This chapter was last reviewed for currency 5/26/2021.
The next thorough review is due 5/26/2024.

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Quick Start Summary

Product ID: 634 | Revision ID: 2380 | Date published: 26 May 2021 | Date effective: 26 May 2021
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemmanageQuickstart.pdf

1 Who needs to know about these requirements

The requirements of Chemical Lifecycle Management apply to workers (as *chemical users*, *requesters,* and *receivers*), their supervisors and line management, *chemical storage asset custodians*, ESH coordinators, *chemical reviewers*, the chemical coordinator, the SLAC fire marshal, the chemical lifecycle management program manager, and subcontractors and the Building Inspection Office.

2 Why

Chemicals and other *hazardous materials* are routinely used and stored at SLAC. To protect the environment and the health of workers, visitors, and the surrounding community, these chemicals are strictly managed throughout their lifecycle, from purchasing to final disposition.

3 What do I need to know

- SLAC utilizes the *chemical management services* supply chain model for chemical management. All chemical purchases must be initiated and fulfilled through the Chemical Management System.
- Chemicals are approved for specific *work areas*, based on use and amount. Once approved, a chemical may be reordered using the system without further ESH approval, as long as original conditions are met. As part of the initial approval, chemical reviewers will review hazards and controls, establish additional requirements that may apply for toxic or hazardous chemicals, and suggest less toxic alternatives. Reuse of existing supplies is highly encouraged, as is keeping on-site inventories to a minimum.
- Chemicals must be handled, used, and stored according to requirements. This includes proper use and inspection of approved storage assets and areas and maintenance of inventories.
- Hazard communication and mitigation related to chemicals are covered in Chapter 53, "Chemical Safety"; transportation, in Chapter 52, "Hazardous Materials and Waste Transportation"; chemical use in laboratories, in Chapter 58, "Laboratory Safety".

4 When

The requirements of this chapter take effect 26 May 2021.

5 Where do I find more information

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

- Chapter 40, "Chemical Lifecycle Management"

Or contact the program manager.

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40

Chemical Lifecycle Management

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URL: https://www-group.slac.stanford.edu/esh/eshmanual/pdfs/ESHch40.pdf

1 Purpose

The purpose of this program is to ensure that *chemicals* and other *hazardous materials* are managed throughout their lifecycle to protect the environment and the health of workers, visitors, and the surrounding community. It covers the procurement, storage, handling, and use of chemicals, and applies to workers (as *chemical users*, *requesters,* and *receivers*), their supervisors and line management; *chemical storage asset custodians*, ESH coordinators, *chemical reviewers*, the chemical coordinator, the SLAC fire marshal, and the chemical lifecycle management program manager; and subcontractors and the Building Inspection Office.

Hazard communication and mitigation related to chemicals are covered in Chapter 53, "Chemical Safety". Chemical use in laboratories is covered in Chapter 58, "Laboratory Safety". Transportation, on-site and off, is covered in Chapter 52, "Hazardous Materials and Waste Transportation". Procurement, storage, handling, and use of radioactive materials are covered in Chapter 9, "Radiological Safety".

2 Roles and Responsibilities

Functional roles and general responsibilities for each under this program are listed below. More detailed responsibilities, if they apply, 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 User

- Complies with the requirements of this program
- Complies with all hazard controls
- Completes training
- Purchases chemicals only through the Chemical Management System
- Only uses chemicals approved for the *work area*
- Uses the least toxic material that is available that meets work specifications
- Minimizes waste, orders only the amount of chemicals needed
- Donates excess chemicals for redistribution

2.2 Chemical Requester

- Is designated by line management
- Submits purchase through the Chemical Management System

2.3 Chemical Receiver

- Inspects deliveries for accuracy and container integrity
- Immediately places highly toxic materials and those with inhalation hazards in a secure area

2.4 Chemical Storage Asset Custodian

- Is designated by line management
- Ensures compliance with the storage requirements of this chapter, including inspection of storage assets, *segregation* of chemicals, and *secondary containment*
- Maintains documentation about the location, inspection, and corrective actions of chemical assets under control
- Assists with annual reconciliation of work area inventories

2.5 Supervisor

- Selects, implements, and maintains appropriate measures for controlling work area hazards associated with chemicals
- Ensures staff complete both ESH training and area-specific on-the-job training (OJT), including any non-routine tasks involving chemicals
- Ensures an accurate work area inventory is provided to the chemical lifecycle management program manager to support regulatory and compliance requirements

2.6 Line Management

- Designates a chemical storage asset custodian for each chemical storage asset under control
- Designates chemical requesters
- Approves justification for purchasing toxic and hazardous chemicals

2.7 ESH Coordinator

- Assists line management in establishing hazard controls
- Reviews chemical purchase requests
- Reviews justification for purchasing toxic and hazardous chemicals
- Approves standard operating procedures (SOPs) for gas cabinets
- Assists with annual reconciliation of work area inventories

2.8 Subcontractor

- Complies with all applicable ESH requirements
- Keeps on-site only those chemicals that are necessary to ensure proper performance of work for the current project, in a secure storage area with limited and controlled access, and properly segregated. Spill prevention and response, hazard communication, and related measures must be consistent with ESH requirements and documented in a site-specific safety plan (SSSP) (see Chapter 42, "Subcontractor Safety").

If using chemicals on-site not purchased through the Chemical Management System

- Obtains approval before bringing chemicals on-site
- Keeps a chemical inventory listing all chemicals being used
- Keeps a *safety data sheet (SDS)* for all chemicals being used and makes available upon request
- Submits quantified receipt and usage information if needed to meet regulatory reporting needs
- Removes all chemical products from the site at the completion of the project

2.9 Chemical Coordinator

- Coordinates chemical management services functions
- Assists chemical requesters and reviewers in using the Chemical Management System

2.10 ESH Program Manager / Chemical Reviewer

- Reviews purchase request notifications
- Evaluates purchase requests against process safety thresholds and program impact
- Reviews justification for purchasing toxic and hazardous chemicals

2.11 SLAC Fire Marshal

- Participates in Building Inspection Office reviews for California fire code and applicable NFPA compliance
- Reviews proposed chemical uses against building occupancy requirements

2.12 Building Inspection Office

- Reviews and approves projects, conventional and experimental, involving installation and construction of equipment, considering chemical inventory, quantity thresholds, and code requirements regarding safe chemical management.

2.13 Chemical Lifecycle Management Program Manager

- Assists line management in the implementation of safe chemical management and storage practices

- Reviews purchase request notifications
- Evaluates purchase requests against process safety thresholds and program impact
- Reviews and tracks justification for purchasing toxic and hazardous chemicals
- Coordinates the initial screening and tracking for chemicals
- Reconciles work area inventories and storage maps annually, with assistance as necessary from chemical storage asset custodians and ESH coordinators, and submits to San Mateo County to satisfy hazardous material business plan reporting obligations
- Ensures and documents that hazardous materials field verification (HMFV) is conducted on all chemical storage areas on a two-year cycle minimum. Higher hazard areas may be verified more frequently.
- Manages the chemical redistribution program
- Supports sustainability efforts related to toxic chemical inventory reduction by the encouraging use of less toxic substitutes and reducing the inventory of toxic materials
- Manages the ESH services of the CMS provider

3 Procedures, Processes, and Requirements

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

- Chemical Lifecycle Management: Planning Requirements (SLAC-I-730-0A09S-039). Describes requirements for approving planned uses, identifying hazards and establishing controls, and final disposition for chemicals and other hazardous materials
- Chemical Lifecycle Management: Purchasing Procedures (SLAC-I-730-0A09C-001). Describes process for ordering, delivery, and receipt of chemicals
- Chemical Lifecycle Management: Chemical Screening Requirements (SLAC-I-730-0A09S-033). Describes requirements for screening chemical purchase requests
- Chemical Lifecycle Management: Management and Use Requirements (SLAC-I-730-0A09S-038). Describes requirements for handling, use, storage, and inventorying of chemicals and other hazardous materials
- Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements (SLAC-I-730-0A09S-030). Describes requirements for storing and handling compressed gas cylinders (CGCs)
- Chemical Lifecycle Management: Portable Welding and Cutting Fuel Requirements (SLAC-I-730-0A09S-024). Describes requirements for storing and handling and using compressed gas cylinders (CGCs) used for welding and cutting
- Chemical Lifecycle Management: Chemical Storage Asset Requirements (SLAC-I-730-0A09S-018). Describes requirements for storing chemicals and other hazardous materials

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 Management Services Program Site (SharePoint)
- Chemical Management Services (CMS)

4 Training

There is no formal training required for this program. However, training is required for chemical safety and for specific chemicals and other hazardous materials. For chemical safety training, see Chapter 53, "Chemical Safety".

4.1 Chemical Management System Users

Chemical requesters and reviewers require the following for accessing and using the Chemical Management System

- A SLAC user ID and password are required for access.
- Additional system training may be required before making a purchase order.
- CMS procurement instructions can be found under SLAC How do I (HDI) resources: HDI for Employee and Faculty>Create a GSS Chemical Requisition.

5 Definitions

area, storage. A designated area, either indoors or outdoors, within which an inventory of material are not in the process of being used, loaded, or unloaded

area, work. A contiguous area controlled and used by one work group

cabinet, chemical storage. Any cabinet used for chemical storage. Special hazard classes require cabinets that meet code requirements (for example, flammable material storage or corrosive storage cabinets).

cabinet, gas. A ventilated enclosure for the safe storage of compressed gases

chemical. Any element, chemical compound, or mixture of elements and/or compounds (see also *hazardous material*)

chemical management services (CMS). A set of services provided to SLAC through which chemicals are ordered, inspected, delivered, inventoried, paid for and reported. (See also *Chemical Management System.*)

Chemical Management System. The software and material inventory management software system used to provide chemical management services. (See also *chemical management services.*)

chemical storage asset. Items used to either directly store hazardous materials or store containers of hazardous materials. These include bulk storage tanks, tube trailers, flammable container storage cabinets, corrosive material storage cabinets, chemical refrigerators, laboratory hoods with built-in storage cabinets,

other cabinets used to store lesser hazardous materials, and gas racks used to store compressed gas cylinders.

chemical storage asset custodian. The individual designated by line management as the responsible party for chemical storage assets. (See also *chemical storage asset.*)

compressed gas cylinder (CGC). A pressure vessel designed to hold compressed gas at an absolute pressure greater than 1 atmosphere at 68°F (20°C)

container. Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical

containment, secondary. There are two types: general and sized.

- *containment, secondary, general.* See also *containment, spill*.
- *containment, secondary, sized.* A specific spill containment method that contains the total contents of the primary container or more

containment, spill. Method of containing spills such as drip pans, gas cabinets, storm drain mats, absorbent material, double-walled piping and tanks, and response plans and equipment.(See also *spill prevention.*)

gas. A state of matter in which the matter expands to the confines of its container, such as a compressed gas cylinder. Gas properties and states include

- *gas, asphyxiant.* A material capable of reducing the level of oxygen in the body to dangerous levels, most commonly by displacing breathable air in an enclosed environment. Displacement reduces the oxygen concentration below the normal level, which is in the 21 percent range per the Compressed Gas Association. Oxygen deficiency can lead to breathing difficulties, unconsciousness or even death within minutes.
- *gas, compressed*. A material or mixture of materials that is a gas at ambient temperature and pressure but is contained in a CGC or other pressure vessel. Within the vessel, a compressed gas may be in a gaseous or liquid state, depending on its unique characteristics under particular temperature and pressure conditions.
- *gas, corrosive*. A gas that exhibits chemical properties that cause visible destruction of, or irreversible alterations in, living tissue and certain metals by chemical action at the site of contact
- *gas, flammable.* A material that is a gas at room temperature and that is ignitable at ambient temperature and pressure when in a mixture of 13 percent or less by volume with air
- *gas, inert.* A non-reactive, nonflammable, non-corrosive gas such as argon, helium, krypton, neon, nitrogen, and xenon
- *gas, oxidizing*. A gas that can support and accelerate combustion of other materials
- *gas, toxic.* A property of certain materials that causes injury, illness, or death when inhaled, ingested or absorbed through the skin if the material is not handled properly. The Compressed Gas Association defines a toxic gas as any gas that can kill 50 percent of the test subjects (LC_{50}) with a concentration of less than or equal to 5000 parts per million.

handling. The deliberate movement of material in containers by any means to a point of storage or use

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. (See also *chemical.*)

hazardous waste. Any hazardous material not appropriate for further use which meets the legal definition of a hazardous waste

occupancy classification. The purpose for which a building or part thereof is used or intended to be used

regulator. A device that controls the release of gas from CGCs

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

segregation. The separation of incompatible hazardous materials to reduce the risk of reactions in the event of a release

six pack. A gas delivery system that consists of a regulator, tubing, valves, and a metal frame that can hold up to six CGCs. Gas is delivered from one CGC at a time and each is emptied in turn.

spill prevention. Methods used to prevent unplanned release of toxic or hazardous materials (spills); may include valve locks, overfill prevention, high level alarms, inspections, and administrative controls. (See *spill containment.*)

tank. Container larger than 60 gallons (227 liters)

6 References

6.1 External Requirements

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

- Title 40, *Code of Federal Regulations*, "Protection of the Environment", Chapter 1, "Environmental Protection Agency (Continued)", Subchapter C, "Air Programs (Continued)", Part 68, "Chemical Accident Prevention Provisions" (40 CFR 68)
- Title 40, *Code of Federal Regulations*, "Protection of the Environment", Chapter 1, "Environmental Protection Agency (Continued)", Subchapter J, "Superfund, Emergency Planning, and Community Right-to-Know Programs"
  - Part 355, "Emergency Planning and Notification" (40 CFR 355)
  - Part 370,"Hazardous Chemical Reporting: Community Right-to-Know" (40 CFR 370)
  - Part 372, "Toxic Chemical Release Reporting: Community Right-to-Know" (40 CFR 372)
- *California Health and Safety Code*, Division 20, "Miscellaneous Health and Safety Provisions"
  - Chapter 6.67, "Aboveground Storage of Petroleum" (HSC 25270–25270.13)
  - Chapter 6.95, "Hazardous Materials Release Response Plans and Inventory" (HSC 25500–25545)

- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 4, "Construction Safety Orders", Article 32, "Oxygen, Acetylene, and Fuel Gas" (8 CCR 1739–1743)
- 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)
  - Article 109, "Hazardous Substances and Processes" (8 CCR 5160–5199)
  - Article 110, "Regulated Carcinogens" (8 CCR 5200–5220)
  - Article 112, "Labeling of Injurious Substances" (8 CCR 5225–5230)
- 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" (8 CCR 5415–5612)
- Title 19, *California Code of Regulations*, "Public Safety", Division 2, "California Emergency Management Agency", Chapter 4.5, "California Accidental Release Prevention (CalARP) Program Detailed Analysis", Article 8, "Regulated Substances for Accidental Release Prevention" (19 CCR 2770)
- Title 24, *California Code of Regulations,* "California Building Standards Code", Part 9, "California Fire Code", Chapter 34, "Flammable and Combustible Liquids" (24 CFR Part 9, Chapter 34)
- Unidocs. *Hazardous Materials Storage Secondary Containment Guidelines* (UN-083)
- American National Standards Institute (ANSI)
  - American Society of Mechanical Engineers (ASME)/ANSI A13.1, "Scheme for Identification of Pipelines" (ASME/ANSI A13.1)
  - American National Standards Institute (ANSI) Z49.1-2005, "Safety in Welding, Cutting and Allied Processes" (ANSI Z49.1)
- National Fire Protection Association (NFPA)
  - NFPA 30, *Flammable and Combustible Liquids Code* (NFPA 30)
  - NFPA 70, *National Electrical Code* (NFPA 70)
  - NFPA 704, "Standard System for the Identification of the Hazards of Materials for Emergency Response" (NFPA 704)
- Compressed Gas Association (CGA)
  - CGA P-1, "Safe Handling of Compressed Gases in Containers" (CGA P-1)

6.2 Related Documents

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

- Chapter 9, "Radiological Safety"
- Chapter 12, "Fire and Life Safety"
- Chapter 16, "Spills"

- Chapter 17, "Hazardous Waste"
- Chapter 22, "Waste Minimization and Pollution Prevention"
- Chapter 42, "Subcontractor Safety"
- Chapter 52, "Hazardous Materials and Waste Transportation"
- Chapter 53, "Chemical Safety"
- Chapter 58, "Laboratory Safety"

Other SLAC Documents

- HDI for Employee and Faculty>Create a GSS Chemical Requisition

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Planning Requirements

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

1 Purpose

The purpose of these requirements is to ensure adequate planning for the use of *chemicals* and other *hazardous materials*. They cover approving planned uses, identifying hazards and establishing controls, and final disposition. They apply to workers (as *chemical users*, *requesters,* and *receivers*), supervisors, ESH coordinators, the chemical lifecycle management program manager, and subcontractors.

2 Requirements

Before using a new chemical, workers and supervisors must plan for that use, considering the following:

1. The chemicals or types of chemicals to be used, their hazards and exposure limits, and their proposed storage and use locations
2. The building or area occupancy classification and the maximum chemical quantities allowed to ensure exempt or maximum amounts are not exceeded. The following occupancies are present at SLAC:
    1. A: assembly areas such as cafeteria and auditorium
    2. B: business areas, laboratories under exempt amounts, vocational shops
    3. F: factories and industrial areas
    4. S-1: moderate hazard storage and service garage
    5. S-2: low hazard storage

    Contact the SLAC fire marshal for details on occupancy and storage.[1]
3. Potential incompatibilities with other processes in the proposed work location
4. Potential hazard controls, including the need to acquire any specialized equipment, such as new spill kits, early warning devices, air monitoring equipment, emergency respiratory equipment, and chemical-specific antidotes (see Section 2.2, “Hazard Controls”)
5. The possibility of substituting a less hazardous substance
6. The possibility of acquiring the chemical from a fellow researcher/user at SLAC rather than placing a new order (see Section 2.3.1, “Redistribution”)
7. The ability to incorporate pollution prevention practices to minimize toxicity and quantity of all wastes and pollutants (see Chapter 22, “Waste Minimization and Pollution Prevention”)

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1 Refer to the California Building (24 CCR Part 2) and Fire (24 CCR Part 9) codes

8. The final disposition of the chemical

2.1 Approvals

The above considerations come into play when new chemicals and uses are being approved. In addition to project review by the Environment, Safety, and Health (ESH) Division (see ESH: Project Review Procedure), and work planning and control (Chapter 2, "Work Planning and Control"), the following may apply:

- Certain time-sensitive, highly hazardous, or toxic chemicals and threshold quantities for each are also subject to process safety analyses (see Section 2.1.1, "Process Safety Analyses").
- Additional approvals are required for experimental uses to ensure chemical hygiene requirements are met (see Laboratory Safety: Chemical Hygiene Plan).

2.1.1 Process Safety Analyses

SLAC is subject to two regulatory programs covering chemical process safety:

1. Cal/OSHA process safety management (8 CCR 5189) (see Appendix A for threshold quantities)
2. California Accidental Release Prevention Program (CalARP) (19 CCR 2735–2785) (see Article 8 for threshold quantities)

These two programs list certain highly hazardous or toxic chemicals and threshold quantities for each. If a facility uses one of these materials in any single process in an amount above the threshold quantity, the facility must prepare process safety management and accidental release prevention documentation for that process and implement the resulting safety and hazard control recommendations. The process safety management (PSM) program will be addressed with the help of ESH. The air quality program manager is responsible for the CalARP program. Any proposed new process at SLAC involving the use of chemicals listed on either the PSM or CalARP lists, or any modification of an existing process using these chemicals, must be reviewed by the appropriate program manager, who will perform a threshold determination analysis. In the event a threshold is exceeded, the line organization must change the process so exposure remains under threshold quantities, or perform the required safety studies and implement controls to satisfy the requirements of the PSM and CalARP programs.

2.2 Hazard Controls

To control exposure, the hazards associated with chemicals must be evaluated and appropriate hazard controls identified and implemented. Hazards should be eliminated through design or engineering before relying on administrative processes or personal protective equipment (PPE). Personnel selecting chemicals for use at SLAC will consider the following hazard controls:

2.2.1 Material / Process Design Selection

- Select the safest chemical for a given job.
- Use and store the smallest quantities necessary and minimize the amount of material on hand.
- Generate the smallest amount of hazardous waste.

2.2.2 Engineering Controls

- Provide engineering controls and suitable facilities to minimize hazards.
- Use the smallest vessels, apparatus, or equipment practical and safe for a given job.
- Complete design review to identify and qualify hazards, evaluate risks, and design appropriate control measures before installing equipment or using a chemical.
- Use warning devices (for example, horns and flashing lights).
- Comply with manufacturer operating instructions for equipment.

2.2.3 Administrative Controls

- Comply with purchasing procedures (see Chemical Lifecycle Management: Purchasing Procedures) and keep an accurate inventory (see Chemical Lifecycle Management: Management and Use Requirements).
- Take appropriate training.
- Review and understand safety data sheets on the materials being used.
- Label all chemicals and post appropriate hazard warning signs in areas of their use.
- Receive appropriate medical surveillance and certification.

2.2.4 Personal Protective Equipment

- Use appropriate personal protective equipment (PPE) for the chemicals involved, such as gloves, coveralls, aprons, indirectly vented goggles, and respirators (see Chemical Safety: Personal Protective Equipment Requirements).

2.3 Final Disposition

The end of the chemical lifecycle can take various forms. The material can be reused, recycled, returned, or become *hazardous waste* and disposed of or treated. Hazardous materials become hazardous waste not only when it is spent, contaminated, or spilt (or is an empty container last containing hazardous material), but also by a decision on its status, such as it is no longer useful or needed. Once a hazardous material meets the definition of a hazardous waste it must be managed more rigorously to meet regulatory requirements (see Chapter 17, "Hazardous Waste").

2.3.1 Redistribution

If the material is no longer needed or is excess inventory, SLAC encourages redistributing the material to another work group that can use it.

SLAC has various mechanisms to redistribute materials. Contact the chemical lifecycle management program manager for assistance.

2.3.1.1 In-house

SLAC will take any excess or unwanted material that is in good condition, even if it has been opened. This material will be stored for up to one year and made available at no cost to any work group that can use it.

2.3.1.2 Partnership with Stanford

SLAC has partnered with Stanford University to redistribute unopened laboratory chemicals. These chemicals are available for free to SLAC staff and users.

Note *Stanford does not accept compressed gases or opened containers.*

2.3.1.3 Direct Contact between Users

Chemical users can search the Chemical Management System to see who has ordered a material. This is a good route if chemical are needed in small amounts or immediately. For reports access, please contact the chemical coordinator.

2.3.1.4 Material Excess

If there is a large quantity of chemicals or a storage asset such as a tank, it can be characterized it as excess and posted it on the Department of Energy (DOE) Material Exchange for other DOE facilities to acquire for free.

2.4 Additional Subcontractor Requirements

Subcontractors using and storing their own chemicals on-site must meet the following additional requirements:

- Obtain ESH approval beforehand. This can be done through the ESH project review process (see ESH: Project Review Procedure).
- Have and make available upon request to the field construction manager (FCM)/service manager (SM) and contract administrator *safety data sheets (*SDSs*)* for all chemicals.
- Remove all chemical products from the site at the completion of their project.

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 40, "Chemical Lifecycle Management"
  - Chemical Lifecycle Management: Purchasing Procedures (SLAC-I-730-0A09C-001)
  - Chemical Lifecycle Management: Chemical Screening Requirements (SLAC-I-730-0A09S-033)
  - Chemical Lifecycle Management: Management and Use Requirements (SLAC-I-730-0A09S-038)
  - Chemical Management Services (CMS)
  - Chemical Management Services Program Site (SharePoint)
- Chapter 1, "General Policy and Responsibilities"
  - ESH: Project Review Procedure (SLAC-I-720-0A24C-001)
- Chapter 2, "Work Planning and Control"
- Chapter 17, "Hazardous Waste"
- Chapter 22, "Waste Minimization and Pollution Prevention"
- Chapter 30, "Air Quality"
- Chapter 53, "Chemical Safety"
  - Chemical Safety: Personal Protective Equipment Requirements (SLAC-I-730-0A09S-017)
- Chapter 58, "Laboratory Safety"
  - Laboratory Safety: Chemical Hygiene Plan (SLAC-I-730-0A09S-040)

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 5189, "Process Safety Management of Acutely Hazardous Materials" (8 CCR 5189)
- Title 19, *California Code of Regulations*, "Public Safety", Division 2, "California Emergency Management Agency", Chapter 4.5, "California Accidental Release Prevention (CalARP) Program Detailed Analysis", Article 8, "Regulated Substances for Accidental Release Prevention" (19 CCR 2770)
- Title 24, *California Code of Regulations*, "California Building Standards Code"
  - Part 2, "California Building Code" (24 CCR Part 2)
  - Part 9, "California Fire Code" (24 CCR Part 9)
- San Mateo County Health Department. California Accidental Release Prevention Program (CalARP)

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Purchasing Procedures

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

1 Purpose

The purpose of these procedures is to ensure that all purchases of *chemicals* and other *hazardous materials* are placed and tracked centrally and that new chemicals are screened against established criteria to support their safe management and use. They cover ordering, delivery, and receipt of chemicals. They apply to workers (as *chemical users*, *requesters,* and *receivers)*, their supervisors and line management, ESH coordinators, *chemical reviewers*, and the chemical lifecycle management program manager.

2 Procedures

2.1 Overview

SLAC utilizes the chemical management services supply chain model for chemical management. All chemical purchases must be initiated and fulfilled through the Chemical Management System. This greatly enhances SLAC's ability to comply with hazard communication, inventory, and usage reporting obligations. No other means of acquiring chemicals for on-site use is permitted without prior management approval and program review.

Chemicals are approved for specific *work areas*, based on use and amount. To ensure this, ESH coordinators, and ESH program managers as appropriate, are notified of all new purchase requests made through the system.

2.2 Chemical Management System Access

To access the Chemical Management System employees or approved users must have a SLAC user ID and password. For access contact the chemical lifecycle management program manager or ERP support. (See Chemical Management Services (CMS) for contact information and a list of chemical requesters, that is, personnel with current ordering privileges.)

2.3 Ordering from the System

Step	Person	Action
1.	Chemical user	Identifies the responsible requester by doing one of the following: ▪ Verifies access to the Chemical Management System

Step	Person	Action
		▪ Checks the list of CMS Requester List or ▪ Contacts the chemical coordinator
2.	Authorized CMS requester	Places chemical order through Chemical Management System The requesting process results in an e-mail notification to the financial approver, work area ESH coordinator, and in some cases, ESH program managers
3.	ESH coordinator	Reviews request based on knowledge work the area and consults ESH program managers if appropriate
4.	ESH program manager/chemical reviewer	Reviews request if appropriate (see Chemical Lifecycle Management: Chemical Screening Requirements)
5.	Financial approver	Approves the order if it is reasonable, within the approved financial limits, and is using the correct account number. Shipment does not occur until the order is approved. Financial approval is approval of the invoice. No further approval will be required except in the case when the supplier list price was not representative of actual cost.

2.4 Specific Acquisition Requirements

2.4.1 Special Hazard Chemicals

If a chemical being purchased from the system poses special hazards (for example, highly toxic, carcinogenic, highly flammable, reactive), further review may be required. This review will verify the intended use of the chemical includes the necessary considerations and controls to ensure it can be stored, used, and disposed of safely. If the safety and/or environmental issues cannot be resolved, acquisition of the chemical is denied until appropriate controls are determined. (See Chemical Lifecycle Management: Chemical Screening Requirements.)

Initially rejected chemical products that are highly toxic or could be replaced with safer, environmentally preferred products may be acquired only if they can be justified as mission critical with the implementation of appropriate safety control. Justification requires approval from the work area ESH coordinator and line management (and is documented using the Chemical Lifecycle Management: Toxic and Hazardous Chemical Justification Form).

2.4.2 Compressed Gas Cylinders

Returnable *compressed gas cylinders (CGCs)* must be used if available. If the product needed comes only in non-returnable or disposable cylinders, arrangements must be made for its final disposal as a condition of its purchase.

2.4.3 DEA Listed Materials or Precursors

The Drug Enforcement Administration (DEA) requires that any listed drug or precursor be highly controlled. The use of any DEA-listed material must follow the requirements of Stanford University's Controlled Substances and Precursor Chemicals Program. Listed precursors typically used in a laboratory

(iodine, for example) can however still be purchased through the Chemical Management System, provided additional controls are in place, such as secure and limited access and use and rigorous inventory control.

2.4.4 Ethanol (190 to 200 proof)

Ethanol is purchased through the Chemical Management System, but additional controls are required. It must be managed and physically controlled, from receipt to point of use, to prevent improper or illegal use and controls must include supervisory approval for issue and storage in locked repositories. Total quantities of one quart or more must be controlled as potable alcohol.

2.5 Delivery and Receipt

Chemical containers shipped to SLAC will be inspected and bar-coded before arrival on site. Chemicals, other than bulk gas or cylinders, directly shipped to SLAC from the manufacturing location and ethanol deliveries will be inspected upon delivery and bar-coded by the chemical coordinator.

Chemical receivers are responsible for inspecting the delivery for accuracy and container integrity before signing the shipping manifest. Shipments containing the wrong material or quantities need to be flagged for return or refund. Damaged containers should not be accepted. Highly toxic materials and those with inhalation hazards must be placed in a secure area immediately.

The following additional requirements apply to compressed gas deliveries:

- Chemical receivers must confirm proper labeling and inspect for damage and unsafe conditions at the point of delivery. If any cylinder is found to be improperly labeled, leaking, or damaged at the time of delivery, delivery must be refused.

Note *Subcontractors are responsible for ensuring that CGCs they bring on-site meet the equivalent safety precaution achieved by a point-of-delivery inspection.*

3 Forms

The following forms and systems are required by these procedures:

- Chemical Lifecycle Management: Toxic and Hazardous Chemical Justification Form (SLAC-I-730-0A09J-006). Form for documenting line management approval of a request to purchase chemical products that are highly toxic or could be replaced with safer, environmentally preferred products as mission critical, with the implementation of appropriate safety control
- Chemical Management System. System used for ordering and tracking chemicals and storing safety data sheets

4 Recordkeeping

The following recordkeeping requirements apply for these procedures:

- Purchase requests, inventories, and safety data sheets are maintained in the Chemical Management System.

5 References

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

- Chapter 40, "Chemical Lifecycle Management"
  - Chemical Lifecycle Management: Planning Requirements (SLAC-I-730-0A09S-039)
  - Chemical Lifecycle Management: Chemical Screening Requirements (SLAC-I-730-0A09S-033)
  - Chemical Management Services (CMS)
  - Chemical Management Services Program Site (SharePoint)
  - CMS Requester List

Other Documents

- Stanford University, Office of Environmental Health and Safety. Stanford University Controlled Substances Program

NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Chemical Screening Requirements

Product ID: 460 | Revision ID: 2383 | Date published: 26 May 2021 | Date effective: 26 May 2021
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemmanageReqChemScreen.pdf

1 Purpose

The purpose of these requirements is to reduce risk by identifying hazards and implementing appropriate controls before a toxic or hazardous chemical is delivered to the site or by substituting an acceptable, less hazardous, alternative product or process. They cover the screening of chemical purchase requests. They apply to ESH coordinators and ESH program managers as *chemical reviewers*. Management and staff may refer to the criteria to make informed chemical and product selections, thereby shortening the review process.

2 Requirements

All chemical orders must be reviewed by Environment, Safety, and Health (ESH) coordinators before purchase (see Chemical Lifecycle Management: Purchasing Procedure). Additional review by ESH program managers may also be appropriate. Review must be done in a timely manner, and based on clear and transparent criteria.

2.1 Chemical Reviewers

Chemical reviewers must have

- Comprehensive knowledge of applicable regulatory lists and requirements
- Ability to interpret *safety data sheets (SDSs)*
- Chemical Management System ESH reviewer status

Backup within each group is highly recommended to ensure continuity. Directorate and local ESH coordinators are vital in this review because of their process knowledge and understanding of the organizational needs of the users and existing controls.. The chemical lifecycle management program manager is the point of contact regarding chemical reviewer assignments.

Table 1 Review Groups and Areas of Responsibility

Discipline / Group	Subject or Area of Review Responsibility
Industrial Hygiene (IH)	Exposure, nanomaterial safety
SLAC fire marshal and Emergency Management	Fire safety, emergency management

Discipline / Group	Subject or Area of Review Responsibility
Hazardous Waste (HW)	Disposal restrictions
Waste Minimization / Pollution Prevention (WM/P2)	Preferred purchases (Greener Choice)
Water	Industrial wastewater discharge, stormwater discharge, groundwater discharge
Air Quality (AQ)	Permitted air emissions, greenhouse gases (GHGs), ozone depleting substances (ODSs), hazardous air pollutants (HAPs)
Radiation Protection (RP)	Radioactive and nuclear materials
Chemical Management Services (CMS) / Chemical Lifecycle Management	Chemical storage and inventory

2.2 Chemical Categorization

2.2.1 Categorization Considerations

For chemical screening purposes, chemicals are divided into the following four categories:

1. Banned
2. Of concern
3. Material-restricted
4. Use-restricted

A description of each category follows. In arriving at a categorization the SME may review various information sources and consider many factors, including the following:

- Analysis of the product SDS
- Identification of human toxicity and analysis of potential for exposure
- Identification of environmental toxicity and potential exposure, including impacts to air and water quality, soils/land, and climate, including an analysis of environmental persistence and bioaccumulation
- Availability of substitutes that deliver required performance
- Availability of controls to manage identifiable risks (for example, process design, engineering, administrative, or personal protective equipment)
- Consideration of the quantity in use and/or storage
- Impacts on mission capability and business costs, including decontamination and disposal costs
- Comparison of chemicals or constituents against applicable regulatory and environmental hazard lists such as priority chemicals identified by the United States Environmental Protection Agency (EPA), any agency-specific toxic or hazardous chemical lists, and emerging contaminants identified by the United States Geological Survey (USGS)

2.2.2 Categories

Categories provide a framework for the review process and assist in identifying risk types, such as exposure or environmental release. Understanding the category helps in determining controls so that the chemical can be used safely.

Note *If a chemical belongs to more than one category, use the more restrictive.*

Table 2 Toxic and Hazardous Chemical Categories

Category	Description
Banned	The following are banned for use at SLAC due to SLAC policy and Department of Energy (DOE) or regulatory directives: ▪ Polychlorinated biphenyls (PCBs) (see Chapter 32, "Polychlorinated Biphenyls") ▪ Department of Transportation (DOT) Class 1.1: Explosives (49 CFR 173.50) Explosive substances release pressure, gas, and heat suddenly when they are subjected to shock, heat, or high pressure. Division 1.1: Explosives with a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously. Examples: dynamite, TNT, black powder. ▪ Class I ozone-depleting substances (ODSs). ODSs were banned completely in 2010; however there is an exemption for laboratory and analytical uses as defined by EPA. This exemption has been extended through December 31, 2021. (See Chapter 30, "Air Quality") ▪ Banned asbestos products (see Chapter 27, "Asbestos") ▪ Controlled substances listed in the Stanford University Controlled Substances Program ▪ Lead paint, lead shot, or lead wool (see Chapter 20, "Lead Safety")
Of concern	Materials that are judged to pose a higher exposure or environmental risk fall into one of several types as listed below. This category of materials may require justification for use. Safer alternatives should be evaluated. **Highly hazardous materials** These materials present an exposure risk to workers, emergency responders, and the surrounding community due to physical and chemical hazards. Chemicals with the following properties are of particular concern: ▪ Time sensitive ▪ Highly reactive, water reactive, or pyrophoric (butyllithium solutions in solvents) ▪ Explosive (such as heavy metal azides, perchlorates with heavy metals, picric acid [[f dry], and peroxide-forming substances) ▪ Highly corrosive (concentrated, glacial, fuming acids, concentrated bases) ▪ Highly toxic (cyanide compounds, due to potential generation of HCN gas), isocyanates (especially MDI), chromium (especially Cr+6), cadmium, lead, nickel, beryllium, including Cu-Be alloys ▪ Chemicals with permissible exposure levels (PELs) that are below levels that can be monitored ▪ Cal / OSHA-listed hazardous and toxic substances (8 CCR 5160–5199)

Category	Description
	▪ Cal / OSHA-listed carcinogens, mutagens, teratogens, reproductive toxins (8 CCR 5209 ▪ Proposition 65 (see chemical lifecycle management program manager for current list **Persistent, bio-accumulative, and toxic pollutants (PBTs)** The EPA's Persistent Bio-accumulative and Toxic (PBT) Chemical Program addresses chemicals that are a risk due to their persistence, bioaccumulation within the food web, and toxicity to living organisms. PBTs transfer relatively easily among air, water, and land, and span boundaries of regulatory programs, geographic entities, and generations, and so require stringent controls to prevent release into the environment. **Priority chemicals** The National Waste Minimization Program focuses efforts on reducing 31 priority chemicals (PCs) found in our nation's products and wastes by finding ways to eliminate or substantially reduce their use by recovering or recycling them.
Material-restricted	Release of these materials are subject to regulatory thresholds that must not be exceeded and apply to the SLAC site as a whole. Every instance of product use must be tracked by work groups and areas. ▪ Total toxic organics (TTO) must never exceed levels specified in the *Solvent Management Plan (SMP)*. For information, see Chapter 43, "Industrial Wastewater". ▪ Hazardous air pollutants listed in Chapter 30, "Air Quality" ▪ Greenhouse gases such as carbon dioxide, methane, nitrous oxide, and fluorinated gases, many of which have high global warming potential and include sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs) and perfluorinated compounds (PFCs) ▪ Ozone-depleting substances, Class II ODS; no production or importing of 90% of hydrochlorofluorocarbons (HCFCs) will be implemented by 2015 with a complete ban of ODSs to be implemented by 2030. ▪ Non-exempt uses of high volatile organic content (VOC) material, which generally includes products that contain more than 300 grams/liter (g/l) VOCs. Note: Bay Area Air Quality Management District (BAAQMD) regulations include specific limits in the 50-800 g/l range (for example, the limit for lacquer thinner is 50 g/l).
Use-restricted	The following materials may only be used in a specified area or process and/or are kept under specified quantity thresholds. This category includes justified mission-critical materials of concern. Use-restricted products must be highly controlled and may require additional work planning and control procedures. ▪ Radioactive materials and standards require prior approval by the Radiation Protection Department and specified training. See ESH Manual, Chapter 9, "Radiological Safety". ▪ Nuclear materials listed in Department of Energy Order 474.2, Change 4, "Nuclear Material Control and Accountability" (DOE O 474.2, Chg 4 [PgChg]), including nonradioactive deuterium (in any form), tritium, and lithium-6, must be approved by the Radiation Protection Department prior to ordering.

Category	Description
	▪ Cyanide salts can be used only within the constraints of the SLAC *Risk Management Plan.* ▪ Mercury-containing apparatus and equipment cannot be purchased unless the exceptions specified by the California Department of Toxic Substances Control (DTSC) are met (see DTSC Fact Sheet). (See also DTSC's "Mercury in Thermostats" and *California Health and Safety Code*, Division 20, Chapter 6.5, Article 10.2.1 [HSC 25214.8.1-25214.8.6].) ▪ Asbestos-containing products can be purchased and used only if approved by the asbestos program manager and the air quality program manager. ▪ Materials with a National Fire Protection Association (NFPA) health rating of 3 or 4 must remain at or below quantities that can be "easily and safely manipulated by one person" (8 CCR 5191) unless approved by the fire marshal. Additional assessment may be required if these materials are stored or used in an area above 5 gallons and all must be tracked (inventoried) in one-gallon quantities. ▪ New lead purchases must be justified in part by determining that on-site stock will not meet user/requesters requirements (see Chapter 20, "Lead Safety"). ▪ DEA listed precursors (Stanford University Controlled Substances Program) must have a rigorous inventory control process and must be stored in a secured area. ▪ Small volumes of material with high VOC content can be approved for specified uses with the approval of the air quality program manager. ▪ Toxic gases can be purchased only if they can be managed safely.

2.3 Preferred Materials

Identifying chemicals and products with fewer health and environmental risks that meet performance specifications is an integral part of the ESH chemical screening process, and supports the federal government's goals to reduce the quantity of toxic and hazardous chemicals and materials acquired, used, or disposed.

2.3.1 Greener Choices

The Chemical Management System identifies preferable "Greener Choice" products for a number of applications. A "Greener Choice" product is typically one that has been certified as "green" by an outside organization, such as products certified by Green Seal, EcoLogo, or the EPA's Design for the Environment program, or certified as BioPreferred by the USDA. "Greener Choices" exhibit some or all of the following attributes:

- Minimize exposure to concentrated chemicals
- Reduced or non-ozone depleting substances
- Reduced bio-concentration and toxicity
- Reduced flammability (Hazardous Materials Information System [HMIS] / NFPA ratings of 1 or 2 preferably)
- Reduced or no added dyes, except when added for safety purposes

- Reduced or no added fragrances
- Reduced or no skin irritants
- Reduced or no VOCs
- Reduced packaging
- Recyclable packaging
- Recycled content in packaging
- Reduced use of disinfectants

2.3.2 Resources

Chemical requesters and ESH reviewers can use the resources in the following table to identify environment-friendly products.

Table 3 Environment-friendly Product Resources

Product Category	Resources	Legal and Other Requirements
Recycled content	▪ US EPA Comprehensive Procurement Guidelines	▪ EO 13514, "Federal Leadership in Environmental, Energy, and Economic Performance" ▪ EO 13423, "Strengthening Federal Environmental, Energy, and Transportation Management" ▪ Resource Conservation and Recovery Act (RCRA), Section 6002 (42 USC 6962) ▪ "Comprehensive Procurement Guideline for Products Containing Recovered Materials" (40 CFR 247)
Environmentally preferable	▪ US EPA Environmentally Preferable Purchasing ▪ Green Seal ▪ EcoLogo ▪ EPA Safer Choice	▪ EO 13514 ▪ EO 13423
Bio-based	▪ USDA Bio-Preferred	▪ EO 13514 ▪ EO 13423 ▪ Farm Security and Rural Investment Act of 2002, Section 9002 (7 USC 8102)
Alternative fuels, fuel efficiency	▪ US DOE Federal Energy Management Program: Federal Fleet Management Requirements ▪ US DOE Energy Efficiency and Renewable Energy: Vehicle Technologies Office	▪ EO 13514 ▪ EO 13423 ▪ Energy Policy Act of 1992 (EPAct), Section 303 (42 USC 13212)

Product Category	Resources	Legal and Other Requirements
Non-ozone depleting substances	▪ US EPA Ozone Layer Depletion – Alternatives / SNAP	▪ Clean Air Act, Section 613 (42 USC 7671)

** Other requirements include applicable Federal Acquisition Regulation (FAR) and Department of Energy Acquisition Regulations (DEAR), as specified in the DOE/SU Contract*

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 40, "Chemical Lifecycle Management"
  - Chemical Lifecycle Management: Purchasing Procedure (SLAC-I-730-0A09C-001)
  - Chemical Management Services (CMS)
  - Chemical Management Services Program Site (SharePoint)
  - CMS Requester List
- Chapter 9, "Radiological Safety"
- Chapter 20, "Lead Safety"
- Chapter 27, "Asbestos"
- Chapter 30, "Air Quality"
- Chapter 32, "Polychlorinated Biphenyls"
- Chapter 43, "Industrial Wastewater"

Other SLAC Documents

- *Risk Management Plan*
- *Solvent Management Plan* (SLAC-I-750-3A03M-001)

Other Documents

- Title 7, *United States Code*, "Agriculture", Chapter 107, "Renewable Energy Research and Development", Section 8102, "Biobased Markets Program" (7 USC 8102)
- Title 42, *United States Code*, "The Public Health and Welfare", Chapter 82, "Solid Waste Disposal", Subchapter 6, "Federal Responsibilities", Section 6962, "Federal Procurement" (42 USC 6962)
- Title 42, *United States Code*, "The Public Health and Welfare", Chapter 85, "Air Pollution Prevention and Control", Subchapter 6, "Stratospheric Ozone Protection", Section 7671, "Definitions" (42 USC 7671)
- Title 42, *United States Code*, "The Public Health and Welfare", Chapter 134, "Energy Policy", Subchapter 1, "Alternative Fuels-General", Section 13212, "Minimum Federal Fleet Requirement" (42 USC 13212)
- Title 40, *Code of Federal Regulations*, "Protection of the Environment", Chapter 1, "Environmental Protection Agency", Part 247, "Comprehensive Procurement Guideline for Products Containing Recovered Materials" (40 CFR 247)
- Title 49, *Code of Federal Regulations*, "Transportation", Subtitle B, "Other Regulations Relating to Transportation", Chapter 1, "Pipeline and Hazardous Materials Safety Administration, Department of Transportation", Part 173, "Shippers: General Requirements for Shipments and Packaging", Subpart C, "Definitions, Classification, and Packaging for Class 1" (49 CFR 173.50)
- Executive Order (EO) 13423, "Strengthening Federal Environmental, Energy, and Transportation Management" (EO 13423)
- Executive Order (EO) 13514, "Federal Leadership in Environmental, Energy, and Economic Performance" (EO 13514)
- Department of Energy Contract DE-AC02-76SF00515
- Department of Energy Order 474.2, Change 4, "Nuclear Material Control and Accountability" (DOE O 474.2, Chg 4 [PgChg])
- *California Health and Safety Code*, Division 20, "Miscellaneous Health and Safety Provisions", Chapter 6.5, "Hazardous Waste Control", Article 10.2.1, "Mercury-Added Thermostats, Relays, Switches, and Measuring Devices" (HSC 25214.8.1-25214.8.6)
- 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" (8 CCR 5139–5230)
- Department of Agriculture. Bio-Preferred
- Department of Energy. Energy Efficiency and Renewable Energy: Vehicle Technologies Office
- Department of Energy. Federal Energy Management Program: Federal Fleet Management Requirements Resource Center
- Environmental Protection Agency. Greenhouse Gas Emissions
- Environmental Protection Agency. Safer Choice
- Environmental Protection Agency. Sustainable Marketplace: Greener Products and Services
- Environmental Protection Agency. Ozone Layer Protection
- Environmental Protection Agency. Significant New Alternatives Policy (SNAP) Program
- Environmental Protection Agency. Ozone-depleting Substances

- Environmental Protection Agency. Phaseout Exemptions for Laboratory and Analytical Uses
- Environmental Protection Agency. Persistent Bioaccumulative Toxic (PBT) Chemicals Covered by the TRI Program
- Environmental Protection Agency. Wastes: Hazardous Waste: Waste Minimization
- Environmental Protection Agency. Wastes: Hazardous Waste: Waste Minimization: Priority Chemicals
- Environmental Protection Agency. Comprehensive Procurement (CPG) Guideline Program
- Occupational Safety and Health Administration (OSHA). Safety and Health Topic: Chemical Hazards and Toxic Substances
- Occupational Safety and Health Administration (OSHA). Safety and Health Topic: Isocyanates
- California Department of Toxic Substances Control. Products and Devices That Contain Mercury
- California Department of Toxic Substances Control. Mercury in Thermostats
- California Office of Environmental Health Hazard Assessment. Proposition 65
- UL. EcoLogo Certification Program
- Green Seal. Certified Products and Services
- Stanford University, Office of Environmental Health and Safety. Stanford University Controlled Substances Program

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Toxic and Hazardous Chemical Justification Form

Product ID: 461 | Revision ID: 2384 | Date Published: 26 May 2021 | Date Effective: 26 May 2021
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemmanageFormChemJust.pdf | .docx

This form documents line management approval of a request to purchase chemical products that are highly toxic or could be replaced with safer, environmentally preferred products but are mission critical. The chemical lifecycle management program manager issues this form to the user/requester if ESH review of a request finds that the toxic or hazardous chemical 1) falls into one of the chemical categories (banned, of concern, material-restricted, use-restricted) based on hazard or regulatory status, and 2) there are less toxic substitutes, or 3) this chemical exceeds screening criteria but is mission-critical. The requester submits the completed form to the chemical lifecycle management program manager.

See Chemical Lifecycle Management: Purchasing Procedure (SLAC-I-730-0A09C-001) and Chemical Lifecycle Management: Chemical Screening Requirements (SLAC-I-730-0A09S-033).

1 Request to purchase chemical *(completed by user/requester)*

Name:		Phone number:	E-mail:
Directorate:	Dept/group:	Dept/group code:	Mail stop:
Safety data sheet (SDS) attached? ☐ Yes ☐ No			
Product name:		Manufacturer:	
Container size *(specify units)*:		Proposed storage location:	
Estimated maximum quantity *(# of containers)*:		Average quantity:	
Mission-critical activity description: Sample form, see URL at top of page			
How will this product be used? (maintenance, construction, research, fabrication, synthesis)			
Less toxic or hazardous substitute was not *procured* because it is not available *(select all that apply)*: ☐ Within a reasonable period of time ☐ At a reasonable price ☐ Within performance requirements Other *(explain)*:			
Provide a detailed justification and attach supporting documentation for each indicated reason:			
Check if applicable and provide supporting documentation: ☐ Safe storage, use, and disposal controls have been identified, implemented and personnel are trained in their use.			
Signature:		Date:	

2 Review *(completed by ESH coordinator)*

Select one:

☐ I have verified that appropriate controls are in place for the use described.

☐ Appropriate controls are not in place and the request for the item is not approved.

Name:

Title:

Signature: Date:

3 Approval *(completed by line management)*

Select one:

☐ The use is justified and this item is approved for the use described.

☐ The request for the item is not approved.

Name:

Title:

Signature: Date:

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Management and Use Requirements

Product ID: 635 | Revision ID: 2385 | Date published: 26 May 2021 | Date effective: 26 May 2021
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemmanageReqManage.pdf

1 Purpose

The purpose of these requirements is to ensure the safe management and use of *chemicals* and other *hazardous materials*. They cover handling, use, storage, and inventorying of chemicals. They apply to workers (as *chemical users*, *requesters,* and *receivers)*, supervisors, *chemical storage asset custodians*, ESH coordinators, the SLAC fire marshal, and the chemical lifecycle management program manager.

2 Requirements

2.1 Handling and Use

Before using any chemical

- Check that all chemical *containers* are labeled properly (see Chemical Safety: Hazard Communication Requirements).
- Review the *safety data sheet (*SDS*)* and any applicable safe handling guideline and work planning and control documents, such as a job safety analysis or standard operating procedure, for specific hazards and controls.
- Review emergency measures:
  - Any local emergency procedures
  - Location and use of the nearest eyewash station and safety shower
  - Location and use of any chemical-specific antidotes
  - Location and use of the nearest fire extinguisher, emergency exit, and fire pull box and telephone for emergency notification
- Check that all controls are in place and working (such as personal protective equipment and ventilation.)

When using any chemical

- Handle chemicals carefully at all times, store in appropriate containers, and close containers after use.
- Transport chemicals in proper carrying devices (see Chapter 52, "Hazardous Materials and Waste Transportation").

For the safe handling of compressed gases, see Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements; for use, see Pressure Systems: Installation, Inspection, Maintenance, and Repair Requirements.

2.2 Fire Prevention

The following requirements are specific to fire hazards of chemicals:

- Take measures to prevent ignition of flammables. Smoking, welding, cutting, grinding, and using open flames or ordinary electric equipment in the vicinity of flammable materials is prohibited. Contact the fire marshal for specific distance requirements. NO SMOKING signs must be posted on or near storage cabinets for flammables and in areas where flammables are stored, handled, or used.
- Anticipate the type of fire extinguisher required should an experiment or other use of chemicals result in a fire. Contact the fire marshal for information regarding type, spacing, and location of fire extinguishers.
- Equipment and containers dispensing flammable or combustible liquids must be properly bonded and grounded to prevent the accumulation of static electricity and a potential ignition source.
- Electrical wiring and equipment in close proximity to flammable and combustible liquids, flammable gases, and flammable solids must be installed and maintained in accordance with Section 500 of the NFPA *National Electrical Code* (NFPA 70) and Chapter 34 of the *California Fire Code* (24 CCR Part 9). Such operations must be classified appropriately and the appropriate class of electrical equipment must be used. Contact the fire marshal to assist in this classification.
- An open flame should only be used when necessary and authorized and extinguished when it is no longer needed.

See Chapter 12, "Fire and Life Safety", for information about fire prevention, protection, and suppression.

2.3 Storage

2.3.1 General

In any single room or laboratory, the quantity of any one chemical should be kept to a minimum. Any exceptions to the storage occupancy amounts or permissible exterior storage amounts in the *California Fire Code* (24 CCR Part 9) must be approved in writing by the fire marshal and line management (see Chemical Lifecycle Management: Planning Requirements). Managers may choose to further limit the amount of chemicals stored or used at their building, facility, or facility area when required to provide a safe work environment for personnel.

Best management practices for the storage of chemicals include the following:

- Only store what can be used within a reasonable amount of time, usually one year.
- Provide a designated storage place for each chemical and return the chemical to that location after each use.
- Store chemicals at or below eye level; keep lids and caps on securely when returning to storage.
- Avoid storing chemicals on bench tops, except for chemicals currently being used.

- Do not store chemicals in laboratory hoods except for those in use.
- Protect stored chemicals from direct heat or sunlight.

2.3.1.1 Additional Subcontractor Requirements

Subcontractors using and storing their own chemicals on-site must meet the following additional requirements:

- Keep on-site only those chemicals that are necessary to ensure proper performance of work for the current job.
- Have and make available upon request to the field construction manager (FCM)/service manager (SM) and contract administrator safety data sheets (SDSs) for all chemicals.
- Label all containers with either the original product label or an appropriate secondary label that clearly communicates what the material is, along with its hazards and enough information to determine which SDS is applicable (for example, unique ID or manufacturer information).
- Placard storage areas in use longer than 30 days in compliance with NFPA 704. Any material with an NFPA health hazard rating of 3 or 4, in quantities that equal or exceed 5 gallons, 40 pounds, or 200 cubic feet, must be reported to the SLAC fire marshal.
- Inventory and map locations of chemicals above threshold quantities (55 gallons, 200 cubic feet, or 500 pounds) and stored on-site longer than 30 days. This information must be made available to the FCM/PM, the SLAC fire marshal, and the chemical lifecycle management program manager.

2.3.2 Storage Area Access

All storage areas must be secured to prevent access by unauthorized personnel.

2.3.2.1 Additional Subcontractor Requirements

Subcontractors using and storing their own chemicals on-site must ensure SLAC Site Security, chemical lifecycle management, and emergency response personnel have access to their chemical storage areas for inspection and response purposes. Locks must be keyed to be opened by the SLAC master key. Subcontractor locks will be cut if this requirement is not met.

2.3.3 Chemical Storage Asset Custodian Program

SLAC has implemented a program to ensure ownership of every *chemical storage asset* or *area*. For each asset or area, a *custodian* is designated by line management and given authority and responsibility for the safe storage within that asset, including carrying out periodic inspections. (See Chemical Lifecycle Management: Chemical Storage Asset Requirements.)

2.3.4 Proper Segregation of Incompatible Chemicals

Many chemicals are incompatible with one another and must be kept separate to avoid the dangerous reactions that would occur if they mixed. This can be accomplished by distance or by *secondary*

containment, depending on the type of incompatibility, the severity of any possible reactions, and the quantities of the respective chemicals[1].

Incompatible chemicals must be separated when the stored chemicals are in containers having a capacity of more than five pounds of solid (2.3 kilograms) or 0.5 gallon of liquid (1.9 liters). Incompatible gases in cylinders with an internal volume of 2 liters or greater may not be stored within the same cabinet or exhausted enclosure.[2] Separation can be accomplished by one of the following techniques:

- Segregating incompatible chemicals storage by a distance of not less than 20 feet (6.1 meters)
- Isolating incompatible gas storage by a noncombustible partition extending not less than 18 inches (0.46 meter) above and to the sides of the stored gas
- Storing liquid and solid chemicals in hazardous materials storage cabinets meeting fire and building code specifications
- Storing compressed gases in approved gas cabinets or exhausted enclosures meeting fire and building code specifications

Do not store chemicals alphabetically as a general group. Chemicals may be separated into compatible groups and stored alphabetically within those compatible groups. Observe all precautions regarding the storage of incompatible chemicals and refer to the safety data sheet (SDS) and any applicable SLAC safe handling guidelines. (See Chemical Safety: Safe Handling Guidelines.)

2.3.5 Time- or Shock-sensitive Chemicals

Because many chemicals cannot be stored indefinitely, the user should establish shelf-life guidelines. Chemicals that form peroxides or are shock-sensitive should be marked in accordance with the criteria set forth for unstable, time-sensitive, and pyrophoric chemicals:

- Write the date received and date opened on all containers of shock-sensitive and peroxide-forming chemicals. Some chemicals become increasingly sensitive with age.
- Unless an inhibitor was added by the manufacturer, closed containers of shock-sensitive or peroxide-forming materials should be discarded after one year.

2.3.6 Storage of Compressed Gases

Storage requirements for gases are described in Chemical Lifecycle Management: Chemical Storage Asset Requirements. All safety requirements and precautions pertaining to the class of hazard the gas belongs to must be observed.

2.3.7 Storage of Acetylene and Oxygen Gas Cylinders Used for Welding

Special requirements apply to the storage (and handling and use) of portable gas cylinders used for welding. (See Chemical Lifecycle Management: Portable Welding and Cutting Fuel Requirements.)

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1 See Stanford University's Chemical Safety: Storage Groups. Also, the American Institute of Chemical Engineers (AIChE) has made available a chemical reactivity worksheet (CRW) that allows one to identify the reactivity of substances or mixtures of substances.

2 Lecture bottles have an internal volume of approximately 0.5 liter.

2.3.8 Seismic Restraints

Safe chemical storage includes providing seismic restraints. Chemical storage and work areas must be evaluated for possible earthquake hazards and mitigations. Include the following:

- Use shelf lips, wire kept taut by a spring, or individual container restraints and cabinet door locking systems instead of bungee cords. A two-inch lip is recommended for laboratories.
- Anchor all tall furniture and storage cabinets to the wall and/or floor. Fallen cabinets frequently block exit paths if not anchored.
- Use engineered restraints on storage cabinets with contents that weigh 400 pounds or more.
- Store heavy items on lower shelves and never store liquids above eye level.

2.4 Spill Prevention and Containment

Spill prevention is an umbrella term to cover all methods used to prevent unplanned release of chemicals. It can include engineered and administrative controls. Examples of spill prevention methods are valve locks, overfill prevention, high-level alarms, and inspections. The purpose of spill prevention in any of its forms is to prevent

- Worker exposure
- Mixing of incompatible materials
- Release to the environment

A method to contain spills is often used. *Spill containment* can include drip pans, gas cabinets, storm drain mats, and absorbent material, as well as double-walled piping and tanks.

2.4.1 Secondary Containment

Secondary containment is required if the following conditions are met:

1. A chemical could come in contact with an incompatible material (that is, it could produce an incompatible chemical reaction, for example, emitting toxic gas, igniting, or exploding).
2. A chemical could threaten personnel or the environment (for example, by contaminating soil or water directly or entering a floor drain or sink) if it escapes from its primary container

General secondary containment is seen in laboratories when containers are in trays, but the trays are not sized to contain the full content of the container.

Sized secondary containment is more specific and is required when any single container is in excess of 55 gallons of liquid, 550 pounds for solids, or when the aggregate capacity of multiple vessels exceeds 1,000 gallons (10,000 pounds for solids).

2.4.2 Spill Response

A chemical spill is the release of any hazardous chemical from its primary container that results in an increased risk or potential risk to human health, the environment, and property. Refer to Chapter 16, “Spills”, for detailed information about spill response.

Note *Preparation is essential to minimizing the hazards caused by a chemical spill. Assemble a chemical spill kit, and understand the hazards associated with the chemicals used and stored in the work area. Consult the SDS for more information. Post an emergency telephone call list near the entrance to each work area as appropriate.*

2.5 Transfer or Repackaging of Chemicals

Gas delivered in refillable cylinders, unlike dewars, cannot be refilled at SLAC and may only be refilled by the gas supplier. Liquid and solid hazardous material that is transferred or repackaged must have a secondary label (see Chemical Safety: Hazard Communication Requirements). This includes squirt bottles and safety cans.

2.6 Inventory and Use Reporting

A current, accurate inventory of *chemicals* and other *hazardous materials* must be maintained by line management for each work area, both for reporting purposes described below and for hazard communication (see Chemical Safety: Hazard Communication Requirements). All chemicals purchased through the Chemical Management System can be captured for inventory. Contact the chemical lifecycle management program manager for assistance in generating a work-area-specific inventory. Programmed barcode scanners are available for use in developing these reports. Chemicals purchased before 2006 or research samples may not be captured in the Chemical Management System and may require physical inventory by work area personnel.

2.6.1 Hazardous Materials Inventory Statement

Work area inventories are reconciled annually by the chemical lifecycle management program manager, with assistance as necessary from chemical storage asset custodians and ESH coordinators, and submitted to San Mateo County (the certified unified program agency [CUPA] for SLAC) to satisfy hazardous material business plan reporting obligations.

2.6.2 Chemical Use Reporting

SLAC has reporting requirements for numerous programs within the Environment, Safety, and Health Division (ESH) associated with chemical use, as well as internal reporting programs required by the Department of Energy. Some of the more important programs that require such information include SLAC's annual emissions report, hazardous materials business plan, and toxic release inventory (TRI) submittals. The chemical lifecycle management program manager has the responsibility to establish the necessary Chemical Management System reporting templates to support this reporting.

2.6.2.1 Additional Subcontractor Requirements

Subcontractors using and storing their own chemicals on-site must meet the following additional requirements:

- Provide both a pre-work chemical list and post-work chemical usage report to the FCM/SM.
- Log fuel consumption for hazardous materials equipment.
- Submit quantified receipt and usage information if needed to meet regulatory reporting needs.

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:

- A hazard communication inventory listing all the chemicals present in an area will be maintained, either through the Chemical Management System or locally.

5 References

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

- Chapter 40, "Chemical Lifecycle Management"
  - Chemical Lifecycle Management: Planning Requirements (SLAC-I-730-0A09S-039)
  - Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements (SLAC-I-730-0A09S-030)
  - Chemical Lifecycle Management: Portable Welding and Cutting Fuel Requirements (SLAC-I-730-0A09S-024)
  - Chemical Lifecycle Management: Chemical Storage Asset Requirements (SLAC-I-730-0A09S-018)
  - Chemical Management Services (CMS)
  - Chemical Management Services Program Site (SharePoint)
- Chapter 1, "General Policy and Responsibilities"
- Chapter 2, "Work Planning and Control"
- Chapter 12, "Fire and Life Safety"
- Chapter 14, "Pressure Systems"
  - Pressure Systems: Installation, Inspection, Maintenance, and Repair Requirements (SLAC-I-730-0A21S-053)
- Chapter 16, "Spills"
- Chapter 52, "Hazardous Materials and Waste Transportation"
- Chapter 53, "Chemical Safety"
  - Chemical Safety: Hazard Communication Requirements (SLAC-I-730-0A09S-042)
  - Chemical Safety: Safe Handling Guidelines
- Chapter 58, "Laboratory Safety"

Other Documents

- Title 24, *California Code of Regulations*, "California Building Standards Code", Part 9, "California Fire Code", Chapter 34, "Flammable and Combustible Liquids" (24 CFR Part 9, Chapter 34)
- National Fire Protection Association (NFPA) 30, *Flammable and Combustible Liquids Code* (NFPA 30)
- National Fire Protection Association (NFPA) 70, *National Electrical Code* (NFPA 70)
- National Fire Protection Association (NFPA) 704, "Standard System for the Identification of the Hazards of Materials for Emergency Response" (NFPA 704)
- American Institute of Chemical Engineers (AIChE). Chemical Reactivity Worksheet (CRW)
- Stanford University, Office of Environmental Health and Safety. Chemical Safety: Storage Groups

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Compressed Gas Cylinder Storage and Handling Requirements

Product ID: 370 | Revision ID: 2386 | Date published: 26 May 2021 | Date effective: 26 May 2021
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemmanageReqCGCHandling.pdf

1 Purpose

The purpose of these requirements is to ensure the safe handling and use of *compressed gas cylinders (cylinders)*. They cover storage and handling, labeling, and removal. They apply to workers and supervisors.

2 Requirements

The following are the storage and handling requirements for compressed gas cylinders (cylinders) throughout their lifecycle at SLAC.

Note *In addition to the following requirements adhere to the equipment manufacturer's instructions and complete applicable training with an experienced equipment user.*

When a cylinder is connected to a gas system, the cylinder becomes a part of the compressed gas system. (See Chapter 14, "Pressure Systems", for the design, procurement, installation, use, inspection, and maintenance of compressed gas systems.)

For information on the safe use of gases, see Chemical Safety: Safe Handling Guidelines.

2.1 Storing Cylinders

- Store adequately secured cylinders upright on solid, dry, level footing, preferably outside of occupied buildings and away from traffic lanes.
- Shade cylinders stored in the sun during the summer, whenever possible.
- Store cylinders away from sources of intense heat (furnaces, steam lines, radiators).
- Do not stockpile gas, especially flammables, poisons, or corrosives, beyond the amount required for immediate use.
- Ensure that containers stored or used in public areas are protected against tampering and damage. Furthermore, containers stored inside or outside must not obstruct exits routes or other areas that are normally used or intended for the safe exit of people.
- Always store cylinders with the protective caps in place.

- For additional information on storage, see Chemical Lifecycle Management: Chemical Storage Asset Requirements.

2.2 Securing Cylinders

All compressed gas cylinders in service or storage at the user's location must be secured to prevent them from falling. Gas cylinders with a water volume of less than 5 L (305 cubic inches) may be stored in a horizontal position, as long as they are prevented from rolling, and will be considered adequately secured.

2.2.1 Individual Cylinders

- Use appropriate material, such as chain or commercially available straps.
- Use two restraints to secure cylinders that are four or more feet in height. Place one restraint around the cylinder body above the cylinder's center of gravity; place the second restraint around the cylinder body below the cylinder's center of gravity. (A good rule of thumb is to place the restraints at one third and two thirds the length of the cylinder).
- Smaller cylinders can be secured in cages, ventilated cabinets, or stands.

2.2.2 Cylinders in Six-unit Stands

- When storing six-unit stands (*six-packs*), individually secure each gas cylinder to the stand using a single restraint.
- Restrain the stand itself in a cage, or secure it to a wall or to the ground.

2.3 Handling Cylinders

- Ensure that the protective valve cover is in place when a cylinder is not connected to a regulator or manifold.
- Always assume a cylinder is pressurized: handle it carefully and avoid bumping or dropping. Never drop cylinders to the ground from trucks or any raised surface.
- Lifting a standard cylinder, or any cylinder weighing more than 50 pounds, requires two people.
- Never lift a cylinder by the cylinder cap.
- Do not handle oxygen cylinders with greasy, oily hands or gloves. The reaction between oxygen and hydrocarbons can be violent, even when small quantities are involved.
- Secure cylinders in suitable cradles or skid boxes before raising them with cranes, fork trucks, or hoists. Do not use ropes or chain slings alone for this purpose.
- Never use a gas cylinder as a roller for moving materials or for supporting other items.

2.4 Empty Cylinders

2.4.1 Handling

- Handle empty cylinders with the same care accorded to full ones.

- Do not completely empty a cylinder; always leave some residual pressure (a minimum of 20 psig) to prevent "suck-back" and contamination.
- Once a cylinder is nearly empty, replace the cap and store it in a compressed gas cylinder storage area, segregated from filled cylinders.
- Label all empty cylinders with tags or write EMPTY or MT along with the date it was emptied using chalk or durable marker. If the cylinder has a yellow tag, be sure to tear off the IN SERVICE section to identify the cylinder for removal.
- Mark any unidentifiable cylinder CONTENTS UNKNOWN.
- Do not refill a cylinder: only gas suppliers can refill cylinders.

2.4.2 Return to Vendor

Once any SLAC-owned or return-to-vendor cylinder is empty, or once the gas in such a cylinder is of no further use, the cylinder must be returned to the vendor through chemical management services (CMS). Contact the CMS coordinator to initiate removal.

Note *Cylinders labeled EMPTY with the vendor-supplied yellow tag will be removed automatically.*

2.4.3 Damaged, Unidentifiable, or Abandoned Cylinders

To dispose of any damaged, unidentifiable, or abandoned cylinders, contact Waste Management (WM).

2.5 Tags

Cylinders are delivered with a yellow tag, as shown here. If a tag is missing, contact the chemical coordinator.

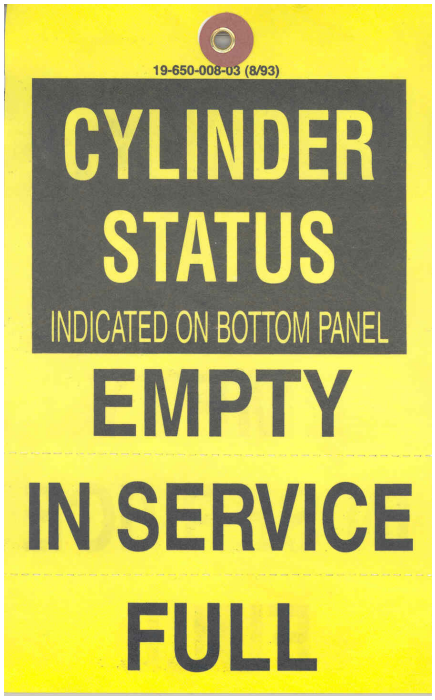

Figure 1 Cylinder Tag

The tag is used to indicate the status of the cylinder by tearing off successive tabs. Make sure the tag identifies the status of the cylinder accurately by ripping off the appropriate tab each time the status changes.

- FULL

  The original tag, which includes all status options, indicates that no gas has been discharged. If you discharge any gas, be sure to tear off the FULL tab.

- IN SERVICE

  IN SERVICE indicates that gas has been discharged. The cylinder is ready to be returned to the vendor when a small amount of pressure remains. (Do not discharge completely.) Tear off the IN SERVICE portion of the tag when the pressure is low.

- EMPTY

  The cylinder is ready for removal by the gas vendor.

3 Forms

The following are forms and systems 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 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)
  - Chemical Management Services (CMS)
  - Chemical Management Services Program Site (SharePoint)
- Chapter 14, "Pressure Systems"
- Chapter 53, "Chemical Safety"
  - Chemical Safety: Hazard Communication Requirements (SLAC-I-730-0A09S-042)
  - Chemical Safety: Safe Handling Guidelines

Other Documents

- Compressed Gas Association (CGA)
  - CGA-P-1, "Safe Handling of Compressed Gases in Containers" (CGA P-1)

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Portable Welding and Cutting Fuel Requirements

Product ID: 377 | Revision ID: 2387 | Date published: 26 May 2021 | Date effective: 26 May 2021
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemmanageReqCGCWelding.pdf

1 Purpose

The purpose of these requirements is to ensure the safe handling and use of *compressed gas cylinders (CGCs)* used for welding and cutting. They cover handling, use, and storage. They apply to workers and supervisors.

2 Requirements

Because of their volatility, extra safety precautions must be observed when using the combination of gases required for welding or cutting operations. (For general CGC storage and handling, see Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements.

2.1 Handling

- Do not handle CGCs roughly because the contents are under pressure.
- Fasten CGCs securely; chain or strap in an upright position to a wall or cart.
- Remove regulators and replace protective caps before moving or transporting CGCs.

2.2 Use

- Keep fire extinguishing equipment readily accessible near welding or cutting operations if combustible materials are present.
- Locate CGCs away from areas where they may be struck or subjected to physical damage. They must be a safe distance from arc welding, cutting operations, or any other source of heat, sparks, or flame.
- Periodically check connections for leaks to prevent fires or explosions. Use a direct-reading instrument, or apply soapy water to connections and check for bubbles. Repair leaks immediately.
- Use acetylene tanks only while in an upright position.
- Open cylinder valves as required by the type of gas.
  - Acetylene: open the valve no more than three-fourths of a turn so it can be closed quickly in case of emergency.
  - Oxygen: open the valve fully. While welding or cutting, leave the valve wrench in position.

- Set the appropriate operating pressure. Never set acetylene pressure over 15 psi. Follow the manufacturer's recommendations for the operating pressures appropriate to the metal being welded and for the tip size being used.
- Ensure reverse flow-check valves and flash arrestors are installed on the oxygen and acetylene lines to control flashbacks and backfires. The back-flow prevention valve may be on the tank or on the wand.
- Never allow the electrode, electrode holder, or any other electrically hot parts to touch a CGC.
- Ensure that gas delivery hoses are a different color for each gas (per ANSI Z49.1).
- Purge fuel and oxygen hoses individually before lighting up a torch tip.
- Be sure the CGC valves are closed and pressure is relieved from the hoses before leaving the work area.
- If a CGC is not going to be in use within the next 24 hours, see below for storage requirements.

2.2.1 Confined Space

- A confined entry permit must be applied for and received before using any gas in a confined space. (See Confined Space: Entry Procedures.)
- When using shielding gases indoors or in a confined space, always use enough ventilation to ensure adequate oxygen levels.

2.2.2 Outdoor Use

- Regardless of location, indoors or outdoors, a hot work permit will always be required. (See Fire and Life Safety: Fire Prevention Hot Work Procedures.)

2.3 Storage

Requirements for when acetylene and oxygen CGCs must be placed in storage depend on the job description or classification:

- **For welding done in conjunction with construction**, acetylene and oxygen can only be stored together for more than 24-hours if they are in a welding cart with a patented engineered steel fire barrier. Acetylene and oxygen CGCs in a regular welding cart must be placed in appropriate storage if these gases will not be used again within a 24-hour period.
- **For welding conducted for general industry purposes** (outside of construction areas): CGCs containing acetylene and oxygen may remain in a cart indefinitely as long as the cylinders remain in an upright position and the regulator remains in place on the CGCs.

3 Forms

The following are forms and systems required by these requirements:

- None

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 40, "Chemical Lifecycle Management"
  - Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements (SLAC-I-730-0A09S-030)
- Chapter 6, "Confined Space"
  - Confined Space: Entry Procedures (SLAC-I-730-0A21C-007)
- Chapter 12, "Fire and Life Safety"
  - Fire and Life Safety: Fire Prevention Hot Work Procedures (SLAC-I-730-0A12C-001)

Other Documents

- Title 8, *California Code of Regulations*, "Industrial Relations", Division 1, "Department of Industrial Relations", Chapter 4, "Division of Industrial Safety", Subchapter 4, "Construction Safety Orders", Article 32, "Oxygen, Acetylene, and Fuel Gas" (8 CCR 1739–1743)
- American National Standards Institute (ANSI) Z49.1, "Safety in Welding, Cutting and Allied Processes" (ANSI Z49.1)

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 40: Chemical Lifecycle Management

Chemical Storage Asset Requirements

Product ID: 223 | Revision ID: 2542 | Date published: 8 December 2022 | Date effective: 8 December 2022
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemmanageReqStorage.pdf

1 Purpose

The purpose of these requirements is to ensure the safe storage of *chemicals* and other *hazardous materials*. They cover storage and inspection of chemicals in *chemical storage assets* and *areas*. They apply to workers (as *chemical users*, *requesters,* and *receivers*), supervisors, line management, *chemical storage asset custodians*, ESH coordinators, the SLAC fire marshal, and the chemical lifecycle management program manager.

2 Requirements

2.1 General

2.1.1 Custodians

For every chemical storage asset or area, a custodian is designated by line management and given authority and responsibility for safe storage within that asset. Custodians must ensure the following requirements are met:

1. Chemical storage assets have been assigned a property control (PC) identification number ("other cabinets" and gas racks are exempted from this requirement).
2. Contact information for the custodian is posted on the asset or area (for example, on the door to a laboratory, entrance to a warehouse, door of a flammable materials cabinet).
3. The asset meets requirements. This includes performing required testing and inspections.

2.1.2 Inspections

Monthly inspections must be carried out by the chemical asset custodian or designated person for all chemical storage areas and all chemical container types.

For remote areas that are not visited daily, these inspections must be documented (using the Chemical Lifecycle Management: Storage Area Inspection Form) and the results kept on record for a minimum of one year and made available to the Environment, Safety, and Health (ESH) Division when requested.

Note *When a storage area contains both hazardous materials and waste, the most restrictive combination of inspection requirements applies. For inspection requirements for hazardous waste storage areas and waste containers, see Chapter 17, "Hazardous Waste".*

2.1.3 Secondary Containment

Sized secondary containment is required for storage assets when any single container is in excess of 55 gallons of liquid, 550 pounds for solids, or when the aggregate capacity of multiple vessels exceeds 1,000 gallons (10,000 pounds for solids). (See *Hazardous Materials Storage Secondary Containment Guidelines* [UN-083].) Line management is responsible for ensuring sized secondary containment is in place where needed.

2.2 Bulk Storage Tanks

Bulk storage *tanks* are used at SLAC to store many materials including liquid nitrogen, helium, water treatment chemicals (acids, bases, and proprietary treatment chemicals), propane, and fuel. The installation of bulk storage tanks for chemicals requires a design review through the ESH Building Inspection Office before purchase or installation (see ESH: Project Review Procedure). This review evaluates issues such as siting, material compatibility, safety controls, hazard communication signs, pressure relief, seismic design, security, and fire protection. Appropriate industrial standards will be incorporated into the design of this type of storage asset.

2.3 Tube Trailers

Tube trailers contain 20 to 40 long, horizontal, compressed gas cylinders (CGCs) bundled together and connected by manifolds for ease of use, transport, and safety. SLAC uses tube trailers for managing hydrogen and helium.

It is a Department of Transportation (DOT) requirement that tube trailers that are *in commerce* (that is, will be transported over public roads) must be pressure-tested every five years. It is the responsibility of the custodian to arrange for this testing with the assistance of the on-site CMS provider. Hydrostatic tests must be conducted by a qualified testing facility.

2.4 Storage Cabinets

All *chemical storage cabinets* must meet the following minimum requirements:

- Doors must be well fitted, equipped with a latch, and self-closing. (Cabinets in continuous use and meeting the fire code at the time of purchase may be used even if not self-closing, but if not in use must be updated or replaced to meet current fire code requirements.)
- Cabinets must be seismically braced to a sound structure to prevent dislodgement during an earthquake. The seismic bracing must not penetrate the cabinet in such a way that it would facilitate release of the chemical from the cabinet. The SLAC fire marshal approves seismic bracing of chemical cabinets to ensure the bracing does not compromise the cabinet listing. Cabinets including contents that weigh 400 pounds or more must have engineered restraints.
- The bottom of the cabinet must be liquid tight to a height of at least two inches (50.8 mm).
- The cabinet, including the door, must be double walled, with 1.5-inch (38.1 mm) airspace between the walls.
- Joints must be riveted or welded and tight-fitting.

- Cabinets must be constructed of metal and must be listed by an accredited listing agency. Unlisted cabinets may be used if approved by the SLAC fire marshal and they
  - Are constructed from steel with a thickness of at least 0.044 inch (1.12 mm) (18 gauge)
  - Meet all the requirements of a listed cabinet
- Approved and rated chemical storage cabinets will not be used for ordinary (non-hazardous) storage.

2.4.1 Flammable Container Storage Cabinets

Flammable liquid in quantities greater than 10 gallons per work area[1] must be stored in chemical storage cabinets that meet the design requirements of the *California Fire Code,* chapters 27 through 41 (24 CCR 2701–4101) and the *Flammable and Combustible Liquids Code* (NFPA 30). Cabinets used to store flammable liquids must meet the following requirements in addition to those in Section 2.4:

- The combined total of all liquids will not exceed 120 gallons (454 L).
- Cabinets used to store flammable liquids must be provided with a conspicuous label in red letters on contrasting background that reads FLAMMABLE–KEEP FIRE AWAY.
- Combustible material (wood shelves added after purchase, cardboard boxes and paper) should be minimized or eliminated.
- The number of flammable liquid storage cabinets and quantity of flammable materials allowed in a building is regulated and determined by occupancy codes, space between cabinets, and whether the building is equipped with sprinklers. Contact the SLAC fire marshal for details.

2.4.2 Corrosive Material Storage Cabinets

Cabinets used to store corrosives must meet the following requirements in addition to those in Section 2.4:

- Incompatible corrosives must not be stored in the same cabinet without containment.
- All corrosive storage cabinets must be conspicuously labeled (letters on contrasting background) with CORROSIVE – ACID or CORROSIVE – BASE.
- Cabinets must be treated or coated on the interior with a material that is non-reactive with the hazardous material stored, and this treatment or coating must cover the entire interior of the cabinet.
- The quantity of corrosive materials allowed in a building is regulated and determined by occupancy codes, space between cabinets, and whether the building is equipped with sprinklers. Contact the SLAC fire marshal for details.

2.4.3 Laboratory Hoods with Built-in Storage Cabinets

Built-in flammable liquid and corrosive material storage cabinets in laboratory hoods are subject to the requirements above for storage cabinets.

Note *For requirements regarding electrical equipment and devices within cabinets used for the storage of flammable chemicals, see the* National Electrical Code *(NFPA 70), Section 500.*

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1 A work area is a *use area*, defined as a contiguous area that is controlled and used by one work group in reference to the exemption in 24 CCR Part 9, Section 3404.3.4.4, "Liquids for Maintenance and Operation of Equipment" (24 CCR 3404.3.4.4).

2.4.4 Chemical Refrigerators

Ordinary domestic refrigerators and freezers must not be used for storing flammable liquids due to exposure to electrical components (light bulbs, switches, contacts and motors) that can become potential ignition sources. These ignition sources may initiate a fire or an explosion if flammable vapors are present. Refrigerators and freezers for storing flammable liquids and/or temperature-sensitive chemicals such as peroxides or epoxies must be designed, constructed, and approved for that purpose. Domestic refrigerator/freezers as well as units that have been modified to remove spark sources are not acceptable.

- Refrigerators must be labeled on the exterior: CAUTION – FOR CHEMICAL STORAGE ONLY; DO NOT STORE FOOD OR BEVERAGES IN THIS REFRIGERATOR. Labels may be fabricated by users provided the labels are legible and securely affixed to the refrigerator.
- The custodian must have a means (manual or automated) to document the storage temperature of the temperature-sensitive materials.
- Refrigerators used for food storage in or near work areas (shops and labs) must be labeled with words to the effect of NOTICE – FOOD MAY BE STORED IN THIS REFRIGERATOR. DO NOT STORE CHEMICALS. Refrigerators used for food and beverage storage that are located in lunchrooms and office buildings, where there is no shop or laboratory type chemical use, do not require any postings.

2.4.5 Other Storage Cabinets

Storage of small quantities of non-flammable, less hazardous chemicals in other storage cabinets is allowed if present in quantities below the exempt limits for that chemical class as provided by the *California Fire Code* (24 CCR Part 9), when the following conditions are met:

- The cabinet is clearly identified through exterior labeling as containing chemicals.
- The total quantity of chemicals stored in this fashion per cabinet is less than five gallons.

These cabinets must still be treated as chemical storage assets, that is, mapped and inspected periodically.

2.5 Compressed Gas Cylinders

The general requirements below apply to all *compressed gas cylinders (CGCs)* in storage. Additional requirements apply to CGCs stored indoors versus outdoors and also depend on the hazard category of the gas itself (toxic, corrosive, flammable, oxidizing, or asphyxiant). In each case, the most stringent applicable storage requirements apply.

For information on handling, see Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements.

2.5.1 Storage Areas

A CGC storage area must be

- Equipped with personnel protective equipment (PPE) and emergency equipment as required by the hazard category.
- Sited out of pedestrian and vehicle traffic.
- Designed to meet segregation requirements for empty CGCs and specific hazard categories.

2.5.2 Segregation

CGCs in storage must be separated from materials and conditions that present exposure hazards. Cylinders containing corrosive, flammable, or oxidizing gases must be segregated by hazard category (for example, oxidizers only with oxidizers).

Note *Gases not in these hazard categories, including inert gases such as nitrogen and helium, have no specific separation requirements.*

The segregation requirement can be met using distance or a barrier such as a fire wall or gas cabinet, as follows:

- A minimum of 20 feet (6.1 m) must separate CGCs containing gases belonging to these hazard categories, or
- The 20 feet (6.1 m) distance can be eliminated when hazard categories are separated by a barrier of noncombustible materials at least 5 feet (1.5 m) high that has a fire resistance rating of at least half an hour, or
- The 20 feet (6.1 m) distance is allowed to be reduced to 5 feet (1.5 m) where one of the gases is enclosed in a ventilated gas cabinet.
- The distance requirement is eliminated where both gases are enclosed in ventilated gas cabinets.
- Where separation is not possible, isolate flammable gas containers by constructing a noncombustible barrier that extends not less than 18 inches above the tallest container and not less than 18 inches beyond the sides of the containers and has a fire resistance rating of at least half an hour.

2.5.3 Indoor Storage

An indoor storage area must be

- Well ventilated, cool, dry, and free of corrosive materials that may damage metal CGCs
- Away from public hallways or other unprotected areas; they must not block any exits or doorways
- Away from elevators and unprotected platform ledges
- Away from any area where CGCs could fall for distances exceeding one-half the height of the cylinder
- Away from objects that may fall and damage the cylinders

2.5.3.1 Gas Cabinets

Gas cabinets are primarily used to mitigate the hazards of *toxic*, *corrosive*, or *flammable* gases when used indoors. The installation of gas cabinets requires a design review by the ESH Building Inspection Office before purchase or installation (see ESH: Project Review Procedure and Gas Cabinet Guidance).

Standard Operating Procedures

Standard operating procedures (SOPs) that detail the safe operation of the gas cabinet must be developed and approved before operation by the ESH coordinator responsible for the area. At a minimum, these procedures must address the following:

- Installation, removal, and securing of gas cylinders inside the cabinet

- Operation of the controller, including the by-pass setting for purge operations and emergency shut-off button
- Purging of the manifold
- Response to alarm activation
- Maintenance requirements, including calibration of gas detection equipment and ventilation checks

SOP training must be provided for all affected workers before operation and tracked for compliance purposes. Should the experiment change in any way, the SOP must be updated and this information communicated to affected workers.

A preventive maintenance program should be implemented to ensure the integrity of connections and piping, adequacy of ventilation, and the functionality of alarms, sensors, valves, controllers, and other hazard mitigations.

Labeling

The outside of all gas cabinets must be labeled to indicate the gas and gas concentration that is being used inside the cabinet.

2.5.3.2 Gas Hazard Category-specific Requirements

Toxic and Corrosive

- Highly toxic gases (and toxic or corrosive ones if there is a concern that an accidental release will cause a health concern) must be stored in gas cabinets or exhausted enclosures.

Flammable

- Signs must be posted within 25 feet (7.6 m) of the storage area perimeter that prohibit smoking or the use of open flame, or both.
- Stored CGCs without pressure-relief devices must be separated from flammable gases with pressure-relief devices.
- Flammable gases must be stored in well ventilated areas away from oxidizers, open flames, sparks, and other sources of heat or ignition.
- Portable fire extinguishers (of carbon dioxide or dry chemical types) or other fire protection or suppression systems or devices must be available for fire emergencies.

Oxidizing

There are no additional indoor storage requirements for *oxidizers*.

Asphyxiant

There are no additional indoor storage requirements for *asphyxiants*.

2.5.4 Outdoor Storage

An outdoor storage area must be

- Located away from gangways or locations where it may be impacted by heavy-moving objects, equipment, or vehicles
- Provided adequate drainage and cover. To prevent rusting, CGCs must be kept away from standing water.
- Located away from sources of heat and ignition including direct sunlight: CGCs, whether full or partially full, must not be exposed to temperatures exceeding 125º F (52° C). If possible, cylinders should be stored under a protective canopy or cover.
- Provided clear access for safe and unobstructed delivery of CGCs and six-packs. This may require infrastructure improvements such as the installation of ramps, paving unimproved roads, or pouring concrete pads. This may also require maintenance such as sweeping up loose gravel or administrative controls such as enforcing parking restrictions to allow safe access for delivery trucks.

Gas racks and cages are used for less hazardous gases stored outdoors. Consideration of exposure to the elements needs to be evaluated, as well as safe transport from the storage area to the use area.

2.5.4.1 Gas Hazard Category-specific Requirements

Toxic

- Outdoor storage of highly toxic or toxic compressed gases must not be within 75 feet (22.9 m) of a building, property line, street, alley, public way, or means of egress to a public way unless the storage is shielded by a structure having a minimum fire-resistive rating of two hours and which interrupts the line of sight between the storage and the exposure. The protective structure must be at least 5 feet (1.5 m) from exposures. The protective structure must not have more than two sides at approximately 90-degree directions, or three sides with connecting angles of approximately 135 degrees.
- When the storage area is located closer than 75 feet (22.9 m) to a building, openings into a building other than piping must not be above the height of the top of the shielding structure or within 50 feet (15.2 m) horizontally from the storage area whether or not shielded by a protective structure.
- The storage area must not be within75 feet (22.9 m) of air intakes.
- CGCs stored outside of buildings must be stored under a canopy of noncombustible construction. (Such storage is not considered indoor storage.)
- An automatic fire-sprinkler system must be provided for canopies used for storage of highly toxic or toxic compressed gases.

Corrosive

- The outdoor storage (or use) of corrosive compressed gas must be 20 feet (6.1 m) from buildings, property lines, streets, public ways, or means of egress.
- A two-hour fire barrier wall without openings or penetrations and extending not less than 30 inches (0.8 m) above and to the sides of the storage area, is allowed in lieu of the 20 feet (6.1 m) distance.
- The fire barrier wall must be either an independent structure or the exterior wall of the building adjacent to the storage area.
- The two-hour fire barrier must be located at least 5 feet (1.5 m) from any exposure.
- The two-hour fire barrier must not have more than two sides at approximately 1.57 rad (90 degree) directions, or not more than three sides with connecting angles of approximately 2.36 rad (135 degrees).

Flammable

In addition to the storage requirements listed in indoor storage for flammable gas, outdoor storage must be in accordance with the following requirements.

Table 1 Flammable Gas Outdoor Storage: Distance to Exposure by Quantity Stored

Aggregate Quantity per Storage Area		Minimum Distance to Buildings, Streets, Public Ways, or Property Lines		Minimum Distance between Storage Areas	
m^3	ft^3	m	ft	m	ft
<120	<4,225	1.5	5	1.5	5
120.1–598	4,226–21,125	3	10	3	10
598.1–1435	21,126–50,700	4.6	15	3	10
1435.1–2393	50,701–84,500	6	20	3	10
≥2393.1	≥84,501	7.5	25	6	20

- The minimum required distances are allowed to be reduced to 5 feet (1.5 m) where protective structures having a minimum fire resistance rating of two hours and interrupt the line of sight between the storage and the exposure.
- The protective structure must be at least 5 feet (1.5 m) from the storage or use area perimeter.
- The configuration of the protective structure must be designed to allow natural ventilation to prevent the accumulation of hazardous gas concentrations.
- Storage must be located at least 50 feet (15.2 m) from air intakes.

Oxidizing

In order to prevent safety hazards such as the accumulation of hazardous gas concentrations, oxidizing gases must be stored in accordance with the following.

Table 2 Oxidizing Gas Outdoor Storage: Distance to Exposure by Quantity Stored

Quantity of Gas Stored (at normal temperature and pressure)		Distance to a Building or to a Public Way or Property Line		Minimum Distance between Storage Areas	
m^3	ft^3	M	Ft	M	Ft
0–1416	0–50,000	1.5	5	1.5	5
1417–2832	50,001–100,000	3.0	10	3.0	10
≥2833	≥100,001	4.6	15	4.6	15

- The distances do not apply where protective structures having a minimum fire resistance of two hours and interrupt the line of sight between the container and the exposure.
- The protective structure must be at least 5 feet (1.5 m) from the storage area perimeter.
- The configuration of the protective structure must allow natural ventilation to prevent the accumulation of hazardous gas concentrations.

3 Forms

The following forms and systems are required by these requirements:

- Chemical Lifecycle Management: Storage Area Inspection Form (SLAC-I-730-0A09J-001). Form used to document monthly inspections for remote areas
- 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:

- Results of monthly inspections of remote areas, in the form of a completed inspection form, must be kept on record for a minimum of one year by the chemical storage asset custodian and made available to ESH when requested.

5 References

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

- Chapter 40, "Chemical Lifecycle Management"
  - Chemical Lifecycle Management: Management and Use Requirements (SLAC-I-730-0A09S-038)
  - Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements (SLAC-I-730-0A09S-030)
  - Chemical Management Services (CMS)
  - Chemical Management Services Program Site (SharePoint)
- Chapter 1, "General Policy and Responsibilities"
  - ESH: Project Review Procedure (SLAC-I-720-0A24C-001)
- Chapter 17, "Hazardous Waste"

Other SLAC Documents

- SLAC CERS (Chemical Inventory) GIS
- Gas Cabinet Guidance

Other Documents

- Title 24, *California Code of Regulations*, "California Building Standards Code", Part 9, "California Fire Code", Chapter 34, "Flammable and Combustible Liquids" (24 CCR Part 9, Chapter 34)
- National Fire Protection Association (NFPA) 30, *Flammable and Combustible Liquids Code* (NFPA 30)
- National Fire Protection Association (NFPA) 70, *National Electrical Code* (NFPA 70)
- Unidocs. *Hazardous Materials Storage Secondary Containment Guidelines* (UN-083)
- Stanford University, Office of Environmental Health and Safety. Chemical Safety: Storage Groups

Chapter 40: Chemical Lifecycle Management

Storage Area Inspection Form

Product ID: 217 | Revision ID: 2389 | Date Published: 26 May 2021 | Date Effective: 26 May 2021
URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/chemmanageFormStorageInspect.pdf | docx

Monthly inspections must be carried out by the *chemical storage asset custodian* or designated person for all *chemical storage assets* and *areas*. (See Chemical Lifecycle Management: Chemical Storage Asset Requirements [SLAC-I-730-0A09S-018].)

For remote areas that are not visited daily, these inspections must be documented and the results kept on record for a minimum of one year and made available to ESH when requested. The following form may be adapted to meet the specifications of your storage area, but all basic inspection elements must be included.

Note *When a storage area contains both hazardous materials and waste, the most restrictive combination of inspection requirements applies. For inspection requirements for hazardous waste storage areas and waste containers, see Chapter 17, "Hazardous Waste".*

Documenting Inspection Results

1. Enter the inspection location on the form. If the location is new, or information is missing or out of date, inform the chemical lifecycle management program manager or the ESH coordinator of any updates.
2. Each month, enter the date and your initials and place a check in every square that applies to this location if the condition meets all safety requirements. The form accommodates 12 inspections, or one full year.

Note *If the item does not apply, cross the section out. For example, if there are no compressed gas cylinders (CGCs), mark one large line or X through the section. Alternatively, modify the form to meet more closely the conditions of the storage area.*

Inspection location: _____

Inspection Date	Inspector's Initials	Storage Area					All Containers					Additional Inspection Items for Compressed Gas Cylinders (CGC)					Observations / corrective action (list full details on back of form)
		Storage area has proper signage and signs are legible	Storage area free of spills and leaks and containers are not in contact with standing water	Eye wash\safety showers serviced and tagged (weekly)	ER equipment and spill kits functional and maintained	Fire extinguishers serviced and tagged (monthly)	Containers properly labeled and labels are legible	Containers free of damage, residue, or corrosion	Appropriate secondary containment is in place	Containers sealed with tight-fitting lids/bungs	Incompatibles properly segregated	CGCs double-chained to rack or wall or approved alternate	CGC valves closed and fitted with safety caps	CGCs containing toxic or flammable gases leak tested (monthly)	Empty CGCs labeled "empty" and segregated from CGCs containing product	CGCs well ventilated, not blocking exits or near a heat source (>125° F)	

Observations and Corrective Actions Log

Inspection Date	Inspector Initials	Observation or Comment	Corrective Action Required	Date Action Completed

851>Cal/OSHA Implementation Plan: Chemical Lifecycle Management

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 Lifecycle Management
2.	Program manager	Pilastro, Yolanda L.
3.	LBNL counterpart	Davies, Evelyn (time-sensitive); Zhu, Julie (inventory) (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 40: Chemical Lifecycle Management ▪ Chemical Lifecycle Management: Quick Start Summary ▪ Chemical Lifecycle Management: Planning Requirements ▪ Chemical Lifecycle Management: Purchasing Procedures ▪ Chemical Lifecycle Management: Chemical Screening Requirements ▪ Chemical Lifecycle Management: Toxic and Hazardous Chemical Justification Form ▪ Chemical Lifecycle Management: Management and Use Requirements

Field Number	Field Name	Field
		▪ Chemical Lifecycle Management: Compressed Gas Cylinder Handling and Use Requirements ▪ Chemical Lifecycle Management: Portable Welding and Cutting Fuel Requirements ▪ Chemical Lifecycle Management: Chemical Storage Asset Requirements ▪ Chemical Lifecycle Management: Storage Area Inspection Form
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.* ▪ None
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.* ▪ Chemical Management Services (CMS) ▪ CMS system ▪ CMS Requester List (SharePoint) ▪ Hazardous Materials Storage Maps (SharePoint)
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 (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Section 101, "Compressed Gases" (29 CFR 1910.101) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Section 102, "Acetylene" (29 CFR 1910.102) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Section 103, "Hydrogen" (29 CFR 1910.103) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Section 104, "Oxygen" (29 CFR 1910.104) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Section 105, "Nitrous Oxide" (29 CFR 1910.105) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Section 106, "Flammable and Combustible Liquids" (29 CFR 1910.106) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H,

Field Number	Field Name	Field
		"Hazardous Materials", Section 108, "Dip Tanks Containing Flammable of Combustible Liquid" (29 CFR 1910.108) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Section 110, "Storage and Handling of Liquefied Petroleum Gases" (29 CFR 1910.110) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Section 119, "Process Safety Management of Highly Hazardous Chemicals" (29 CFR 1910.119) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart H, "Hazardous Materials", Sections 123–126, "Dipping and Coating Operations" (29 CFR 1910.123–126) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart I, "Personal Protective Equipment", Section 132, "General Requirements" (29 CFR 1910.132) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart Q, "Welding, Cutting, and Brazing", Section 253, "Oxygen-fuel Gas Welding and Cutting" (29 CFR 1910.253) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1910, "Occupational Safety and Health Standards", Subpart Z, "Toxic and Hazardous Substances", Sections 1000–1052 (29 CFR 1910.1000–1052) ▪ Title 29, Code of Federal Regulations, "Labor", Subtitle B, "Regulations Relating to Labor (Continued)", Chapter 17, "Occupational Safety and Health Administration, Department of Labor (Continued)", Part 1926, "Safety and Health Regulations for Construction", Subpart J, "Welding and Cutting", Section 350, "Gas Welding and Cutting" (29 CFR 1926.350) ▪ Title 40, Code of Federal Regulations, "Protection of the Environment", Chapter 1, "Environmental Protection Agency", Subchapter C, "Air Programs", Part 68, "Chemical Accident Prevention Provisions" (40 CFR 68) ▪ Title 40, Code of Federal Regulations, "Protection of the Environment", Chapter 1, "Environmental Protection Agency", Subchapter J, "Superfund, Emergency Planning, and Community Right-to-Know Programs", Part 355, "Emergency Planning and Notification" (40 CFR 355) ▪ Title 40, Code of Federal Regulations, "Protection of the Environment", Chapter 1, "Environmental Protection Agency", Subchapter J, "Superfund, Emergency Planning, and Community Right-to-Know Programs", Part 370, "Hazardous Chemical Reporting: Community Right-to-Know" (40 CFR 370) ▪ Title 40, Code of Federal Regulations, "Protection of the Environment", Chapter 1, "Environmental Protection Agency", Subchapter J, "Superfund, Emergency Planning, and

Field Number	Field Name	Field
		Community Right-to-Know Programs", Part 372, "Toxic Chemical Release Reporting: Community Right-to-Know" (40 CFR 372) ▪ Department of Energy Handbook 1139/3-2008, "Chemical Management", Volume 3, "Consolidated Chemical User Safety and Health Requirements" (DOE HDBK-1139/3-2008) ▪ Department of Energy Order 151.1C, "Comprehensive Emergency Management System" (DOE O 151.1C) ▪ Department of Energy Order 580.1A, "Department of Energy Personal Property Management Program" (DOE O 580.1A) ▪ California Health and Safety Code, Division 20, "Miscellaneous Health and Safety Provisions", Chapter 6.67, "Aboveground Storage of Petroleum" (HSC 25270-25270.13) ▪ California Health and Safety Code, Division 20, "Miscellaneous Health and Safety Provisions", Chapter 6.95, "Hazardous Materials Release Response Plans and Inventory" (HSC 25500-25545) ▪ 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" (8 CCR 5415-5612) ▪ 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 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 19, California Code of Regulations, "Public Safety", Division 2, "California Emergency Management Agency", Chapter 4.5, "California Accidental Release Prevention (CalARP) Program Detailed Analysis", Article 8, "Regulated Substances for Accidental Release Prevention" (19 CCR 2770) ▪ Title 24, California Code of Regulations, "California Building Standards Code", Part 9, "California Fire Code", Chapters 27 through 41 (24 CCR 2701–4101) ▪ Unidocs. Hazardous Materials Storage Secondary Containment Guidelines (UN-083) ▪ American Society of Mechanical Engineers (ASME)/ANSI A13.1, "Scheme for Identification of Pipelines" (ASME/ANSI A13.1) ▪ American National Standards Institute (ANSI) Z49.1-2005, "Safety in Welding, Cutting and Allied Processes" (ANSI Z49.1-2005) ▪ Compressed Gas Association (CGA) C-6-2007, "Standards for Visual Inspection of

Field Number	Field Name	Field
		Compressed Gas Cylinders" (CGA C-6-2007) ▪ Compressed Gas Association (CGA) C-8-2005, "Standard for Requalification of DOT-3HT, CTC-3HT, and TC-3HTM Seamless Steel Cylinders" (CGA C-8-2005) ▪ Compressed Gas Association (CGA) P-1-2008, "Safe Handling of Compressed Gases in Containers" (CGA P-1-2008) ▪ National Fire Protection Association (NFPA) 30-2003, Flammable and Combustible Liquids Code (NFPA 30-2003) ▪ National Fire Protection Association (NFPA) 70-2011, National Electrical Code (NFPA 70-2011) ▪ 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.* ▪ There are a number of reference/guidance citations, but none should be affected by the 851>Cal/OSHA change
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.*** ▪ Deleted references to 29 CFR 1910, Subpart H, "Hazardous Materials", and Subpart Z, "Toxic and Hazardous Substances" ▪ Replaced 29 CFR 1910.253, "Oxygen-fuel Gas Welding and Cutting", and 29 CFR 1926.350, "Gas Welding and Cutting" with 8 CCR 1739–1743, "Oxygen, Acetylene, and Fuel Gas" ▪ Deleted regulations and standards covered under other programs
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.*** ▪ No changes
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.*** ▪ Deleted catalog add process ▪ Added review by ESH coordinators of purchase requests ▪ Changed ethanol purchase process: requesters now contact the chemical coordinator ▪ Deleted requirement for chemical requesters to provide safety data sheets ▪ Deleted requirement for chemical storage asset custodians to update storage maps ▪ Added description of obtaining access to and training on the Chemical Management System
11.	Affected program documents	*List program documents affected by the changes above.* ***Enter "no changes" if none.*** ▪ Chemical Lifecycle Management: Planning Requirements (SLAC-I-730-0A09S-039)

Field Number	Field Name	Field		
		▪ Chemical Lifecycle Management: Purchasing Procedures (SLAC-I-730-0A09C-001) ▪ Chemical Lifecycle Management: Chemical Screening Requirements (SLAC-I-730-0A09S-033) ▪ Chemical Lifecycle Management: Toxic and Hazardous Chemical Justification Form (SLAC-I-730-0A09J-006) ▪ Chemical Lifecycle Management: Compressed Gas Cylinder Storage and Handling Requirements (SLAC-I-730-0A09S-030) ▪ Chemical Lifecycle Management: Portable Welding and Cutting Fuel Requirements (SLAC-I-730-0A09S-024) ▪ Chemical Lifecycle Management: Chemical Storage Asset Requirements (SLAC-I-730-0A09S-018) ▪ Chemical Lifecycle Management: Storage Area Inspection Form (SLAC-I-730-0A09J-001)		
12.	Affected training courses	*List training courses affected by the changes above.* ***Enter "no changes" if none.*** ▪ None		
13.	Other affected program resources	*List other program resources affected by the changes above.* ***Enter "no changes" if none.*** ▪ None		
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	9/18/2020 (rev 9/23/2020)	11/25/2020	5/26/2021