of the sash or slide gate damper (as applicable) to ensure adequate airflow.
- The results of all calibrations, tests, and certifications are recorded in the Ventilated Lab Hoods database maintained by Industrial Hygiene. Hazard control ventilation system test records must be retained for at least five years.

5 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 53, "Chemical Safety"
  - Chemical Safety Program Site (SharePoint)
- Chapter 34, "Biosafety"
- Chapter 36, "Cryogenic and Oxygen Deficiency Hazard Safety"
- Chapter 40, "Chemical Lifecycle Management"
  - Chemical Lifecycle Management: Planning Requirements (SLAC-I-730-0A09S-039)
  - Chemical Lifecycle Management: Chemical Storage Asset Requirements (SLAC-I-730-0A09S-018)
- Chapter 58, "Laboratory Safety"

Other SLAC Documents

- Chemical Management Services (CMS)
- Gas Cabinet Guidance

Other Documents

- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 1, "General Physical Conditions and Structures Orders, Introduction", Section 3202, "Application" (8 CCR 3202)
- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 107, "Dusts, Fumes, Mists, Vapors and Gases" (8 CCR 5139–5155)
  - Section 5143, "General Requirements for Mechanical Ventilation Systems (8 CCR 5143)
  - Section 5154.1, "Ventilation Requirements for Laboratory-Type Hood Operations (8 CCR 5154.1)
  - Section 5154.2, " Ventilation Requirements for Biological Safety Cabinets" (8 CCR 5154.2)

- National Research Council. *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards* (Prudent Practices)
- Stanford University, Department of Environmental Health and Safety. Lab Safety
- Stanford University, Department of Environmental Health and Safety. Chemical Hygiene Plan

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 53: Chemical Safety

Emergency Eyewash / Shower Requirements

Product ID: 641 | Revision ID: 2010 | Date published: 1 June 2021 | Date effective: 1 June 2021
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemsafetyReqShower.pdf

1 Purpose

The purpose of these requirements is to ensure emergency eyewash and shower stations are available to help protect workers after an eye or skin exposure to chemicals that may cause injurious corrosion, severe irritation, or permanent tissue damage, or are toxic by skin absorption. The requirements cover selecting, installing, inspecting, and maintaining emergency eyewash and shower stations. They apply to workers (as *chemical workers*, who use hazardous materials or work in areas where they may be exposed to them), supervisors, area and building managers, ESH coordinators, the chemical safety program manager, ESH, and Facilities and Operations.

2 Requirements

Note *Emergency eyewashes, showers, and drench hoses are not substitutes for proper eye and face protection, such as chemical splash goggles, face shields, and protective clothing. (See Chemical Safety: Personal Protective Equipment Requirements.)*

Eyewash and shower stations are required in areas where workers can come into contact with hazardous chemicals.

Area managers must

- Ensure that appropriate emergency eyewash and shower equipment is available in the work area
- Know where the equipment is located
- Ensure that workers are instructed in the location and proper use of eyewash/shower stations. A copy of the Chemical Safety: Emergency Eyewash/Shower Use Procedure should be placed at each station to supplement training

Building managers responsible for such areas must

- Ensure maintenance and routine activation or visual checks are performed, including keeping the stations free of obstructions

2.1 Installation

2.1.1 All Stations

The following requirements apply to all emergency eyewash and shower installations.

1. Sole purpose must be as an eyewash or shower.
2. Travel time must be no greater than 10 seconds from the hazard. Passages/access to the unit must be unobstructed.
3. Where the hazard is not corrosive, a single door may be in the path as long as it cannot lock from the direction of travel and opens toward the eyewash or shower.
4. The installation must be designed and positioned in such a way as to pose no hazard to the user.
5. The installation must be marked with a highly visible sign. The sign and unit must be well lit.
6. For outdoor installations, the unit will be protected from freezing or freeze-protected equipment (designed to operate under freezing conditions) must be installed.
7. If shutoff valves are installed in the supply line for maintenance purposes, provisions must be made to prevent unauthorized shutoff.
8. The actuation valve must be simple to operate, activate the water source within one second of operation, and remain open until intentionally closed.
9. The manufacturer's instructions covering installation, operation, inspection, and maintenance requirements must be readily available to maintenance and training personnel. Note: Hand-held drench hoses may be installed to supplement an eyewashes or showers, but may not replace them.

2.1.2 Emergency Eyewash Installations

1. The eyewash must provide flushing fluid to both eyes simultaneously and be designed such that, once activated, it can be used without the use of the operator's hands.
2. The eyewash nozzles must be positioned 33 to 53 inches from floor and 6 inches from the wall or nearest obstruction.
3. The water supply must be plumbed unless access to water is not feasible.
4. The water supply must provide 0.4 gallons per minute for at least 15 minutes.
5. Nozzles and flushing fluid units must be protected from airborne contaminants in a manner that does not require a separate motion from the operator.
6. For indoor installations, the eyewash drainpipes must be plumbed to a sink or directly to the sewer line.
7. Self-contained eyewash units may be used in areas where it is not feasible to install plumbed units.

2.1.3 Emergency Shower Installations

1. The shower will provide flushing from a height of at least 82 inches and not more than 96 inches from the surface on which the user stands.
2. The spray pattern will be a minimum of 20 inches wide at 60 inches above the floor.
3. The shower will provide a minimum flow of 20 gallons per minute for 15 minutes.
4. The installation of a floor drain is optional. If a floor drain is installed, it must be protected from contamination by chemical spills. The floor drain may be fitted with a temporary plug to protect the floor drains from chemical intrusion (unless protected from spills by a covered sump or berm system).Alternatively, chemicals may be stored in spill containment.

5. The valve actuator must not be more than 69 inches above the floor, be simple to operate, must activate the shower from “off” to “on” in 1 second or less. The valve must remain open without the use of the operator’s hands until intentionally closed.

2.2 Inspection and Activation

ESH will inspect the performance of eyewash and shower stations annually, as described in 8 CCR 5162, and provide a written report to the owner. The owner is assumed to be the area, laboratory, or building manager, but may be an ESH coordinator.

Plumbed eyewashes will be activated weekly by the building manager to verify proper operation and run until the flushing fluid is clear. Self-contained eyewashes do not need to be activated but must be checked visually to determine if the flushing fluid needs to be changed or supplemented.

Showers will be activated and flushed monthly by the building manager to verify proper operation and run until the flushing fluid is clear.

If the station fails to activate, the building manager must remove it from service and notify the ESH coordinator immediately.

3 Forms

The following forms and systems are required by these requirements:

- A sticker or tag must be available near stations for logging activations and visual checks.

4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- The results of the required activations or visual checks must be logged on a tag available near the station, including the name or initials of the person and the date.
- The results of annual inspections by ESH must be provided in writing to the owner.

5 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 53, “Chemical Safety”
  - Chemical Safety: Emergency Eyewash/Shower Use Procedure (SLAC-I-730-0A09C-008)
  - Chemical Safety: Personal Protective Equipment Requirements (SLAC-I-730-0A09S-017)
  - Chemical Safety: Accidental Exposure Requirements (SLAC-I-730-0A09S-041)

Other SLAC Documents

- Chemical Management Services (CMS)

Other Documents

- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 109, "Hazardous Substances and Processes", Section 5162, "Emergency Eyewash and Shower Equipment" (8 CCR 5162)
- American National Standards Institute (ANSI) Z358.1, "Emergency Eyewashes and Safety Equipment" (ANSI Z358.1)

SLAC NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 53: Chemical Safety

Emergency Eyewash / Shower Use Procedure

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The purpose of this procedure is to minimize harm to workers from accidental exposures to *chemicals* and other *hazardous materials*. It covers the use of emergency eyewash and shower stations. It applies to workers (as *chemical workers*).

In the event of chemical self-contamination, follow these steps:

1. Do not panic.
2. Shout for help to allow co-workers to assist and call for medical assistance.
3. Flush the affected area of the body immediately **for a minimum of 15 minutes.**
4. For chemical spills to the eyes, hold eyes open as wide as possible to permit the eyewash water to reach all areas around the eye.
5. If possible, move both eyes back-and-forth during washing, to flush the maximum of eye surface.

Warning Recognize that both eyes move together, so do not leave the uninjured eye open or uncovered. If a protective dressing is used, do not apply pressure over the eyes.

Warning Eyewash stations should not be used following injury with a known metal or similarly rigid solid fragment. In this event, seek immediate medical attention.

6. If clothing is contaminated, remove while under the shower.
7. Shut off water:
   - For eyewashes, pull push plate or foot plate back.
   - For showers, push valve actuator back.
8. Seek medical attention immediately.
   - If medical emergency, call 911, then call SLAC Site Security (ext. 5555 or 650-926-5555 from a cell phone), and your supervisor.
   - If non-emergency, contact SLAC Site Security (ext. 5555 or 650-926-5555 from a cell phone), and your supervisor.
9. If you are not transported directly to an emergency room from the scene of the exposure, report immediately to the Occupational Health Center.
10. See Chemical Safety: Accidental Exposure Requirements (SLAC-I-730-0A09S-041) for additional details.

This document should be attached to each emergency eyewash/shower station to supplement worker training. (See Chemical Safety: Emergency Eyewash/Shower Requirements [SLAC-I-730-0A09S-043.])

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 53: Chemical Safety

Personal Protective Equipment Requirements

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1 Purpose

The purpose of these requirements is to ensure the proper selection and use of personal protective equipment (PPE) to minimize or eliminate exposure to chemical hazards. They cover selecting, using, inspecting, and maintaining chemical safety PPE. They apply to workers (as *chemical workers*), supervisors, and area and building managers.

2 Requirements

In addition to specific requirements below, follow these general precautions in the work area:

- Do not use or wear torn or excessively loose clothing.
- Wear shoes at all times.
- Do not wear perforated shoes, sandals, or cloth sneakers. Steel-toed shoes are recommended for use with compressed gas cylinders (CGCs).

2.1 General PPE

General policies and procedures pertaining to PPE are described in Chapter 19, "Personal Protective Equipment". In addition to requirements listed in Chapter 19, the guidelines listed below ensure maximum protection:

- Select PPE based upon the greatest hazard: ensure the PPE provides both the kind and degree of protection needed for the potential hazard as well as the task.
- Understand PPE limitations: for instance, splash-proof goggles must be used when handling corrosive liquids because regular safety glasses are insufficient.
- Ensure the PPE fits properly.
- Maintain PPE according to the manufacturer's instructions.

2.2 Chemical PPE

Chemical-specific PPE must be chosen with careful attention to the physical and health hazards of the substance(s) and work processes involved, as well as the chemical compatibility of the PPE material itself. PPE selection guidance can be found in the resources below:

- Safety data sheets (SDSs) for all chemicals and chemical mixtures.

- Chemical Safety: Safe Handling Guidelines
- Stanford University Lab Safety Fact Sheets
- Stanford University Standard Operating Procedures
- Stanford University Laboratory PPE Assessment Tool
- The PPE manufacturer's recommended use and chemical-compatibility or chemical-resistance guides.

Warning Solutions or mixtures may differ in hazard or solubility than starting reagents. Ensure the PPE selected is compatible with all substances that will be used.

2.3 Protective Apparel

Protective apparel includes coats, aprons, jump suits, special types of boots, shoe covers, and gauntlets. Appropriate protective apparel is recommended for most chemical work; for some tasks it is required. Protective apparel should protect against physical hazards yet enable easy execution of physical tasks.

2.3.1 Lab Coats

Lab coats protect the body and clothing from dirt, grime, incidental splashes, incidental chemical contamination and chemical attack. Lab coats should be used for all work in chemical and biological laboratories, and are recommended for use where chemical use is routine. The composition of lab coats must be compatible with the types of hazards in use. A review of common lab coat materials and recommended uses is listed below:

- Flame resistant (FR) rated materials are typically NFPA 70E and NFPA 2112 certified, and have arc ratings and CAT ratings based on performance standards in testing. FR-rated fabrics are either treated with an FR coating or are made from fabrics that have inherent FR properties, such as aramid (Nomex). FR fabrics must be used for work with any volume of pyrophoric chemicals outside a glove box. FR-rated fabrics should be used with work that involves an open flame, the combination of flammable chemicals and heat, or large volumes of flammables (>4 L).
- Chemical protection (CP) fabrics offer splash protection against corrosives, polar solvents, and other chemicals.
- Polyester and poly-cotton blends will readily ignite and melt onto skin, exacerbating injury in a flash fire event. Polyester and poly-cotton blends are acceptable for work with nonflammable chemicals, and for general work that involves limited volumes of hazardous materials.
- Cotton is not FR, but ignites more slowly than poly-blends, and will not readily melt onto skin in a flash fire. 100 percent cotton is often used in laboratories where flammable chemicals are handled. 100 percent cotton fabrics may be permissible when working with small volumes of flammable chemicals and contained heat sources (such as hot plates). Cotton is sensitive to degradation from acids.
- FR/CP materials, such as Shieldtec, are both flame resistant and chemical protection and are compatible with the widest variety of hazardous materials in the laboratory.

2.3.2 Chemical Aprons

Chemical aprons should be used when working with strong corrosives, reactive mixtures, or where other potential for splashes to the body exist.

2.4 Eye and Face Protection

Eye and face protection is required in areas where chemicals used could cause injury to the eyes or face upon contact from splashing or pouring. PPE for eye and face protection must be selected in accordance with 8 CCR 3382 and must meet the requirements specified in ANSI Z87.1.

Laboratory managers or supervisors should contact the equipment manufacturers and the ESH coordinator for proper equipment selection.

- Safety glasses with permanently attached side shields are required whenever there is a potential for projectile objects in the work area.
- Safety goggles are required to protect the eyes when handling any chemical or process that can create fine dust, fumes, mists, and sprays.
- Face shields are typically paired with safety goggles. Face shields are required to protect the face when splash potential exists or when performing strongly exothermic reactions or working with reactive mixtures.
- Do not use face shields as a substitute for eye protection. When both face and eye protection is needed, both types of protective equipment must be used.
- Eye and face protection is required when radiant energy sources are present in the work area.

2.5 Hand Protection

Skin contact is a potential source of exposure to toxic materials. For substances that can create a significant exposure to individuals through skin contact, see 8 CCR 5155 Table AC-1, “Permissible Exposure Limits for Chemical Contaminants” (see those marked with “skin designation”). Appropriate gloves can be selected from safety supply catalogs.

- Gloves are required whenever there is potential for contact with corrosive or toxic materials, or materials of unknown toxicity or other unknown properties or hazards.
- Gloves should be worn as a standard precaution for all work in laboratories and other work areas where chemicals are routinely handled, used, or stored.
- Select glove material based on chemical resistance, as not all gloves are equally effective in preventing skin exposure to certain chemicals.
- Know the time-exposure limitations of glove use. Check degradation, breakthrough and permeation rates for the chemicals planned for use.
- Disposable gloves are designed for short-term applications; change frequently throughout the day and never re-use.
- If heavy-duty gloves are reused, wash gloves after you complete a procedure but before removing them from your hands. Let dry completely before storing.
- Inspect heavy-duty gloves for damage before and after each use. Replace heavy-duty gloves periodically, depending on frequency of use and permeability of the substances.
- Ensure gloves are air-tight: fill the gloves with air, roll the cuff, and check for leaks.

A good summary reference is Stanford University’s Lab Gloves.

Informative glove chemical-compatibility and resistance resources are listed below:

- Ansell Chemical Hand Protection Tool (for use with single chemicals or mixtures)
- Cole Parmer Glove Chemical Compatibility Database
- North Chemical Resistance Guide

2.6 Respiratory Protection

Respiratory protection prevents the inhalation of hazardous vapors or fumes into the lungs. Chemical fume hoods or other hazard control ventilation systems will prevent most exposures. However, when procedures cannot be performed in a fume hood or ventilation is not adequate to provide protection against inhalation hazards, respiratory protection equipment is required. (See Chemical Safety: Hazard Control Ventilation Requirements.)

Respirators may be used at SLAC only after medical evaluation, training, fit-testing, and specific approval of the operation by an ESH industrial hygienist. Respirators are the last resort for control of exposures and are only to be used when engineering controls, process modification, and other measures are not practical or have proved inadequate. (See Chapter 29, "Respiratory Protection".)

2.7 Training

Workers who are required to use PPE must receive training specific to both the required PPE and the conditions under which it will be used. The supervisor or principle investigator must determine if the general training meets the level of training required for the work area. If it does not, they must ensure on-the-job training is completed for any specialized PPE. Training requirements for hazard-specific PPE are listed in each appropriate ESH Manual chapter.

ESH provides the following general PPE training:

- ESH Course 255, Personal Protective Equipment (ESH Course 255)

Laboratory-specific PPE training is provided in either of the training courses below:

- Course 204, Sample Preparation Laboratory Training (Course 204). This course is geared toward users who work in sample preparation laboratories.
- ESH Course 128, Laboratory Safety Orientation (ESH Course 128). This course is geared towards staff research laboratories.

3 Forms

The following forms and systems are required by these requirements:

- Chemical Management System. System used for ordering and tracking chemicals and storing safety data sheets

4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- None

5 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 53, "Chemical Safety"
  - Chemical Safety: Hazard Control Ventilation Requirements (SLAC-I-730-0A09S-021)
  - Chemical Safety: Safe Handling Guidelines
  - Chemical Safety Program Site (SharePoint)
- Chapter 19, "Personal Protective Equipment"
- Chapter 29, "Respiratory Protection"

Other SLAC Documents

- Chemical Management Services (CMS)

Other Documents

- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders"
  - Group 2, "Safe Practices and Personal Protection", Article 10 (8 CCR 3382–3384)
  - Group 16, "Control of Hazardous Substances", Article 107, "Dusts, Fumes, Mists, Vapors, and Gases", Section 5155, "Airborne Contaminants" (8 CCR 5155)
- American National Standards Institute (ANSI) Z87.1, "Occupational and Educational Personal Eye and Face Protection Devices" (ANSI Z87.1)
- Stanford University, Department of Environmental Health and Safety. Lab Safety. Personal Protective Equipment. Lab Gloves
- Stanford University, Department of Environmental Health and Safety. Lab Safety. Lab Safety Fact Sheets
- Stanford University, Department of Environmental Health and Safety. Lab Safety. Standard Operating Procedures
- Stanford University, Department of Environmental Health and Safety. Lab Safety. Personal Protective Equipment. Laboratory PPE Assessment Tool
- Ansell Chemical Hand Protection Tool (for use with single chemicals or mixtures)
- Cole Parmer Glove Chemical Compatibility Database
- North Chemical Resistance Guide

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 53: Chemical Safety

Accidental Exposure Requirements

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URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemsafetyReqExposure.pdf

1 Purpose

The purpose of these requirements is to minimize harm to workers from accidental exposures to *chemicals* and other *hazardous materials* and to ensure such exposures are properly reported. They cover signs of exposure, general response, and reporting for accidental chemical exposures. (For chemical-specific information, see safety data sheets.) They apply to workers (as *chemical workers*), supervisors, area and building managers, and ESH.

1.1 Exposure Assessments

An exposure assessment is strongly recommended when there is potential for exposure exceeding 10 percent of either an *action level* or, if no action level exists, an *occupational exposure limit (OEL)*.

Requests for assessments may be made by the supervisor, area manager, and/or ESH coordinator. An ESH industrial hygienist will conduct a risk-based exposure assessment and recommend controls to prevent or mitigate exposures.

Exposure assessment may also be performed after an exposure event to determine if proper safety controls were in place that could have prevented the exposure, and to recommend any new controls that may be necessary to prevent or mitigate future exposures.

1.1.1 Monitoring

If there is reason to believe that either an *action level* or, if no action level exists, an *OEL* may be exceeded, monitoring is required. ESH will provide monitoring that meets the following conditions:

1. Initial monitoring. ESH will provide an industrial hygienist to monitor worker exposure.
2. Periodic monitoring. If exposure is observed that exceeds either the action level or the exposure limit, the frequency of exposure monitoring provisions will comply with the relevant regulation.
3. Termination of monitoring. Monitoring may be terminated in accordance with the relevant regulation.
4. Employee notification. Monitoring results will be provide to workers within 15 working days after the receipt of any results. Monitoring records are maintained by ESH.

1.2 Signs of Exposure

Potential overexposure to hazardous chemicals or substances may be indicated when one or more of the following occurs:

- A chemical or laboratory worker manifests certain physical symptoms (such as headache, rash, nausea, coughing, tearing, irritation or redness of the eyes, irritation of the nose or throat, dizziness, loss of motor dexterity or judgment), and one of the following also occurs:
  - Some or all of the symptoms disappear when the worker is removed from the exposed area.
  - The symptoms reappear soon after the worker returns to work with the same hazardous chemicals.
- Two or more persons in the same work area have similar physical symptoms as described above.
- A hazardous chemical is leaked, spilled or otherwise rapidly released in an uncontrolled manner.
- A chemical or laboratory worker has direct skin or eye contact with a hazardous chemical.

Warning Odor is not a reliable indicator in determining exposure; if there is any reason to believe a chemical exposure has occurred, notify the area or lab manager, even if a suspicious odor is not detected. Follow the emergency notification and medical examination protocols below.

2 Requirements

2.1 Inhalation

Many chemicals can become airborne as gases, mists, vapors, or dusts. Exposure through the respiratory system can be very dangerous because absorption into the blood stream through the lungs occurs quickly. In addition, many materials can damage the nose, throat, and lungs directly.

Persons over-exposed to chemicals must be relocated immediately to fresh air and provided with medical attention. This may include the administration of oxygen as well as other medical treatment. Notify medical personnel or responders if the chemical is toxic or corrosive. Follow the Emergency Notification and Medical Examination and Treatment protocols below.

2.2 Eye Contact

If a chemical contacts the eyes:

1. Shout for help to allow co-workers to assist and call for medical assistance.
2. Immediately flush the eyes with copious amounts of water, preferably at the nearest eyewash station (see Chemical Safety: Emergency Eyewash/Shower Use Procedure).
3. If possible, move both eyes back-and-forth during washing, to flush the maximum of eye surface.
4. Do not stop flushing the eyes until emergency personnel inform you to stop, or for a minimum of 15 minutes.
5. Seek medical attention immediately. Notify medical personnel or responders if the chemical is toxic or corrosive or could have been absorbed through the eyes. Follow emergency notification and medical examination and treatment protocols below.

2.3 Skin Contact

If a chemical comes into contact with the skin:

1. Shout for help to allow co-workers to assist and call for medical assistance.
2. Immediately rinse the affected area with large amounts of running water. This may be done in a sink if the hands are the only portion of the body contacted or under a safety shower if the exposure area is more extensive (See Chemical Safety: Emergency Eyewash/Shower Use Procedure).
3. Remove contaminated clothing while under the shower.
4. Remain under the shower until emergency personnel inform you to stop, or for a minimum of 15 minutes.
5. Seek medical attention immediately. Notify medical personnel or responders if the chemical is toxic or corrosive or could have been absorbed through the skin. Follow the emergency notification and medical examination and treatment protocols below.

2.4 Emergency Notification

In the event of an accidental chemical exposure, emergency response must be notified as soon as possible:

- If life-threatening, call 911, then SLAC Site Security (ext. 5555 or 650-926-5555 from a cell phone), then supervisor. If evacuation is necessary:
  - Follow evacuation path as demonstrated during evacuation drills and/or as illustrated on a posted building evacuation map. These are located near exits, fire extinguishers, or stairwells.
  - Go directly to the assigned emergency assembly point (EAP).
  - Notify the person in charge of taking roll. (Generally, the building manager is the designated roll taker.)
  - Report any additional information with regard to the safety of co-workers and condition of the area evacuated.
- If non-life-threatening, notify supervisor, then SLAC Site Security (ext. 5555 or 650-926-5555 from a cell phone)

Be prepared to provide information on the location, number of people affected, injury types, if any, and incident description. Also describe the chemicals and quantities involved, and have the safety data sheet (SDS) available. (See Emergency Management: Emergency Notification, Response, and Reporting Procedures and Spills: Response, Cleanup, and Reporting Procedure for details).

2.5 Medical Examination and Treatment

Medical attention must be sought, even if no injury is apparent. Arrange to be examined and treated by a doctor or other trained medical specialist as soon as possible. If you are not transported directly to an emergency room from the scene of the exposure, report immediately to the Occupational Health Center.

3 Forms

The following forms and systems are required by these requirements:

- Chemical Management System. System used for ordering and tracking chemicals and storing safety data sheets

4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- None

5 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 53, "Chemical Safety"
  - Chemical Safety: Emergency Eyewash/Shower Use Procedure (SLAC-I-730-0A09C-008)
  - Chemical Safety: Safe Handling Guidelines
  - Chemical Safety Program Site (SharePoint)
- Chapter 16, "Spills"
  - Spills: Response, Cleanup, and Reporting Procedure (SLAC-I-750-0A16C-006)
- Chapter 37, "Emergency Management"
  - Emergency Management: Emergency Notification, Response, and Reporting Procedures (SLAC-I-730-0A14C-002)

Other SLAC Documents

- SLAC Occupational Health Center
- Chemical Management Services (CMS)

851>Cal/OSHA Implementation Plan: Chemical Safety

This form is for documenting changes to a program and the program's supporting resources (ESH Manual chapter or similar program description, training courses, databases, and so on) resulting from the adoption of the model Revolutionary Working Group (RWG) contract (see below) and the associated DOE variance from 10 CFR 851, "Worker Safety and Health Program". The purpose is to ensure consistent, concise descriptions of the resulting changes. The form is to be completed by the program manager and sent to the DOE as a cover sheet with the revised documents. The general process is as follows:

1. Program manager completes form
2. Changes to program resources made and reviewed following normal revision processes
3. DOE sent draft form and revisions
4. Changes to program resources published
5. DOE sent final form and revisions

1 Introduction

The RWG model contract and 10 CFR 851 variance are intended to simplify and improve the implementation of worker safety and health requirements by tailoring the laws, regulations, and standards that apply while achieving a level of protection equivalent to the requirements of 10 CFR 851. This mostly entails replacing federal Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1910 and 1926) with Cal/OSHA regulations (8 CCR) as external requirements to be complied with but may also involve other laws and regulations and either different versions of industry standards than those cited in 10 CFR 851 or entirely different standards. (One purpose of this form is to capture the specific changes in external requirements for each program.) (For more information on this effort, see the variance application in 851>Cal/OSHA resources.)

2 Plan

Field Number	Field Name	Field
1.	Program name	Chemical Safety
2.	Program manager	Patty, Cynthia A.
3.	LBNL counterpart	Robinson, Scott Thomas (SME list) (LBNL Phonebook)
4.	Program documents	*The following is a list of existing program documents, to be reviewed by the program manager to determine which will need to be revised to reflect 851>Cal/OSHA changes.* ▪ ESH Manual Chapter 53: Chemical Safety (package includes all documents below) ▪ Chemical Safety: Quick Start Summary ▪ Chemical Safety: Hazard Communication Requirements ▪ Chemical Safety: Personal Protective Equipment Requirements ▪ Chemical Safety: Emergency Eyewash/Shower Requirements ▪ Chemical Safety: Emergency Eyewash/Shower Use Procedure ▪ Chemical Safety: Accidental Exposure Requirements

Field Number	Field Name	Field
		▪ Chemical Safety: Chemical Hygiene Requirements ▪ Chemical Safety: Laboratory Standard Operating Procedure Template ▪ Chemical Safety: Non-hazardous Waste Sink Disposal Procedure Safe handling guidelines (15 chemical specific guides)
5.	Training courses	*The following is a list of existing training courses, to be reviewed by the program manager to determine which will need to be revised to reflect 851>Cal/OSHA changes.* *Course materials are available for review.* ▪ ESH Course 103, Hazard Communication (ESH Course 103) ▪ ESH Course 128, Laboratory Safety Orientation (ESH Course 128) ▪ ESH Course 255, Personal Protective Equipment (PPE) (ESH Course 255)
6.	Other program resources	*The following is a list of existing program resources, to be reviewed by the program manager to determine which will need to be revised to reflect 851>Cal/OSHA changes.* ▪ None
7.	Current external requirements	*The following is a list of current external requirements for this program, as identified in the program documents above.* ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor", Part 1910, "Occupational Safety and Health Standards", Subpart I, "Personal Protective Equipment", Section 133, "Eye and Face Protection" (29 CFR 1910.133) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor", Part 1910, "Occupational Safety and Health Standards", Subpart Z, "Toxic and Hazardous Substances", Section 1000, "Air Contaminants", Table Z-1, "Limits for Air Contaminants" (29 CFR 1910.1000 Table Z-1) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor", Part 1910, "Occupational Safety and Health Standards", Subpart Z, "Toxic and Hazardous Substances", Section 1910.1200, "Hazard Communication" (29 CFR 1910.1200) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor", Part 1910, "Occupational Safety and Health Standards", Subpart Z, "Toxic and Hazardous Substances", Section 1450, "Occupational Exposure to Hazardous Chemicals in Laboratories" (29 CFR 1910.1450) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 107, "Dusts, Fumes, Mists, Vapors, and Gases (8 CCR 5139–5155) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 109, "Hazardous Substances and Processes" (8 CCR 5160–5199) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry

Field Number	Field Name	Field
		Safety Orders", Group 16, "Control of Hazardous Substances", Article 110, "Regulated Carcinogens" (8 CCR 5200–5220) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 112, "Labeling of Injurious Substances" (8 CCR 5225–5230) ▪ Title 8, California Code of Regulations, "Department of Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 20, "Flammable Liquids, Gases and Vapors", Articles 134 through 146 (8 CCR 5415-5612) ▪ American Society of Mechanical Engineers (ASME)/ANSI A13.1, "Scheme for Identification of Pipelines" (ASME/ANSI A13.1) ▪ American National Standards Institute (ANSI) Z87.1-2003, "Occupational and Educational Personal Eye and Face Protection Devices" (ANSI Z87.1-2003) ▪ American National Standards Institute (ANSI) Z358.1-2004, "Emergency Eyewashes and Safety Equipment" (ANSI Z358.1-2004) ▪ National Fire Protection Association (NFPA) 704, "Standard System for the Identification of the Hazards of Materials for Emergency Response" (NFPA 704) *The following is a list of current external reference/guidance documents.* ▪ National Research Council. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards (Prudent Practices) ▪ Stanford University, Department of Environmental Health and Safety. Chemical Safety ▪ Stanford University, Department of Environmental Health and Safety. Lab Safety ▪ Stanford University, Department of Environmental Health and Safety. Chemical Hygiene Plan ▪ Stanford University, Department of Environmental Health and Safety. Stanford Storage Groups
8.	Proposed external requirements	*List all the external requirements that will apply to this program. To determine, start by looking up existing external requirements in 851>Cal/OSHA resources (variance, gap analysis, and contract) and finding replacements (for example a specific section in 29 CFR 1910 to a specific section in 8 CCR or a current version of an industry standard).Where Cal/OSHA requirements are less stringent than those of 10 CFR 851, check with Jeremy Sawyer on which to use.* ***Enter "no changes" if none.*** ▪ Title 8, California Code of Federal Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 2, "Safe Practices and Personal Protection", Article 10, "Personal Safety Devices and Safeguards (8 CCR 3382) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 107, "Dusts, Fumes, Mists, Vapors, and Gases (8 CCR 5139–5155) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 107, "Dusts, Fumes, Mists, Vapors, and Gases", Section 5143, "General Requirements for Mechanical Ventilation Systems (8 CCR 5143)

Field Number	Field Name	Field
		▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 107, "Dusts, Fumes, Mists, Vapors, and Gases", Section 5154.1, "Ventilation Requirements for Laboratory-Type Hood Operations (8 CCR 5154.1) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 109, "Hazardous Substances and Processes" (8 CCR 5160–5199) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 109, "Hazardous Substances and Processes", Section 5194 "Hazard Communication" (8 CCR 5194) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 109, "Hazardous Substances and Processes", Section 5191 "Occupational Exposure to Hazardous Chemicals in Laboratories" (8 CCR 5191) ▪ Title 8, California Code of Regulations, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 16, "Control of Hazardous Substances", Article 110, "Regulated Carcinogens" (8 CCR 5200–5220) ▪ Title 8, California Code of Regulations, "Department of Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 7, "General Industry Safety Orders", Group 20, "Flammable Liquids, Gases and Vapors", Articles 134 through 146 (8 CCR 5415-5612) ▪ American Society of Mechanical Engineers (ASME)/ANSI A13.1, "Scheme for Identification of Pipelines" (ASME/ANSI A13.1) ▪ National Fire Protection Association (NFPA) 704, "Standard System for the Identification of the Hazards of Materials for Emergency Response" (NFPA 704) ▪ American National Standards Institute (ANSI) Z87.1, "Occupational and Educational Personal Eye and Face Protection Devices" (ANSI Z87.1) ▪ American National Standards Institute (ANSI) Z358.1, "Emergency Eyewashes and Safety Equipment" (ANSI Z358.1) *The following is a list of proposed external reference/guidance documents.* ▪ National Research Council. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards (Prudent Practices) ▪ Stanford University, Department of Environmental Health and Safety. Chemical Safety ▪ Stanford University, Department of Environmental Health and Safety. Lab Safety ▪ Stanford University, Department of Environmental Health and Safety. Chemical Hygiene Plan ▪ Stanford University, Department of Environmental Health and Safety. Stanford Storage Groups ▪ Stanford University, Department of Environmental Health and Safety. Hazard Communication. ▪ Stanford University, Department of Environmental Health and Safety. General Use SOPs ▪ National Research Council. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, Chapter 6, Working with Chemicals

Field Number	Field Name	Field
		▪ National Institute for Occupational Safety and Health. International Chemical Safety Cards.
9.	Proposed substantive changes	*Describe (list) the substantive changes to be made in the program, based on the new external requirements.* ***Enter "no changes" if none.*** ▪ Deleting references to 29 CFR 1910.133, "Eye and Face Protection", 29 CFR 1910.1000 Table Z-1, "Limits for Air Contaminants", and 29 CFR 1910.1200, "Hazard Communication" ▪ HazCom laboratories and industrial areas are subject to Proposition 65 requirements. ▪ Local exhaust ventilation operation and testing requirements are introduced under 8 CCR 5139–5155. New requirements are detailed in Chemical Safety: Hazard Control Ventilation Requirements, and include ventilation performance, annual testing, and labeling requirements. ▪ Removed 8 CCR 5225–5230 from external requirements because all sections of Article 112 have been repealed.
10.	Additional proposed substantive changes	*Describe (list) the substantive changes to be made in the program, in addition to those based on the new external requirements. For example, those due to stakeholder input, other reviews and audits, operating experience.* ***Enter "no changes" if none.*** In addition, the chapter is being re-organized to focus on hazard communication: requirements for chemical hygiene are being moved to a new Chapter 58, "Laboratory Safety". Substantive changes: ▪ Added exemptions for warehouse operations, office work, and excluded substances ▪ Added role and responsibility entries for area/facility and building managers and the ESH and Facilities and Operations divisions ▪ Moved requirements for local exhaust ventilation, especially fume hoods, from the cancelled Chapter 5, "Industrial Hygiene", and made laboratory and mechanical ventilation operation and testing criteria more stringent ▪ Revised requirements for making safety data sheets (SDSs) available to reflect current practice of relying on online versions ▪ Added requirements for labelling samples and small secondary containers
11.	Affected program documents	*List program documents affected by the changes above.* ***Enter "no changes" if none.*** ▪ ESH Manual Chapter 53: Chemical Safety (package includes all documents below) ▪ Chemical Safety: Quick Start Summary (SLAC-I-730-0A09L-005) ▪ Chemical Safety: Hazard Communication Requirements (SLAC-I-730-0A09S-042) ▪ Chemical Safety: Personal Protective Equipment Requirements (SLAC-I-730-0A09S-017) ▪ Chemical Safety: Emergency Eyewash/Shower Requirements (SLAC-I-730-0A09S-043) ▪ Chemical Safety: Emergency Eyewash/Shower Use Procedure (SLAC-I-730-0A09C-008) ▪ Chemical Safety: Accidental Exposure Requirements (SLAC-I-730-0A09S-041) ▪ Chemical Safety: Hazard Control Ventilation Requirements (SLAC-I-730-0A09S-021) ▪ Safe handling guidelines (15 chemical specific guides) Cancelled Exhibits ▪ Chemical Safety: Emergency Eyewash/Shower Activation Log Form (SLAC-I-730-0A09J-003) Exhibits moved to Chapter 58: Laboratory Safety ▪ Laboratory Safety: Chemical Hygiene Plan

Field Number	Field Name	Field		
		▪ Laboratory Safety: Laboratory Standard Operating Procedure Template ▪ Laboratory Safety: Non-hazardous Waste Sink Disposal Procedure		
12.	Affected training courses	*List training courses affected by the changes above.* ***Enter "no changes" if none.*** ▪ ESH Course 103, Hazard Communication (ESH Course 103) ▪ ESH Course 128, Laboratory Safety Orientation (ESH Course 128) ▪ ESH Course 255, Personal Protective Equipment (PPE) (ESH Course 255) ▪ SSRL Course 204, Sample Preparation Laboratory Training (SSRL 204)		
13.	Other affected program resources	*List other program resources affected by the changes above.* ***Enter "no changes" if none.*** ▪ No change		
14.	Comments/Questions/Issues	*Add any comments or questions regarding applicable requirements or changes.* [Add text]		
15.	Status	☒ Initial draft (proposed changes)	☒ Draft (for DOE review)	☒ Final (published changes)
16.	Date completed	1/17/2020 (rev 9/30/2020)	3/25/2021	6/1/2021