Chapter 40: Chemical Lifecycle Management

Quick Start Summary

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1 Who needs to know about these requirements

The requirements of Chemical Lifecycle Management apply to workers (SLAC employees, subcontractors, and users), their supervisors and line management; chemical storage asset custodians; ESH coordinators, chemical reviewers, SLAC fire marshal, and the program manager; and the ESHQ 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 (CMS) supply chain model for chemical management. All chemical purchases must be initiated and fulfilled through the CMS system.
- Chemicals are approved for specific work areas, based on use and amount. Once approved, a chemical may be reordered using the CMS system without further ESHQ 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”.

4 When

The requirements of this chapter take effect 20 May 2013.

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.
Chapter 40

Chemical Lifecycle Management

Product ID: 23 | Revision ID: 1455 | Date published: 20 May 2013 | Date effective: 20 May 2013
URL: http://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 all workers (SLAC employees, subcontractors, and users), their supervisors and line management; chemical storage asset custodians, ESH coordinators, chemical reviewers, SLAC fire marshal, and the program manager; and the Environment, Safety, Health, and Quality (ESHQ) Division Building Inspection Office.

Hazard communication and mitigation related to chemicals are covered in Chapter 53, “Chemical 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 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, and responsibilities may be delegated.

2.1 Worker

As a chemical user

- Complies with the requirements of this program
- Complies with all hazard controls
- Completes training
- Purchases chemicals only through the chemical management services (CMS) 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
As a chemical requester

- Is designated by line management in the CMS system
- Submits purchase and catalog add requests through the CMS system
- Provides safety data sheet (SDS) and all other required information when submitting a catalog add request

As a chemical receiver

- Is designated by line management in the CMS system
- Inspects deliveries for accuracy and container integrity
- Immediately places highly toxic materials and those with inhalation hazards in a secure area

### 2.2 Chemical Storage Asset Custodian

- Is designated by line management
- Ensures compliance with the storage requirements of this chapter, including mapping and 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

### 2.3 Supervisor

- Selects, implements, and maintains appropriate measures for controlling work area hazards associated with chemicals
- Ensures staff complete both ESHQ 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

### 2.4 Line Management

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

### 2.5 Subcontractor

- Complies with all applicable ESHQ 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
ESHQ requirements and documented in a site-specific safety plan (SSSP) (see Chapter 42, “Subcontractor Safety”), and if required, stormwater pollution prevention plan (SWPPP) (see Chapter 26, “Stormwater”).

If using chemicals on-site not purchased through the CMS 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

2.6 ESH Coordinator

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

2.7 Chemical Reviewer

- Reviews purchase request notifications
- Evaluates purchase requests against process safety thresholds and program impact
- Reviews requests to add chemicals to the CMS catalog and evaluates against screening criteria
- Reviews justification for purchasing toxic and hazardous chemicals

2.8 ESHQ 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.

2.9 SLAC Fire Marshal

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

2.10 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 requests to add chemicals to the CMS catalog

Reviews and tracks justification for purchasing toxic and hazardous chemicals

Coordinates screening process for adding new chemicals to the CMS catalog

Coordinates the initial screening and tracking for chemicals under DOE O 151.1C

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 encouraging use of less toxic substitutes and reducing the inventory of toxic materials

Manages the ESHQ services of the CMS provider

### 3 Procedures, Processes, and Requirements

These documents list the core requirements for this program and describe 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 adding chemicals to the chemical management services (CMS) catalog, ordering chemicals, and delivery and receipt
- **Chemical Lifecycle Management: Chemical Screening Requirements** (SLAC-I-730-0A09S-033). Describes requirements for screening requests to add chemicals to the chemical management services (CMS) catalog
- **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 Handling and Use Requirements** (SLAC-I-730-0A09S-030). Describes requirements for handling and using compressed gas cylinders (CGCs)
- **Chemical Lifecycle Management: Portable Welding and Cutting Fuel Requirements** (SLAC-I-730-0A09S-024). Describes requirements for 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 documents provide useful guidance; their use is not mandatory:

- None
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”.

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.

*Asset, chemical storage.* 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.

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

*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).

*Catalog, CMS.* A web-based list of chemicals approved for purchase and use at SLAC, part of the CMS system maintained by the chemical management services provider (see CMS system).

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

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

*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 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 spill prevention).

*Custodian, chemical storage asset.* The individual designated by line management as the responsible party for chemical storage assets (see chemical storage asset).
Cylinder, compressed gas (CGC). A pressure vessel designed to hold compressed gas at an absolute pressure greater than 1 atmosphere at 68°F (20°C)

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, asphyxiating.** 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 CGA defines a toxic gas as any gas that can kill 50 percent of the test subjects (LC50) 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.

*Material, hazardous.* 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 chemical).

*Prevention, spill.* 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).

*Regulator.* A device that controls the release of gas from CGCs.

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

*Services, chemical management (CMS).* A set of services provided to SLAC through which chemicals are ordered, inspected, delivered, inventoried, paid for and reported (see CMS system).

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

System, CMS. The software and material inventory management software system used to provide chemical management services (see chemical management services)

Tank. Container larger than 60 gallons (227 liters)

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

6 References

6.1 External Requirements

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

  - Section 102, “Acetylene” (29 CFR 1910.102)
  - Section 103, “Hydrogen” (29 CFR 1910.103)
  - Section 105, “Nitrous Oxide” (29 CFR 1910.105)
  - Section 106, “Flammable and Combustible Liquids” (29 CFR 1910.106)
  - Section 110, “Storage and Handling of Liquefied Petroleum Gases” (29 CFR 1910.110)


- Part 370, “Hazardous Chemical Reporting: Community Right-to-Know” (*40 CFR 370*)

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 580.1A*)


- Chapter 6.95, “Hazardous Materials Release Response Plans and Inventory” (*HSC 25500–25545*)

- 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*)


6.2 Related Documents

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

- Chapter 1, “General Policy and Responsibilities”
- Chapter 2, “Work Planning and Control”
- Chapter 9, “Radiological Safety”
- Chapter 12, “Fire and Life Safety”
- Chapter 16, “Spills”
- Chapter 17, “Hazardous Waste”
- Chapter 22, “Waste Minimization and Pollution Prevention”
- Chapter 26, “Stormwater”
- Chapter 30, “Air Quality”
- Chapter 36, “Cryogenic and Oxygen Deficiency Hazard Safety”
- Chapter 42, “Subcontractor Safety”
- Chapter 52, “Hazardous Materials and Waste Transportation”
- Chapter 53, “Chemical Safety”

Other SLAC Documents

- Chemical Management Services (CMS)
CMS system

Chemical Procurement – CMS (SharePoint)

Hazard Communication and MSDS References

Other

None
Chapter 40: Chemical Lifecycle Management

Planning Requirements

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, supervisors, ESH coordinators, and the program manager.

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”)

8. The final disposition of the chemical

¹ Refer to the California Building (24 CCR Part 2) and Fire (24 CCR Part 9) codes
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, Health, and Quality (ESHQ) Division (see ESHQ: Project Review Procedure), and work planning and control (Chapter 2, “Work Planning and Control”), the following may apply:

- Certain 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 Chemical Safety: Chemical Hygiene Plan Requirements).

2.1.1 Process Safety Analyses

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

1. Occupational Safety and Health Administration (OSHA) Process Safety Management (29 CFR 1910.119) (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 ESHQ. 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 CMS system to see who has ordered a material. This is a good route if chemicals are needed in small amounts or immediately.

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 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 ESHQ approval beforehand. This can be done through the ESHQ 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 are forms 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: Purchasing Procedures (SLAC-I-730-0A09C-001)
– Chemical Lifecycle Management: Management and Use Requirements (SLAC-I-730-0A09S-038)

- 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: Chemical Hygiene Plan Requirements (SLAC-I-730-0A09S-040)
  – Chemical Safety: Personal Protective Equipment Requirements (SLAC-I-730-0A09S-017)

Other SLAC Documents
- Chemical Management Services (CMS)
- Hazard Communication and MSDS References

Other Documents
- Environmental Protection Agency. Checklist for Toxic and Hazardous Chemicals Plans
- San Mateo County Health System. The California Accidental Release Prevention Program (CalARP)
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Purchasing Procedures

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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 adding chemicals to the chemical management services (CMS) catalog, ordering chemicals, and delivery and receipt. They apply to workers (chemical users and requesters), their supervisors and line management, CMS representatives, chemical reviewers, and ESH coordinators.

2 Procedures

2.1 Overview

SLAC utilizes the chemical management services (CMS) supply chain model for chemical management. All chemical purchases must be initiated and fulfilled through the CMS 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, using the catalog add process, in effect creating a separate catalog for each work area (Section 2.4, “Adding Chemicals to the Catalog”). This streamlines approval of additional purchase requests, as long as the original conditions are met (Section 2.3, “Ordering from the Catalog”). To ensure this, ESHQ program managers and ESH coordinators are notified of all new purchase requests made through the system.

If a chemical being added to the catalog 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.

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.
2.2 CMS System Access

To access the CMS system, employees or approved users must be registered with it. To register, contact the chemical lifecycle management program manager. (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 Catalog

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| 1.   | Chemical user | Identifies the responsible requester by doing one of the following:  
  - Checks the list of authorized CMS requesters  
  - Contacts the on-site CMS representative  
  - Contacts the CMS representative to place the order if a requester is not assigned to the workgroup |
| 2.   | Chemical user / authorized CMS requester | Checks catalog listing for chemical  
  If the chemical is not listed, submits a Catalog Add request as described in Section 2.4, “Adding Chemicals to the Catalog” |
| 3.   | Authorized CMS requester | Places chemical order through on-line CMS system  
  The requesting process results in an e-mail notification to the financial approvers |
| 4.   | Financial approvers | 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 catalog list price was not representative of actual cost. |

2.4 Adding Chemicals to the Catalog

For an illustration of this procedure, see Figure 11.

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| 1.   | Authorized CMS requester or viewer | If the required chemical is not listed in the catalog, submits a Catalog Add request.  
  The CMS system Help menu describes each step, including the submission of product specifications and a safety data sheet (SDS).  
  Note: chemicals similar to previously approved products may be expedited. To initiate fast track approval for time-sensitive projects, contact the CMS representative. |
| 2.   | CMS system | Notifies chemical reviewers that a new chemical addition is pending  
  Confirms that submitted chemical information (such as the SDS, supplier, and package size) is current |
| 3.   | Chemical reviewer(s) | Reviews new chemical request within three business days against approved screening criteria (see Chemical Lifecycle Management: Chemical Screening Requirements) to determine the status of the chemical or product:  
  Note: if more than one chemical reviewer is involved, the most strict status determination applies. |
Step | Person | Action
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- **Approved.** There are no additional controls required. The product has ESHQ approval for use in the requesting work area. Go to step 11.

- **Conditionally approved.** The product is approved for use with specified conditions. Conditions can include limiting the quantity, restricting use to a project or process, and in the case of a highly hazardous material, justification that the material is required for mission-critical work with no alternatives available (as described in steps 7 through 10). Materials in this category may be initially rejected as a catalog addition until the conditions have been satisfied, at which time they can be resubmitted.

- **Rejected.** The product is rejected and will not be made available for purchase. Justification for rejection can include any of the following:
  - The material is highly hazardous and is not mission critical.
  - A less hazardous substitute is available.
  - The material is highly hazardous and there are no available mitigations.
  - The quantities will exceed applicable thresholds that will impact the site due to additional regulatory restrictions and oversight or high cost of implementing new requirements.
  - The material is one of the listed banned materials (see [Chemical Lifecycle Management: Chemical Screening Requirements](#)).
  - The material will be used in a manner that results in unacceptable exposure risks.

4. **Chemical reviewer(s)** Contacts the chemical user (and ESH coordinator if appropriate) to discuss
   - Less toxic substitute(s)
   - Conditional approval contingent on restrictions or controls
   - Rejection of the request based on established screening criteria
   - The need for upper management approval for toxic or hazardous mission-critical products that otherwise may have been rejected. May result in the chemical lifecycle management program manager requesting the completion of the justification form (as described in steps 7 through 10).

5. **Chemical user and ESH coordinator** Accepts chemical reviewers’ assessment of the chemical and works with directorate or local ESH coordinator to identify and implement controls. Directorate ESH coordinator will review implementation before approval.

6. **Chemical user** **Appeal process:** If the chemical user disagrees with the ESHQ assessment on categorization, restrictions, or mitigations attached to the use of the materials:
   - Works directly with the chemical reviewer with whose assessment he/she disagrees. Communicates the issue; includes directorate ESH coordinator and provides supporting documentation and alternative mitigations if necessary
   - If the issue is still not resolved, communicates with direct supervisor and the SLAC chief safety officer. The decision at this level is final and binding.

**Justifying purchase of toxic and hazardous products**

7. **Chemical user** Completes the [Chemical Lifecycle Management: Toxic and Hazardous Chemical Justification Form](#), which requires review by the directorate or local ESH coordinator to verify adequate controls are in place and approval by line management for the responsible directorate.
<table>
<thead>
<tr>
<th>Step</th>
<th>Person</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>▪ If justification is approved, submits justification form to the chemical lifecycle management program manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ If justification is declined, an alternative chemical or product will need to be found</td>
</tr>
<tr>
<td>8.</td>
<td>Directorate or local ESH coordinator</td>
<td>Reviews submitted justification form and verifies adequate controls are in place</td>
</tr>
<tr>
<td>9.</td>
<td>Line management</td>
<td>Reviews submitted justification form and approves or declines. Approval is acknowledgement that the use is justified.</td>
</tr>
<tr>
<td>10.</td>
<td>Chemical lifecycle management program manager</td>
<td>Keeps approved justification form and informs CMS representative of approved request(s)</td>
</tr>
<tr>
<td><strong>Adding approved chemical to the CMS catalog</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>On-site CMS representative</td>
<td>Approves catalog addition</td>
</tr>
<tr>
<td>12.</td>
<td>CMS buyer</td>
<td>Obtains pricing for approved request within one business day</td>
</tr>
<tr>
<td>13.</td>
<td>CMS system</td>
<td>Adds specifications, safety data, conditions of use, and controls, if any, to catalog and notifies requester of approval status</td>
</tr>
<tr>
<td>14.</td>
<td>Requester</td>
<td>Places chemical order through CMS system as described in Section 2.3, “Ordering from the Catalog”</td>
</tr>
</tbody>
</table>
Figure 1 Adding a New Chemical to the Catalog
2.5 Specific Acquisition Requirements

2.5.1 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.

2.5.2 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 CMS system, provided additional controls are in place, such as secure and limited access and use and rigorous inventory control.

2.5.3 Ethanol

The purchase and use of ethanol is regulated by the Department of the Treasury, Bureau of Alcohol, Tobacco, and Firearms. There is a federal excise tax on the use of ethanol; however, tax-free alcohol may be used for scientific, medicinal, and mechanical purposes. SLAC receives its research-use ethanol through an agreement with Stanford University. Users of ethanol can initiate purchase through the CMS system but will be invoiced directly. Ethanol must be managed and physically controlled, from receipt to point of use, to prevent improper or illegal use. 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.

2.6 Delivery and Receipt

Chemical containers shipped to SLAC through the CMS provider 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 an on-site CMS representative.

Chemical receivers are identified and associated with delivery locations within the CMS system. They 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:

- A leak test must be conducted for all compressed gas cylinders (CGC) containing toxic or corrosive gases at the point of delivery by the chemical lifecycle management program manager or a designate.
- 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 are required by this procedure:

- **Chemical Lifecycle Management: Toxic and Hazardous Chemical Justification Form** (SLAC-I-730-0A09J-006). Form for documenting line management approval of a request to add toxic or hazardous chemicals to the chemical management services (CMS) catalog
- **CMS system.** System used for ordering chemicals, tracking inventory, and storing safety data sheets

4 Recordkeeping

The following recordkeeping requirements apply for this procedure:

- Purchase requests are maintained in the CMS system.
- Completed justification forms are kept by the chemical lifecycle management program manager.

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 Lifecycle Management: Toxic and Hazardous Chemical Justification Form** (SLAC-I-730-0A09J-006)

- **Chapter 53, “Chemical Safety”**

Other SLAC Documents

- **Chemical Management Services (CMS)**
- **Chemical Procurement – CMS** (SharePoint)
- **CMS Requester List** (SharePoint)
- **Hazard Communication and MSDS References**

Other Documents

- Stanford University, Department of Environmental Health and Safety. **Controlled Substances and Precursor Chemicals Program**
Chapter 40: Chemical Lifecycle Management

Chemical Screening Requirements

Product ID: 460 | Revision ID: 1484 | Date published: 20 May 2013 | Date effective: 20 May 2013

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 requests to add chemicals to the chemical management services (CMS) catalog. They apply to ESHQ program managers and other chemical reviewers reviewing requests. Management and staff may refer to the criteria to make informed chemical and product selections, thereby shortening the review process.

2 Requirements

All requests to add chemicals to the CMS catalog must be reviewed by Environment, Safety, Health, and Quality (ESHQ) before purchase (see Chemical Lifecycle Management: Purchasing Procedure). ESHQ review must be done in a timely manner, and based on clear and transparent criteria that are communicated to, and therefore can be anticipated by, management and staff and made part of the chemical and product selection process.

2.1 Reviewers

Requests for additions to the CMS catalog are screened by subject matter experts (SMEs) representing various disciplines, organized as distinct approval groups as shown in Table 1.

Chemical reviewers must have

- Comprehensive knowledge of applicable regulatory lists and requirements
- Ability to interpret safety data sheets (SDSs)
- CMS system ESH approver 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. They can choose to be in the initial review or only participate when line management approval and controls are required. 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
Project Safety and Emergency Management | Fire safety, emergency management
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 Status Determination

Each review group will review products as described below. Each group will make its own status determination for the product, and the most restrictive will apply:

- **Approved.** There are no additional controls required. The product has ESHQ approval for use in the requesting work area.

- **Conditionally Approved.** The product is approved for use with specified conditions. Conditions can include limiting the quantity, restricting use to a project or process, and in the case of a highly hazardous material, documentation that the material is required for mission-critical work with no alternatives available. In this case, the Chemical Lifecycle Management: Toxic and Hazardous Chemical Justification Form must be completed and submitted before making the product available for purchase. Materials in this category may be initially rejected as a catalog addition until the conditions have been satisfied, at which time they can be resubmitted.

- **Rejected.** The product is rejected and will not be made available for purchase. Justification for rejection can include any of the following:
  - The material is highly hazardous and is not mission critical.
  - A less hazardous substitute is available.
  - The material is highly hazardous and there are no available mitigations.
  - The quantities will exceed applicable thresholds that will impact the site due to additional regulatory restrictions and oversight or high cost of implementing new requirements.
  - The material is one of the listed banned materials (see Section 2.3.2 below).
  - The material will be used in a manner that results in unacceptable exposure risks.
2.3 Chemical Categorization

2.3.1 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)

2.3.2 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

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banned</td>
<td>The following are banned for use at SLAC due to SLAC policy and Department of Energy (DOE) or regulatory directives:</td>
</tr>
<tr>
<td></td>
<td>• Polychlorinated biphenyls (PCBs) (see Chapter 32, “Polychlorinated Biphenyls”)</td>
</tr>
<tr>
<td></td>
<td>• Department of Transportation (DOT) Class 1.1: Explosives (49 CFR 173.50)</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>• 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, 2014. (See Chapter 30, “Air Quality”)</td>
</tr>
<tr>
<td></td>
<td>• Banned asbestos products (see Chapter 27, “Asbestos”)</td>
</tr>
<tr>
<td></td>
<td>• Controlled substances listed in the Stanford University Controlled Substances and Precursor Chemicals Program</td>
</tr>
<tr>
<td></td>
<td>• Lead paint, lead shot, or lead wool (see Chapter 20, “Lead Safety”)</td>
</tr>
<tr>
<td>Of concern</td>
<td>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.</td>
</tr>
</tbody>
</table>

**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:

• 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
• Occupational Safety and Health Administration (OSHA)-listed hazardous and toxic substances (29 CFR 1910.1000-1052)
• OSHA-listed carcinogens, mutagens, teratogens, reproductive toxins per 29 CFR 1910.1003
• 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
| Category             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
Category Description

- 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” (29 CFR 1910.1450[b]) 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 and Precursor Chemicals 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.

2.4 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.

2.4.1 Greener Choices

The CMS catalog 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. SLAC may also list a product in the “Greener Choice” catalog if it is a less toxic or less hazardous alternative to other commercially available products. For example, a product for a specific application may not be certified by an outside organization as “green”, however, it may have reduced toxic or hazardous attributes compared to other available alternatives. “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

2.4.2 Resources

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

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Resources</th>
<th>Legal and Other Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Resource Conservation and Recovery Act (RCRA), Section 6002 (42 USC 6962)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Comprehensive Procurement Guideline for Products Containing Recovered Materials&quot; (40 CFR 247)</td>
</tr>
<tr>
<td>Environmentally preferable</td>
<td>US EPA <a href="https://www.epa.gov/epamailings/environmentally-preferable-purchasing">Environmentally Preferable Purchasing</a></td>
<td>EO 13514</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EO 13423</td>
</tr>
<tr>
<td>Bio-based</td>
<td>USDA <a href="https://www.biopreference.com">Bio-Preferred</a></td>
<td>EO 13514</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EO 13423</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Farm Security and Rural Investment Act of 2002, Section 9002 (7 USC 8102)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy Policy Act of 1992 (EPAct), Section 303 (42 USC 13212)</td>
</tr>
<tr>
<td>Non-ozone depleting substances</td>
<td>US EPA <a href="https://www.epa.gov/ozone-layer-depletion">Ozone Layer Depletion – Alternatives / SNAP</a></td>
<td>Clean Air Act, Section 613 (42 USC 7671)</td>
</tr>
</tbody>
</table>

*Other requirements include applicable Federal Acquisition Regulation (FAR) and Department of Energy Acquisition Regulations (DEAR), as specified in the [DOE/SU Contract](https://www.energy.gov/eere/solar)
3 Forms

The following are forms 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: Purchasing Procedure (SLAC-I-730-0A09C-001)
  - Chemical Lifecycle Management: Toxic and Hazardous Chemical Justification Form (SLAC-I-730-0A09J-006)

- 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

- Chemical Management Services (CMS)
- Chemical Procurement – CMS (SharePoint)
- CMS Requester List (SharePoint)
- Hazard Communication and MSDS References
- Risk Management Plan
- Solvent Management Plan (SLAC-I-750-3A03M-001)

Other Documents


- 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 151.1C, “Comprehensive Emergency Management System” (*DOE O 151.1C*)

- Department of Energy Order 474.2, Change 2, “Nuclear Material Control and Accountability” (*DOE O 474.2, Change 2*)


- Department of Agriculture. Bio-Preferred


- Environmental Protection Agency. Climate Change: Greenhouse Gas Emissions

- Environmental Protection Agency. Design for the Environment

- Environmental Protection Agency. Environmentally Preferable Purchasing (EPP)

- Environmental Protection Agency. Ozone Layer Protection - Regulatory Programs: Exemption for Laboratory and Analytical Uses
- Environmental Protection Agency. Ozone Layer Protection: Alternatives / SNAP
- Environmental Protection Agency. Ozone Layer Protection: Science: Ozone-depleting Substances
- Environmental Protection Agency. Persistent Bio-accumulative and Toxic (PBT) Chemical Program
- Environmental Protection Agency. Wastes: Hazardous Waste: Waste Minimization
- Environmental Protection Agency. Wastes: Resource Conservation: Comprehensive Procurement Guidelines
- Occupational Safety and Health Administration (OSHA). Safety and Health Topic: Hazardous and Toxic Substances
- Occupational Safety and Health Administration (OSHA). Safety and Health Topic: Isocyanates
- California Department of Toxic Substances Control. Fact Sheet: Mercury-Added Switches and Relays in Consumer Products
- California Department of Toxic Substances Control. Fact Sheet: Mercury Thermostat Collection Act of 2008
- California Office of Environmental Health Hazard Assessment. Proposition 65
- EcoLogo
- Green Seal
- Stanford University, Department of Environmental Health and Safety. Controlled Substances and Precursor Chemicals Program
Chapter 40: *Chemical Lifecycle Management*

**Toxic and Hazardous Chemical Justification Form**

*Product ID: 461 | Revision ID: 1485 | Date Published: 20 May 2013 | Date Effective: 20 May 2013

This form documents line management review approving a request to add toxic or hazardous chemicals to the chemical management services (CMS) catalog. The chemical lifecycle management program manager issues this form to the user/requester if ESHQ 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).

**Request to add new chemical to the CMS catalog** *(completed by user/requester)*

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

*(print name, title):*

<table>
<thead>
<tr>
<th>Signature:</th>
<th>Date:</th>
</tr>
</thead>
</table>

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.

*(print name, title):*

<table>
<thead>
<tr>
<th>Signature:</th>
<th>Date:</th>
</tr>
</thead>
</table>

*User/request submits completed form to the chemical lifecycle management program manager at M/S 84.*
Chapter 40: Chemical Lifecycle Management

Management and Use Requirements

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, supervisors, chemical storage asset custodians, the SLAC fire marshal, and the 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 and use of compressed gases, see Chemical Lifecycle Management: Compressed Gas Cylinder Handling and Use 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. Personnel should rely on just-in-time delivery provided by the CMS system. 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/SM, 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\(^1\).

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\(^1\) See the Stanford Compatible Storage Group Chemical Classification System. Also, the National Oceanic and Atmospheric Administration (NOAA) has made available a chemical reactivity worksheet (CRW) that allows one to identify the reactivity of substances or mixtures of substances.
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. 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.)

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:

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2 Lecture bottles have an internal volume of approximately 0.5 liter.
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 CMS 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 CMS 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 CMS 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 are forms required by these requirements:
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 CMS 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 Handling and Use 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)

- Chapter 1, “General Policy and Responsibilities”
- Chapter 2, “Work Planning and Control”
- Chapter 12, “Fire and Life Safety”
- 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

Other SLAC Documents

- Chemical Management Services (CMS)
- Hazard Communication and MSDS References
- CMS system

Other Documents

- National Fire Protection Association (NFPA) 70, National Electrical Code (NFPA 70)

• National Oceanic and Atmospheric Administration (NOAA), Office of Response and Restoration. Chemical Reactivity Worksheet (CRW)

• Stanford University, Department of Environmental Health and Safety. Stanford Compatible Storage Group Chemical Classification System
Chapter 40: Chemical Lifecycle Management

Compressed Gas Cylinder Handling and Use Requirements

1 Purpose

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

2 Requirements

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

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

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

2.1 Before First Use

Before a CGC is used the first time:

- Make sure the CGC is equipped with the correct regulator. Never force connections that do not fit. An improper fit may indicate that the regulator or connector is not suitable.
- Inspect the regulator and CGC valve and remove any grease, oil, dirt, or solvent. Never use grease or oil to lubricate regulators or valves – compressed gas and volatile lubricants can cause an explosion.
- Only use wrenches or tools provided or recommended by the CGC supplier to open or close a valve; never use pliers.
- Place the CGC so that it is easily accessible, does not become part of an electric circuit, and does not become entangled in experimental apparatus.
- Equip CGC discharge lines with approved check valves when connected to a closed system. This prevents inadvertent backflow contamination of cylinders.
2.1.1 Securing CGCs

2.1.1.1 Individual CGCs
- 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.

2.1.1.2 CGCs 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.

2.2 General Use Requirements
- Keep valve protection caps in place until ready to use.
- Close the valve when equipment is not in use.
- Before opening the cylinder valve, back the regulator pressure adjusting screw off to release any spring force.
- Use the cylinder valve, not the regulator, for turning off the gas.
- Close the cylinder valve and release all pressure before removing the regulator.
- Never heat CGCs – even when partially empty – with any device that could raise the surface temperature of the cylinder to above 125º F.
- Keep the cylinder clear of all electrical circuits, flame, and sparks.

2.2.1 Upright and Inverted Use
- CGCs containing flammable liquefied gas (for example, acetylene) must be used valve end up, except those designed for use in a horizontal position and those CGCs containing non-liquefied gases.
- When used upright (inclined no more than 45 degrees from the vertical), the relief device must always be in direct communication with the gas phase.
- If inverted, the CGC must be secured and the dispensing apparatus must be specifically designed for inverted use.

2.3 Empty CGCs

2.3.1 Handling
- Handle empty CGCs with the same care accorded to full CGCs.
- Do not completely empty a cylinder; always leave some residual pressure.
Once a gas cylinder is nearly empty, replace the cap and store it in the 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 CGC 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 CGC: only gas suppliers can refill cylinders.

### 2.3.2 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 CGC must be returned to the vendor through chemical management services (CMS). Contact the CMS representative to initiate removal.

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

### 2.3.3 Damaged, Unidentifiable, or Abandoned CGCs

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

### 2.4 Tags

CGCs are delivered with a yellow tag, as shown here. If a tag is missing, contact the CMS representative.
Figure 1 CGC Tag

The tag is used to indicate the status of the CGC 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 CGC 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 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: Management and Use Requirements (SLAC-I-730-0A09S-038)
  - Chemical Lifecycle Management: Chemical Storage Asset Requirements (SLAC-I-730-0A09S-018)

- Chapter 53, “Chemical Safety”
  - Chemical Safety: Hazard Communication Requirements (SLAC-I-730-0A09S-042)
  - Chemical Safety: Safe Handling Guidelines

Other SLAC Documents

- Chemical Management Services (CMS)
- Chemical Procurement – CMS (SharePoint)
Hazard Communication and MSDS References

CMS system

Other Documents

None
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 handling and use, see Chemical Lifecycle Management: Compressed Gas Cylinder Handling and Use 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 Z49.1-2005).
- 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.¹ 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 required by these requirements:

- None

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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 Handling and Use 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 SLAC Documents

- None

Other Documents


- Occupational Safety and Health Administration (OSHA). **OSHA Standard Interpretation: 29 CFR 1926.350(a)(10)**

Chapter 40: Chemical Lifecycle Management

Chemical Storage Asset Requirements

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, supervisors, line management, chemical storage asset custodians, the SLAC fire marshal, and the program manager.

2 Requirements

2.1 General

2.1.1 Mapping

Locations of all chemical storage assets are shown on hazardous materials storage maps. These maps are maintained by chemical lifecycle management program manager and custodians.

2.1.2 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. The local hazardous material inventory and use maps are correct, current, and made available to the chemical lifecycle management program manager.

2. Chemical storage assets have been assigned a property control (PC) identification number (“other cabinets” and gas racks are exempted from this requirement).

3. 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).

4. The asset meets requirements. This includes performing required testing and inspections.

2.1.3 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, Health, and Quality (ESHQ) 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.”

2.1.4 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 ESHQ 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 30-2003). 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.

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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).
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 70-2011), Section 500.

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 lunch rooms 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.
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 ESHQ 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 within 75 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**

<table>
<thead>
<tr>
<th>Aggregate Quantity per Storage Area</th>
<th>Minimum Distance to Buildings, Streets, Public Ways, or Property Lines</th>
<th>Minimum Distance between Storage Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>m³</td>
<td>ft³</td>
<td>m</td>
</tr>
<tr>
<td>&lt;120</td>
<td>&lt;4,225</td>
<td>1.5</td>
</tr>
<tr>
<td>120.1–598</td>
<td>4,226–21,125</td>
<td>3</td>
</tr>
<tr>
<td>598.1–1435</td>
<td>21,126–50,700</td>
<td>4.6</td>
</tr>
<tr>
<td>1435.1–2393</td>
<td>50,701–84,500</td>
<td>6</td>
</tr>
<tr>
<td>≥2393.1</td>
<td>≥84,501</td>
<td>7.5</td>
</tr>
</tbody>
</table>

- 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

<table>
<thead>
<tr>
<th>Quantity of Gas Stored (at normal temperature and pressure)</th>
<th>Distance to a Building or to a Public Way or Property Line</th>
<th>Minimum Distance between Storage Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>m³, ft³</td>
<td>M, Ft</td>
<td>M, Ft</td>
</tr>
<tr>
<td>0–1416, 0–50,000</td>
<td>1.5, 5</td>
<td>1.5, 5</td>
</tr>
<tr>
<td>1417–2832, 50,001–100,000</td>
<td>3.0, 10</td>
<td>3.0, 10</td>
</tr>
<tr>
<td>≥2833, ≥100,001</td>
<td>4.6, 15</td>
<td>4.6, 15</td>
</tr>
</tbody>
</table>

- 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 are forms 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

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 ESHQ 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)
- Chapter 17, “Hazardous Waste”
- Chapter 1, “General Policy and Responsibilities”
  - ESH: Project Review Procedure (SLAC-I-720-0A24C-001)
Other SLAC Documents

- Hazardous Materials Storage Maps
- Gas Cabinet Guidance

Other Documents

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 ESHQ 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 and verify that this location is accurately mapped on the hazardous materials storage maps. 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.
### Storage Area Inspection Form

**Inspection location:**

☐ Check this box if this location is accurately mapped on the CMS chemical use map.

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