Chapter 20: Lead Safety

Lead Management Requirements

1 Purpose

The purpose of these requirements is to protect workers and the environment from hazards associated with lead, and to reduce waste. They cover the acquisition, use, handling, storage, and disposal of lead. They apply to workers (as lead handlers and lead users), supervisors, area and building managers, lead storage area owners, the lead safety program manager, Industrial Hygiene, Waste Management, Environmental Protection, Radiation Protection, and Purchasing.

2 Requirements

2.1 Lead Form

*Spaghetti lead, pencil lead, and lead wool* may no longer be purchased or used in shielding at SLAC. They are banned materials because lead in these forms is known to produce large amounts of lead dust. These forms of lead must be disposed of or recycled when encountered and must not be stored or used (see Section 2.6, “Waste”). Lead shot may only be used if it is in a sealed container.

2.2 Purchasing and Receiving Lead

Wherever possible existing lead should be reused. (To request a transfer of used lead from central storage, see Lead Safety: Lead Transfer Procedure).

Requesters of new lead are required to justify the request (see Lead Safety: Standard Lead Shielding Purchase Procedure).

Standard, non-custom bricks and sheets of lead are purchased using the Chemical Management System. Custom-fabricated (machined) lead and sandwich materials are purchased through the Purchasing Department.

All purchases must use the following required language:

Delivered lead products and packaging must be free of visible lead debris; shipments in violation of this requirement may be subject to rejection. If visible lead debris is present, product will not be off loaded and will be returned to supplier at their cost. Prior to subsequent deliveries, the supplier’s facility and procedures may be audited to confirm that lead contamination will not be transferred/carried to the SLAC National Accelerator Laboratory site.
The requesting SLAC organization will be responsible for receiving lead shipments and inspecting for visible lead debris (including machined shavings and loose chips). If such contamination is present, the lead safety program manager will be notified, and the shipment will not be accepted.

2.3 Lead Storage and Management

All lead at SLAC must be stored indoors in designated areas, with proper signage and controls. Lead in unusable forms will be properly stored until recycled or disposed of.

Equipment containing lead should also be stored indoors and may only be stored outdoors by exception and only with the approval of the lead safety program manager. For any such exceptions the lead safety program manager will determine appropriate covering, signage, and periodic inspection requirements.

The lead safety program manager will consult with Environmental Protection concerning outdoor storage exceptions.

2.3.1 Housekeeping

Surfaces will be maintained as free as practicable from accumulation of lead as required by the Cal/OSHA lead standard (8 CCR 5198 [h][1]).

Proper cleaning methods must be used where lead dust may be present in order to prevent personal exposures or environmental contamination (see Lead Safety: Lead Work Requirements).

2.3.2 Lead Storage Areas

The storage area owner must ensure that lead storage areas are inspected periodically (not less than once per year), cleaned as necessary, and posted with the signs identifying both the hazard and the prohibited activities.

![Lead Storage Area Warning Sign](image)

**Figure 1** Lead Storage Area Warning Sign

At the request of the lead safety program manager, Industrial Hygiene will conduct lead surface dust sampling to test for the presence of lead dust in storage areas when appropriate.
2.3.3 Lead Use Areas

2.3.3.1 Shielding in Place

In accelerator or experimental areas where unpainted lead shielding is present, the area must be inspected periodically (not less than once per year) and cleaned as necessary. In accelerator or experimental areas where painted lead shielding is present, the area should be inspected periodically and cleaned or repainted as necessary.

When accelerator or experimental area lead shielding is moved, the area should be inspected and cleaned.

At the request of the lead safety program manager, Industrial Hygiene will conduct lead surface dust sampling to test for the presence of lead dust in accelerator or experimental areas when appropriate.

2.3.3.2 Detector Lead

The lead safety program manager is responsible for inspecting and determining the need for cleaning of detector surfaces at the Stanford Large Detector (SLD) and the Mark II Detector in the Building 750 pit, and the High Resolution Spectrometer (HRS) in Building 660.

2.3.3.3 Machining and Cutting

Lead use areas where lead machining or cutting is performed will be cleaned and inspected at the end of each job or project.

Lead will be machined in the following locations exclusively. The exception to this, by approval of the lead safety program manager, is for equipment, shielding, or other lead materials that cannot be moved in a practicable way to a listed machining location. Safe lead work practices must be used and a 6 millimeter thick polyethylene sheet must be used to contain all lead shavings. Lead machining areas will be cleaned and inspected at the end of each job or project (see Lead Safety: Lead Work Requirements).

Table 1 Lead Machining and Cutting Locations

<table>
<thead>
<tr>
<th>Location</th>
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<tbody>
<tr>
<td>Klystron High Bay (Building 044)</td>
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<tr>
<td>SSRL lead machining tent with air cleaner (Building 131)</td>
</tr>
<tr>
<td>MFD machine shops (Buildings 025 and 26)</td>
</tr>
</tbody>
</table>

2.3.3.4 Posting

Where lead work may result in exposures that may reach half of the permissible exposure level (PEL), the supervisor is required to ensure the area is posted with signs identifying both the hazard and the prohibited activities.
2.4 Movement and Transportation of Lead and Items with Lead

2.4.1.1 Lead Movement within Lead Use Areas

Lead must be moved in a manner that minimizes the potential for occupational exposure and environmental contamination. Any lead wool or loose lead debris associated with shielding must be separated for recycling or disposal.

2.4.1.2 Lead Movement between Use Areas or Buildings

While being moved from one area to another, lead must be protected from contact with rain and wrapped with plastic or similarly contained to prevent release of lead into the environment. The lead safety program manager must be notified of the move and the quantities and location.

2.4.1.3 Movement of Items / Equipment with Lead

SLAC has experimental equipment with lead shielded components and shielding (for example, concrete blocks and klystrons) and materials that may have residual lead on their surfaces. These items must be inspected before moving. If it appears that residual lead is present, the lead safety program manager must be contacted, who will coordinate inspection and lead removal, if required. Equipment with lead components should be wrapped or otherwise contained in a manner that prevents the release of lead during movement.

2.4.1.4 Removal of Lead Shielding

Lead shielding to be reused must be transferred to Central Lead Storage, after having been surveyed by the Radiation Protection Field Operations (RPFO) (see Lead Safety: Lead Transfer Procedure).

Note Any removal of lead used as shielding requires a Radiation Safety Work Control Form (see Radiological Safety: Facility Design and Operation Requirements).
2.5 Radioactive Lead

2.5.1 Identification of Radioactive Lead

Radioactive lead must be identified with a stamped trefoil symbol and yellow paint.

2.5.2 Handling of Radioactive Lead

Workers handling radioactive lead must have Radiological Worker I Training (ESH Course 116). Handling includes the use of hands or tools to move/manipulate radioactive lead.

If the lead has loose radioactive contamination then Radiological Worker II Training (ESH Course 250) is required. Radioactive contamination information is noted on the radioactive material tag. Lead identified to have loose radioactive contamination must be appropriately contained, such as wrapped in polyethylene.

2.5.3 Working with Radioactive Lead

A radiological work permit (RWP) must be issued before working on radioactive lead. Work includes the use of tools to perform actions such as cutting, machining, welding, grinding, filing, or drilling on radioactive lead. The RWP will list the radioactive controls, which may include

- The use of HEPA vacuums
- Personal protective equipment (PPE) for contamination
- Respirators
- Ventilation

To obtain an RWP a procedure or RWP application must be submitted to Radiation Protection Field Operations (RPFO) detailing the tasks to be completed (see the Radiological Work Permits Procedure for further information).

2.5.4 Storage and Management of Radioactive Lead

Radioactive lead should be segregated from non-radioactive lead in order to avoid generating unnecessary mixed waste. Radioactive lead should be stored indoors as practicable (see Section 2.3, “Lead Storage and Management”). If radioactive lead must be stored outdoors, approval from Radiation Protection is required.

Excess radioactive lead should be reused on-site. If no on-site use can be identified, it must be listed in the Department of Energy (DOE) excess materials database to offer for reuse at other DOE sites.

2.6 Waste

2.6.1 Radioactive Waste

All radioactive lead considered waste is regulated as a mixed waste and must be shipped off-site within 90 days of generation.
The declaration as waste must be coordinated with the Radioactive Waste Management Group to ensure disposal within the regulatory timeframe and securing of funding appropriate for the waste generation volume expected (see Radiological Safety: Radioactive and Nuclear Material and Waste Requirements).

2.6.2 Lead Waste and Lead Contaminated Waste

All wastes contaminated with lead meeting the state and federal regulatory threshold limit concentrations are classified as hazardous waste. Disposal must be coordinated with Waste Management (see Chapter 17, “Hazardous Waste”).

Note See Chapter 17 for disposal of lead-containing items not within the scope of this chapter, such as lead-acid batteries, cathode ray tubes, and solder waste containers.

3 Forms

The following forms and systems are required by these requirements:

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

4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- The Central Lead Storage manager keeps the completed lead transfer forms.

5 References

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

- Chapter 20, “Lead Safety”
  - Lead Safety: Standard Lead Shielding Purchase Procedure (SLAC-I-730-0A09C-005)
  - Lead Safety: Lead Transfer Procedure (SLAC-I-730-0A09S-014)
  - Lead Safety: Lead Work Requirements (SLAC-I-730-0A09S-001)

- Chapter 9, “Radiological Safety”
  - Radiological Safety: Facility Design and Operation Requirements (SLAC-I-760-0A05S-003)
  - Radiological Safety: Radioactive and Nuclear Material and Waste Requirements (SLAC-I-760-0A30S-001)

- Chapter 17, “Hazardous Waste”

Other SLAC Documents

- Chemical Management Services (CMS)
- Radiological Work Permits Procedure (SLAC-I-760-0A05C-002)
- ESH Course 116, Radiological Worker I Training ([ESH Course 116](#))
- ESH Course 250, Radiological Worker II Training ([ESH Course 250](#))

Other Documents