

PHYSICS DIVISION ESH BULLETIN 2004-02
LEAD SHIELDING

1/15/04

Lead bricks (also sheet, tape, shot) are commonly used in the Physics Division for radiation shielding. Lead is toxic by inhalation and ingestion. Lead is a carcinogen and a reproductive hazard for both males and females. In addition to being an occupational hazard, lead dust carried home on clothing can pose a hazard to the worker's family. Lead is particularly hazardous to young children since the blood-brain barrier is not fully developed.

The OSHA lead standard can be found at 29 CFR 1910.1025. The standard (d)(2) states: "Each employer who has a workplace or work operation covered by this standard shall determine if any employee may be exposed to lead at or above the action level" (30 ug/m³) and (d)(3) "Basis of initial determination. (i) The employer shall monitor employee exposures and shall base initial determinations on the employee exposure monitoring results." (d)(4) "Where a determination conducted under paragraphs (d)(2) and (3) of this section shows the possibility of any employee exposure at or above the action level, the employer shall conduct monitoring which is representative of the exposure for each employee in the workplace who is exposed to lead."

Operations that have the potential for exposures at or above the action level of 30 ug/m³ fall under the scope of the OSHA lead standard. Required protective measures include training, medical monitoring, personal protective equipment, and exposure monitoring. Employers must ensure that no employee receives an exposure above the permissible exposure limit (PEL) of 50 ug/m³ over 8 hours.

Handling Lead Bricks Can Create Excessive Levels of Lead in Air

Air sampling has shown that personnel moving lead bricks may be exposed to concentrations of airborne lead above permissible limits. To minimize exposures, lead used for shielding in the Physics Division is typically painted or taped. Contact the ESH Officer if you need to obtain lead for radiation shielding.

The following precautions must be followed when working with lead shielding:

- Do not use lead bricks for any purpose other than shielding. Improper uses of lead bricks include pencil sharpeners, door-stops, weights for fans.
- Wear gloves when handling lead. Wash your hands after handling lead.
- Store lead indoors to protect from the weather and to limit oxidization.

- Avoid handling heavily oxidized lead whenever possible. Oxidized lead can be cleaned by wet-wiping. Use water or Formula 409. Use disposable rags. Place used rags in a labeled plastic bag for disposal as hazardous waste.
- Lead shielding that has been machined or formed in anyway for a specific detector, experiment or end station, should be stored in a clearly marked box or other container when not in use. The markings on the box should include “Lead Shielding for Reuse,” information about the experiment or detector with which the shielding is used, and the staff scientist’s name. Consult the ESH Officer if you need to drill, mill or saw lead for any purpose.
- Arrange for an Industrial Hygienist to evaluate operations that involve handling more than a few lead bricks at a time.
- Arrange for craft support (leadburners) for operations that involve handling more than a few lead bricks at a time.
- Lead scraps regardless of their size, should be recycled. Never put lead in the trash.

Lessons Learned

Legacy Lead at SLAC

“Legacy” lead refers to lead shot and lead matting (also called pencil lead, lead wool, and spaghetti lead). Historically, these were used at SLAC as added radiation shielding between and around shielding blocks as well as between and around experimental equipment that penetrates concrete shielding or walls.

Using lead shot and lead matting poses potential environmental and health hazards. Oxidized and friable lead can be hazardous because it can crumble into smaller fragments and mix with the environment and air. For example, when shielding blocks are moved, lead fragments from oxidized lead shot and matting could detach from the shielding blocks, drop to the ground, and pose an environmental hazard. If the lead then sloughs into smaller particles, it poses the risk of being inhaled or ingested in the form of dust or powder. Because of these hazards, only workers who are trained in lead handling may manage lead.

1. Do not use loose lead shot or lead matting as shielding. Limited use of lead shot (in bags or other containment) may be allowed. Contact ESH Officer for review.
2. If you are loose lead shot or matting, stop immediately and contact the ESH Officer. Do not attempt to clean-up the area.