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Volume II

Part 11: General H&S Controls—Personnel

Document 11.1
Personal Protective Equipment

Recommended for approval by the ES&H Working Group

Approved by: Robert W. Kuckuck
Deputy Director for Operations

New document or new requirements

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11.1

Personal Protective Equipment*

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Personal Protective Equipment

1.0 Introduction

The methods used for mitigating hazards are engineered controls, administrative controls, and personal protective equipment (PPE). Of these, PPE is the least preferred and is only to be used when engineered and administrative controls are infeasible or ineffective, during the development or installation of engineered controls, or as a supplement to other controls to reduce exposure to acceptable levels.

This document contains requirements for the common types of PPE used at LLNL. These requirements are based on Occupational Safety and Health Administration (OSHA) standards and are to be used in conjunction with those in applicable documents in the *Environment, Safety, and Health (ES&H) Manual* and in area-specific safety and operating plans.

Note that all of the requirements do not specifically apply to PPE used in construction activities. However, the respirator provisions apply to all activities, including construction. Additional information for PPE can be obtained from the area ES&H Team.

All University of California (UC) employees and supplemental labor workers working under direct Laboratory supervision shall comply with the requirements in this document. NonLLNL-supervised workers whose employers' PPE program meets OSHA requirements and is equivalent to the Laboratory's may not be bound by the requirements in this document. Requirements for construction subcontractors can be found in Document 2.4, "Construction Subcontractor Environment, Safety, and Health Program," and Document 2.5, "Procured Services Subcontractor Environment, Safety, and Health Program," in the *ES&H Manual*.

Visitors and guests must be evaluated on a case-by-case basis in accordance with Document 2.2, "Managing ES&H for LLNL Work," in the *ES&H Manual* to determine the appropriate equipment needed.

2.0 Hazards

Failure to properly select, maintain, and use the appropriate PPE required for specific work activities can result in bodily injuries to workers. These injuries vary greatly in severity (minor to severe) and type (e.g., chemical or thermal burns, eye damage, broken bones, hearing loss, lacerations, amputation).

3.0 Requirements for Common Types of PPE

This section contains requirements for the common types of PPE (see Table 1) used for LLNL operations. Effective and safe use of PPE depends on several key elements:

- Conducting a thorough hazard assessment to identify hazards.
- Selecting the best configuration or type of PPE to protect against the hazards and ensuring that it fits the user(s).
- Maintaining PPE in a state of cleanliness, readiness, and good repair.
- Training workers in use, and communicating why the PPE was selected.
- Enforcing the proper use of PPE.

Table 1. Common types of PPE used at LLNL.

Head protection **Hard hat** **Hood**	**Fall protection** **Safety line** **Body harness**
Eye protection **Safety glasses** **Goggles**	**Hand protection** **Gloves** **Finger cots**
Respiratory protection **Air-purifying respirator** **Air-supplying respirator**	**Face protection** **Face shield**
Body protection **Anti-contamination clothes** **Lab coats** **Aprons** **Coveralls** **Protective suits**	**Foot protection** **Safety shoes** **Boots** **Shoe covers/booties** **Hearing protection** **Ear plugs** **Ear muffs**

The supervisors of workers required to wear PPE are responsible for ensuring that these elements are met. The Hazards Control Department provides support in this process through the ES&H Teams and various training programs.

3.1 General Information

The selection of PPE is fairly simple in some cases (e.g., determining whether safety glasses with side shields are necessary in a wood-working shop), but it can be complicated in many others (e.g., choosing the best glove or respirator for protection against specific chemicals). Thus, work supervisors and employees should exercise care

to select the appropriate PPE for the job, inspect it prior to use, and make sure that workers required to wear the equipment receive the proper training. If assistance is needed in the selection process, the work supervisor should contact the ES&H Team.

OSHA requires documentation for the selection and fit of the PPE described in this document. Training in the use of these types of PPE shall also be documented.

3.2 Hazard Assessment

In accordance with Document 2.2, an Integration Work Sheet (IWS) shall be completed for most hazardous work activities performed at the Laboratory to determine the controls that must be in place prior to beginning work. The IWS process determines whether or not other documentation (e.g., Hazards Assessment Control (HAC) form, work permits, etc.) is required for specific activities. In most cases, the HAC form is sufficient documentation for work involving the PPE covered in this document and for determining the appropriate methods for controlling or mitigating hazards identified.

Work supervisors are responsible for ensuring that the appropriate hazard assessment is performed for each workplace and work activity. (Specific hazard assessment requirements for each group of PPE are given in the subsections below.) Work supervisors can perform the assessment or a safety committee or a Hazards Control representative may do it. They also are responsible for communicating information about hazards and appropriate PPE selection to all workers in the area.

3.3 Obtaining Equipment

The Laboratory provides all required PPE (except safety-shoe upgrades) at no expense to Laboratory employees and supplemental labor only (SLO) workers.

Except as specified in the following sections, PPE may be obtained through any standard LLNL procurement system, such as the LLNL Material Distribution Division, Shop Stock, UniCards, or blanket orders. Note that there are restricted items that require prior approval. For a current list of restricted items, contact any technical release representative (TRR) or the area ES&H Team, or refer to the following Internet address:

http://www-r.llnl.gov/pm/trr/html/controlitem.html

Newly purchased equipment must comply with the standards given in Table 2.

Table 2. Regulations and standards for PPE.

Type of PPE	Applicable standard	Requirement
Respirators	**ANSI Z88.2-1992** **42 CFR 84** **29 CFR 1910.134**	**WSS** **IBR** **WSS**
Laser eye protection	**ANSI Z136.1-1993**	**WSS**
Face and eye protection	**ANSI Z87.1-1989**	**IBR**
Head protection	**ANSI Z89.1-1986**	**IBR**
Footwear	**ANSI Z41-1991**	**IBR**
Insulating gloves	**ASTM D-120-95**	**IBR**
General	**29 CFR 1910.132**	**WSS**

Note: ANSI = American National Standards Institute; ASTM = American Society for Testing and Materials; IBR = Included by reference, i.e., required by being referenced in a WSS; NIOSH = National Institute for Occupational Safety and Health; WSS = Work Smart Standard.

3.4 Respirators

Respirators are used to prevent the inhalation of toxic or otherwise hazardous materials (including radioactive and infectious materials) and, in very limited cases, to provide oxygen in an oxygen-deficient atmosphere. Specific requirements for respirators are specified in the LLNL Respiratory Protection Program. Contact Hazards Control Respirator Services, the respirator program administrator, or your area ES&H Team for details.

Facial Hair. No respirator with a tight-fitting facepiece will be issued to any worker who has facial hair or other facial condition (e.g., scarring) that interferes with the fit, seal, or function of the respirator. Additionally, fit testing will not be conducted on any worker who has facial hair that may interfere with the seal or function of a respirator.

Use of Approved Respirators. Respirator manufacturers submit their equipment to NIOSH for certification for most uses. There are exceptions, such as chemical/biological warfare masks; in these cases, NIOSH-certified masks are not available. DOE has authorized LLNL to use military-type respirators for limited applications. Contact the respirator program administrator for more information.

Respirators are certified as complete units and include all components that are attached to the respirators as well as hoses and fittings. Adding or substituting a noncertified part voids the NIOSH certification and is in violation of OSHA regulations. Therefore, respirators shall not be modified in any manner that will void the certification.

Hazard Assessment. The work supervisor conducts a preliminary hazard assessment of the work area or activity to determine if there is any potential for significant exposure to airborne hazardous agents. If it is determined that a hazard may exist, the

work supervisor shall contact the ES&H Team. An ES&H Team industrial hygienist or health physicist will then evaluate the operation to determine if a hazardous exposure to airborne agents may occur. Where feasible, the industrial hygienist or health physicist shall recommend engineered controls before selecting a respirator. The results of the hazard assessment are recorded on a Hazard Assessment and Control (HAC) Form which specifies the PPE to be used, including respirators and, when applicable, the appropriate cartridges. Alternatives to the HAC Form include asbestos, lead, hazards (explosives), or radiological work permits or safety plans (Operational Safety Plan, OSP, or Facility Safety Plan, FSP).

Medical Approval. Once the hazard assessment has been completed and a respirator has been selected, the worker must obtain medical approval from Health Services before the specified respirator can be fit-tested or issued. The requesting worker's payroll supervisor shall initiate this process by completing and signing the Respirator Approval Form (LL-6150), which can be found at the following Internet address:

http://www.llnl.gov/healthserv/Forms/resp-app.html

Medical approval is based on the attending occupational health professional's review of the health of the individual assigned to wear the respirator. The nature of the review is dependent upon the type of respirator issued, the duration of use, and other factors. The occupational health examiner may, in very rare circumstances, determine that the worker is unable to wear the specified respirator or may limit its use to a specific number of hours a day (e.g., four hours). The occupational health provider may also specify that the worker only performs certain tasks. Any respirator-use medical restrictions shall be communicated to the employer and the work supervisor and noted on the approval card and in the approvals database.

Selection and Fit. The industrial hygienist or health physicist shall select the appropriate respiratory protection equipment based on the hazard assessment conducted and record it on the HAC Form; or on the asbestos, lead, or radiological work permit; or in a safety plan. Respirator Services shall ensure that respirators fit comfortably and seal properly prior to initial issue and at least every 12 months thereafter. Respirator users must be refitted if they gain or lose 20 pounds (or 10% of body weight), have dental surgery between regular fit testing, and if there are any other changes in facial shape or configuration. Appointments for fit-testing are required and can be made by contacting Respirator Services.

Obtaining Respirator and Related Equipment. Respirator Services issues respirators other than self-contained breathing apparatus (SCBA). These include all air-purifying respirators, airline respirators that are not equipped with escape air cylinders ("hip packs"), breathing air compressors, air purification/carbon monoxide detector ("R2D2") units, and airlines.

The LLNL Fire Department issues SCBAs, including both "back-pack" and "hip-pack" models, and all associated items (e.g., high-pressure compressors and breathing air in compressed gas cylinders, and airlines for "hip-pack" models). To help ensure that equipment will be ready and available when needed, requests for SCBA, airline, and hip-pack respirators should be made at least 24 hours in advance.

All respirators are issued in the field by respirator issue point administrators following strict requirements. Personnel trained to be respirator issue point administrators may receive, store, and issue respirators to individuals that have been approved to wear them in specific work areas.

Spectacle lens adapters can be obtained from Respirator Services at the time of fit-testing. Lenses are provided by Industrial Optometry in Health Services in accordance with the procedures described in Section 10.3.7.

To obtain the respirator specified by an industrial hygienist or health physicist, the worker must be

- Medically approved.
- Trained by taking Course HS4610 for any respirator, as well as Course HS4621, "Air-Line Respirators—Specific Training," and Course HS4630, "Self-Contained Breathing Apparatus."
- Successfully fit-tested to wear the respirator(s) recorded in the respirator approvals database.

The medical approval, training, and fit-testing status is recorded in the respirator approvals database and on the respirator user's card issued following successful completion of fit-testing. In addition, the user must provide Respirator Services or the issue point administrator a HAC Form; an asbestos, lead, or radiological work permit; a safety plan; or another document approved by the respirator program administrator.

Purchase Control. *Respiratory protective equipment (including filtering facepieces or "dust masks") can be purchased only with specific written approval of the Hazards Control Department.* This control is in place because an improperly selected respirator may provide inadequate protection or even no protection at all. For a complete listing of designated signatories/approvers who can authorize respiratory equipment, contact Respirator Services.

Maintenance. Respirator Services maintains air-purifying respirators and maintains or arranges for the maintenance of airline respirators other than SCBAs. Fire Department personnel maintain or arrange for maintenance of all SCBAs. Employees shall use, store, and dispose of respirators in accordance with the training provided.

Training. Prior to fitting a respirator, each worker is provided basic training (Course HS4610) on how to use the assigned respirator appropriately. Following successful fit-testing, SCBA users are also required to complete Course HS4630. The supervisor is then responsible for providing the worker additional training specific to the hazards for which the respirator has been selected as well as on area-specific procedures. Ongoing training includes annual refresher (Courses HS4610 and HS4630) and triennial training (Course HS4621). Course HS4621 shall be conducted in the area where the respirators are used or at the home shop if users are part of a mobile crew that use airline respirators in the field. "Hip-pack" and "back-pack" SCBA users prior to use must complete Course HS4630.

The work supervisors of workers required to wear respirators and personnel designated as respirator issue point administrators must complete Course HS4660 (Respirator Training for Supervisors of Respirator Users and Respirator Issue Point Administrators). This course is required every three years.

3.5 Chemical, Radiological, and Biohazards Protective Clothing (Including Gloves, Aprons, and Coveralls)

A variety of body protection is used to prevent exposure to hazardous chemicals, radioactive materials, biological agents, and physical hazards. In many cases, this equipment protects the individual from exposure or injury and prevents the spread of contamination to adjacent areas.

Personal protective garments should always be considered as combustible unless otherwise specified. LLNL has conducted combustibility tests to determine the suitability of anti-contamination and cleanroom garments for various activities (see Table 3). Garments for low fire-risk operations should never be used for cutting, welding or any other operation that might produce a spark, flame, high-energy light sources, or hot surfaces. Be sure to select the appropriate garment based on the fire-risk hazard.

Disposable protective gear, including latex gloves and "paper" coveralls, should be used for only one shift. Contaminated disposable equipment shall be properly stored or disposed of as hazardous, radioactive, or mixed waste (as appropriate). Contact your area ES&H Team for assistance with the types of PPE that constitutes hazardous wastes.

Hand or skin cream shall not be used in lieu of the required gloves, but may be used in addition to gloves or when gloves are not required.

Table 3. Anti-contamination garments suitable for low, moderate, and high fire-risk operations at LLNL.

If the operation involves these risk levels,	Then use
Low risk includes tasks where garment contact with any source of ignition is remote, or unlikely, or where exposure to the beams from a Class 1 or 2 laser is possible.	**Garments made of 65% polyester or dacron and 35% cotton and manufactured by Euclid; Uniform Manufacturers, Inc.; KWB Mfg. Co.; Best Manufacturers, Inc.; and Wranglers.** **NOTE: These garments burn rapidly when exposed to high temperature and therefore should never be used for moderate- or high-risk operations.**
Moderate risk includes tasks where garment contact with moderate ignition sources is possible. Typical tasks include grinding operations where workers could be exposed to sustained showers of friction sparks, work involving the use of open flames for heating or soldering—excluding cutting or welding—and operations where potential contact with sparks or exposure to the beams from Class 3b and 4 lasers is possible.	**Garments such as those manufactured by Kappler (Tempro), Kimberly-Clark (Prevail), and Durafab (Sontara). These resist ignition, but if ignited burn slowly relative to those for low-risk operations. They are suitable for some operations if the worker is fully aware of the hazards involved and could easily or quickly sense fire or smoke from a burning garment, thus allowing time to extinguish the burning area on the garment.**
High risk includes tasks where garment contact with a substantial ignition source is routine. Typical tasks include cutting or welding operations and electric work where it is possible for workers to be exposed to high-voltage electric arc flashes.	**Garments made of flame-resistant fabrics such as Nomex or Kevlar/polybenzimidazole (PBI). These resist ignition, but if ignited do not continue to burn after the energy source is removed. It should be noted that these garments melt, but do not ignite. They offer no protection from fire, but do not contribute to a fire or provide a means for flame to spread.**

Hazard Assessment. Where PPE is used to protect against radioactive contamination, extended immersion of hands or feet in hazardous liquids, or splashes with acutely toxic or corrosive chemicals, the supervisor shall contact the health physicist or industrial hygienist to review or conduct the hazard assessment.

Note: Some workers may have allergic reactions to some types of gloves (e.g., latex or powdered).

Selection and Fit. Selection of the most effective types of protective clothing can be difficult, particularly clothing that protects against liquid chemicals. Chemicals can degrade some types of plastics and rubbers, or may insidiously permeate the material without evidence of degradation. Thus, unless the exact nature of the chemical protective clothing is specified in a safety plan, it is necessary to contact the ES&H Team industrial hygienist or health physicist so that he/she can select the optimum type of gear.

The work supervisor is responsible for ensuring that protective clothing fits and is used properly. Clothing must be appropriately sized to protect the worker and to reduce any discomfort.

Obtaining Protective Clothing. The Material Distribution Division maintains a set of common types of gloves and body protective gear. Other types of equipment must be purchased on a case-by-case basis.

Maintenance. The work supervisor of workers that are required to use chemical protective clothing is responsible for maintaining the equipment. Chemical protective clothing must be stored properly to avoid deterioration, damage, or exposure to hazardous chemicals. This is especially important if the clothing (e.g., a splash apron used at a chemical process tank) is shared among workers.

Training. The work supervisor shall ensure that the worker is adequately trained to use the specified PPE. In some cases, the Hazards Control Department provides specific training. Outside vendors also provide training, such as the 40-hour Hazardous Waste Operations (HAZWOPER) training course for workers at hazardous waste sites. All affected workers must complete specific training (Course HS6340) on the use of radiological anti-contamination equipment.

3.6 Hand Protection (Other than Chemical, Radiological, and Biohazards Protective Clothing)

Hand protection is often required to protect against abrasion, puncture, cuts, heat, or cold.

Selection, Fit, and Training. The work supervisor is responsible for the selection, fit, and maintenance of gloves and for ensuring that workers are properly trained to use hand protection.

Obtaining Hand Protection. The work supervisor is responsible for the procurement of hand protection. Some glove types are available through the Material Distribution Division. The use of asbestos gloves is prohibited. Silica-fiber gloves are available for hot work up to 1100°C. If it is necessary to handle objects hotter than 1100°C, contact the ES&H Team industrial safety engineer.

3.7 Face and Eye Protection

Face and eye protection shall be provided where chemical splashes (including cryogens), flying particles, or mucous membrane exposure to a biological agent presents a hazard. The minimum type of eye protection is a pair of safety glasses. Increased protection against flying particles is provided when safety glasses have side shields; side shields

must be used in most cases. Safety glasses with side shields are appropriate for general use in wood and metal shops and for use of small quantities of chemicals that are not highly corrosive. Goggles are used for additional eye protection.

Goggles are the preferred form of eye protection. They shall be used instead of safety spectacles, face shields, or a combination of safety spectacles and faces shields when

- Caustics and hydrofluoric acid (these eye injuries are more serious than with other acids) are involved in operations.
- High concentrations of acids (pH<2) or bases (pH >11) are used.
- Temperatures are elevated. Chemical reactions, including acid-base, fuel-oxidizer/reducing chemical, and solution reactions, also generate heat in labs or shops. The MSDS provide advice about these types of hazards in industrial settings. In a plating shop, tank heaters may provide heating as part of the process.
- Work generates splash, dust, mists, or aerosols. Some electroplating and chemical processes create airborne mists. Air agitation, pouring of either large quantities of liquids or powders, or pouring from greater heights, vigorous mixing or sparging, or any operation may create corrosive splashes or mists.

Face shields should be used as supplemental protection for the skin of the face, but when used without safety eyewear are not considered to be adequate eye protection.

Special eye protection is required when workers are exposed to bright light, lasers, or ultraviolet light; when operations such as welding, metal cutting with a torch or arc, or brazing are performed; and when ultraviolet (UV) sources are used.

For employees who routinely wear safety glasses, it is recommended that they obtain high quality fitted or prescription glasses as these tend to be more comfortable than nonadjustable visitor spectacles. Safety glasses provided to visitors must be in compliance with ANSI Z87.1-1989.

Selection and Fit. Generally, the work supervisor selects eye and face protection for the worker, or the safety plan specifies the appropriate type of equipment. For assistance with the selection of safety eye wear for various operations or if you have questions regarding the necessary equipment, contact the ES&H Team industrial hygienist (for chemicals) or industrial safety engineer (for flying particles). Laser safety goggles require approval by the laser safety officer.

Obtaining Face and Eye Protection. Workers who regularly use safety glasses should have a pair of specially fitted prescription or plano glasses issued by the LLNL Hazards Control Safety Glasses Office located in the Health Services Department (Bldg. 663). The issue procedure for safety glasses includes selection, fit, and worker

training. Other common types of eye protection may be available from the Material Distribution Division.

Maintenance. Eye protection must be stored properly to avoid deterioration, damage, or exposure to hazardous chemicals. This is especially important if the equipment (e.g., a face shield used at a chemical process tank) is shared among workers.

Training. Specific training (Course HS5200) is provided for laser operators who are required to wear eye protection. Work supervisors are responsible for training other workers on the proper use of eye and face protection.

3.8 Head Protection

Typically, a hard hat is used to protect against impacts such as falling objects or striking overhead objects, and occasionally, electrical hazards. A hard hat is required on all construction sites, and may be required for operations where workers are working below other workers on experimental apparatus or in areas with limited head room (e.g., crawl spaces). "Bump hats" are not permitted, except where approved, in writing, by the cognizant industrial safety engineer.

Selection and Fit. IWS or safety plans governing a particular work area specify the head protection required for that area. Alternatively, the supervisor may select the appropriate headgear or may contact the ES&H Team for assistance.

Obtaining Head Protection. Hard hats are available from the Material Distribution Division.

Training. The work supervisor shall train workers in the use of head protection.

3.9 Foot Protection (Safety Shoes, Boots, Toe and Metatarsal Guards)

Feet are vulnerable to injury from falling or rolling heavy objects, sharp protrusions and chemicals on walking surfaces, and electrical shock. Foot protection is often used to reduce these hazards, especially in construction work areas where engineered controls are often insufficient.

The basic type of footgear is a pair of safety shoes; these come in many varieties and with various types of built-in protection. All safety shoes protect the toes against falling and rolling heavy objects and the sole of the foot from penetrating objects such as nails. Similarly, all safety shoes provide some protection from chemicals, while some provide additional protection against high-voltage electricity and twisted ankles. Rubber boots that are designed to be worn over safety shoes or in lieu of safety shoes provide increased protection from chemicals and water and some protection to the lower part of the leg.

Safety shoes are required on all construction sites. However, they are not necessarily required for individuals who only occasionally enter areas where foot hazards are possible.

Selection and Fit. IWS or safety plans for an area or operation specifies the need for safety shoes or boots. Alternatively, the work supervisor shall select foot protection based on an assessment of the hazards.

Hazard Assessment. OSHA requires documentation for the selection and fit of foot protection and training for workers who use this type of equipment. The safety shoe issue procedure incorporates all of these elements.

Obtaining Foot Protection. Normally, employees who are required to wear safety shoes are provided one pair a year unless their work supervisor determines that more frequent issue is required. Safety shoes can be obtained onsite one day a week or through an approved offsite vendor. For more information, contact your area ES&H Team.

Maintenance, Use, and Inspection. Foot protection must be used and maintained in accordance with the manufacturer's requirements and area-specific procedures. For example, some work areas may not permit safety shoes outside those areas. Refer to the applicable safety plan or area procedure(s) for additional information.

3.10 Hearing Protection

See Document 18.6, "Hearing Conservation," in the *ES&H Manual*.

3.11 Electrical Protective Equipment

Electrical protective equipment includes insulating gloves, covers, and floor mats. These are described in detail in Document 16.1, "Electrical Safety," in the *ES&H Manual*.

3.12 Fall Protection

Specialized protective devices are available at LLNL for workers who work at elevated locations or in confined spaces. Fall protection shall be worn when a fall hazard exceeds 6 ft, but is not normally needed where portable ladders are in use. A full-body harness is required, except when working in a manlift requires it or for worker positioning only—where a body belt is allowed. The mixing of equipment from various manufacturers is prohibited because this could compromise the safety that each piece provides.

Lifelines, safety belts, full-body harnesses, and lanyards shall be used only for worker safeguarding. Any of these devices subjected to a fall shall be immediately removed from service and not used again for worker safeguarding.

Hazard Assessment. Work planning is vital in situations where fall protection is required because of the potential for serious injury or death. Below are a few general work planning guidelines.

- List each fall exposure.
- Determine the worker's vertical and horizontal movement.
- Evaluate the strength of the anchor point.
- Plan the anchoring system.
- Select and obtain the appropriate equipment.
- Train workers.
- Maintain equipment.

Document 2.2 covers work planning in further detail.

Selection and Fit. The supervisor of a worker who uses fall-protection equipment shall select the appropriate equipment and ensure that it fits properly. The ES&H Team industrial safety engineer must concur with the selection of these devices.

Obtaining Fall Protection Equipment. When obtaining fall-protection equipment, the purchaser shall also get an LLNL Fall-Protection Equipment Inspection Tag (Stock No. 4280-71009). This tag is to be completed and attached to a solid point on the equipment with a cable tie. Fall-protection equipment shall be issued only after the industrial safety engineer has agreed to the selection.

Maintenance. The work supervisor is responsible for ensuring fall-protection equipment is inspected and that the inspection is recorded on the tag. The worker shall inspect the equipment before each use and every six months thereafter in accordance with the manufacturer's guidelines. These guidelines may be part of the literature included with the equipment at the time of purchase.

Training. Each user of fall-protection equipment shall receive training on how to properly select, use, and maintain the equipment. Course HS5960 (Fall Protection) fulfills this requirement.

3.13 Other PPE (Flack Jackets and Welding Leathers)

Hazard Assessment. Where flack jackets or other similar PPE may be necessary, the ES&H Team industrial safety engineer shall review and concur with the hazard assessment.

Selection and Fit. The work supervisor or a designated representative of the ES&H Team selects miscellaneous PPE based on the degree of the hazard. This equipment must provide adequate protection and be suitable for the worker.

Obtaining Other PPE. Special PPE usually must be purchased from a vendor.

Training. Work supervisors are responsible for training workers in the proper use of miscellaneous PPE. Assistance is available from the ES&H Team.

3.14 PPE for Explosives Handlers

PPE requirements specific to explosives handlers can be found in Document 17.1, "Explosives," in the *ES&H Manual*.

4.0 Administrative Controls

4.1 Entering and Posting the Area

Where entry into work areas requires the use of PPE, the Hazard Notice Door Sign (or other sign) shall be posted on the doors or other accesses indicating the types of hazards present and the PPE required. This constitutes notification of the results of a hazard assessment and PPE selection for these work areas.

Each person entering areas where PPE is required shall wear the specified equipment. The Responsible Individual shall enforce these requirements and provide information on the proper use of the specified PPE to untrained workers and visitors. Untrained visitors are not allowed in areas where a hazard exists and the use of respirators, chemical protective body clothing (other than shoe covers), electrical protective equipment, laser goggles, welding face gear, body harnesses, lifelines, or flack vests are required.

4.2 Training

All LLNL workers are required to complete initial training in the use of basic safety equipment such as safety glasses, hard hats, and safety shoes. Training programs for

each type of PPE must include when, where, and what PPE is necessary; limitations; how to properly don, doff, adjust, and wear PPE; and proper care, maintenance, useful life, and disposal. Some of these items can be accomplished readily under other existing systems (e.g., the Hazard Notice Door Sign in Document 10.2, "LLNL Health Hazard Communication Program," and Document 14.12, "Safe Handling of Carcinogenic Materials," in the *ES&H Manual*). Others require more in-depth training programs.

Workers may satisfy the training requirements specified in this section by doing the following:

- Completing onsite web-based training (WBT) or computer-based training (CBT).
- Attending a supervisor-conducted courses (formal or informal).
- Receiving On-the-job training (OJT).
- Attending tailgate/toolbox safety meetings.
- Completing local training programs.
- Reviewing the IWS, OSP, Facility Safety Plan (FSP), or other reviews of procedures.
- Viewing Videotape programs.
- Taking training courses conducted by outside vendor, the Hazards Control Department, or the Environmental Protection Department.

In all cases, training must be documented, at least locally, in accordance with each directorate's training plan. In the case of formal courses with LLNL-issued course numbers (e.g., Course HS4610), documentation is through the Laboratory Training Requirements and Information Network (LTRAIN) system. The applicable OSHA standards also allow for payroll supervisors to certify attendance for training that occurred prior to the implementation of these requirements (i.e., grandfathering). For assistance with determining the appropriate training and applicable documentation, contact the ES&H Team.

The work supervisor or host is responsible for ensuring that all workers receive or have had site-specific training for the particular area, including training in the use of all types of PPE (e.g., gloves, face shields, respirators, and splash aprons). Table 4 contains courses that workers can take (or may have taken) to satisfy requirements for work involving the use of PPE.

5.0 Responsibilities

General responsibilities for all workers are described in Document 2.1, "Laboratory and ES&H Policies, General Worker Responsibilities, and Integrated Safety Management," in the *ES&H Manual*. Specific responsibilities for PPE are listed under each title in the following table.

Table 4. Training courses that meet PPE requirements. Note that the requirement(s) for a specific PPE is satisfied if a worker has taken any of the courses specified or alternative training.

Type of Equipment	Course	Or alternatively, PPE training can be provided by
Safety glasses	**EP0039-01, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response Treatment, Storage, and Disposal Facilities (HWM)"** **EP0039-02, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response for Occasional Environmental Cleanup Site Worker"** **EP0039-03, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response for the General Environmental Cleanup Site Worker"**	**Your work supervisor or area ES&H Team, or the industrial vision specialist**
Safety Shoes	**Training in the safety shoe issue process**	**Your work supervisor**
Goggles, face shields	**EP0039-01, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response Treatment, Storage, and Disposal Facilities (HWM)"** **EP0039-02, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response for Occasional Environmental Cleanup Site Worker"**	**Your work supervisor or area ES&H Team**
	EP0039-03, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response for the General Environmental Cleanup Site Worker" **An accredited course in asbestos**	
Hard hats	**—**	**Your work supervisor**
Respirators	**HS4610, "Basic Respirator Training"** **HS4660, "Respirator Training for Supervisors of Respirator Users and Respirator-issue Point Administrators"**	**Respirator Services** **Respirator staff**

Table 4. Training courses that meet PPE requirements. (cont'd)

Type of Equipment	Course	Or alternatively, PPE training can be provided by
Respirators (cont'd)	**HS4630, "Self-Contained Breathing Apparatus"** **HS4621, "Air-Line Respirators—Specific Training"**	**Your work supervisor or area ES&H Team, or the Fire Department**
Chemical protective clothing	**EP0039-01, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response Treatment, Storage, and Disposal Facilities (HWM)"** **EP0039-02, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response for Occasional Environmental Cleanup Site Worker)"** **EP0039-03, "Initial SARA/OSHA Training: Hazardous Waste Operations and Emergency Response for the General Environmental Cleanup Site Worker)"** **An accredited course in asbestos or health and safety substance-specific training**	**ES&H Team**
Gloves	**Accredited asbestos training or health and safety substance-specific training**	**Work Supervisor or ES&H Team**
Laser goggles	**HS5200-CBT, "Laser Safety"** **HS5200-RW, "Laser Safety Refresher-WBT"**	**Hazards Control Safety Education and Training Section**
Fall protection	**HS5960, "Fall Protection"**	**Work Supervisor**
Radiological protection equipment	**HS6340, "Anti-Cs"**	**—**
Electrical safety equipment	**HS5250, "Working on Energized R&D Equipment"**	**Work Supervisor**

5.1 Workers

- Use PPE in accordance with the training received.

  Note: LLNL provides the appropriate PPE. It is each employee's responsibility to wear the required PPE to protect himself/herself from injury.

- Notify any work supervisor of problems with PPE.

5.2 Hazards Control Department

- Provide assistance with workplace hazard assessments and in the selection of PPE, upon the request of supervisors.
- Provide basic respirator training for users; special training on the use of PPE, as requested; training that governs the use of fall-protection and anti-contamination coveralls (anti-Cs); and training for supervisors of respirator users and respirator issue point administrators.
- Complete a HAC form or an asbestos, lead, explosives, or radiological work permit.
- Assist with developing the IWS and safety plan to document any hazards identified and PPE selected.
- Review the IWS and safety plan to verify that adequate hazard assessments are provided and that any PPE required for the operation is specified.
- Review, procure, maintain, stock, and issue respirators and related equipment.
- Fit-test respirator users.
- Specify the types of PPE to be stocked by the Material Distribution Division.
- Maintain a shoe-sales contract with at least one vendor and ensure industrial vision specialist services.
- Review the purchase of PPE.

5.3 Material Distribution Division

The Material Distribution Division is responsible for stocking and procuring various types of PPE specified by the Hazards Control Department.

5.4 Environmental Protection Department

The Environmental Protection Department is responsible for providing information on the handling and disposition of potentially contaminated PPE.

5.5 Health Services Department

The Health Services Department is responsible for approving workers to use respirators and for providing hearing tests and hearing conservation training (Course HS4361) as part of the LLNL Hearing Conservation Program.

5.6 Responsible Individuals/Work Supervisors

- Enforce the use of PPE when required.
- Provide training when it is not provided through other means.
- Ensure that
  - — All available engineered and administrative controls are used or considered before allowing the use of PPE.
  - — A hazard assessment is conducted for all operations that may require the use of PPE.
  - — Workers who use PPE receive the proper training or retraining, as necessary.
  - — PPE is properly fitted, donned, doffed, sized, maintained, and returned or disposed of.
  - — All required PPE is readily available.
  - — Records are available for hazard assessments, PPE selection and fit, and training.

6.0 Work Smart Standards

10 CFR 835, "Occupational Radiation Protection."

10 CFR 850, "Chronic Beryllium Disease Prevention Program."

29 CFR 1910, Subpart I, "Personal Protective Equipment," as of July 1, 2000, but not including 29 CFR 1910.139 (1910.132-1910.138).

29 CFR 1910, Subpart Q, "Welding, Cutting, and Brazing."

29 CFR 1910, Subpart Z, "Toxic and Hazardous Substances."

ACGIH TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents, 2002, (excluding Biological Exposure Indices, TLVs for Physical Agents, and Biologically Derived Airborne Contaiminants).

ANSI Z88.2-1992, "American National Standard for Respiratory Protection."

ANSI Z136.1-2000, "Safe Use of Lasers," with exemption of sections 4.3.7, 4.3.8, 4.3.10.2.1, 4.4.2, 4.5.1, 4.6.5.2, 4.6.5.3, 4.6.5.4, and all appendices; replace "approve" with "review" in sections 1.3.2.4, 1.3.2.7, and 4.4.1; in section 4.3.4 exempt all portions except the last paragraph dealing with lock and tag of power sources.

DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees," Attachment 2, "Contractor Requirement Document," Sections 1–11, 13–18 (delete item 18.a), 19 (delete item 19.d.3), and 22.

DOE M 440.1-1, *DOE Explosives Safety Manual* (including DOE Explosives Safety Committee approved changes through May 2003).

7.0 Resources for More Information

7.1 Contacts

Contact the following for further information:

- Local ES&H Team—Technical guidance in selecting PPE, assistance with training programs (including hazard-recognition training), and selection of respirators and laser eyewear.
- Respirator Services—Scheduling and providing respirator training programs, and obtaining and maintaining respirators and related equipment.
- Respirator Program Administrator—Providing technical guidance on respiratory protection issues, maintaining and overseeing the Respiratory Protection Program, and conducting or coordinating audits and evaluations.
- Safety Glasses office—Making appointments and obtaining safety eyewear.
- Safety Education and Training Section—Enrolling in Hazards Control courses, obtaining videotapes, getting information about web-based training and computer-based training.

7.2 Applicable Lessons Learned

Examples of lessons learned applicable to PPE can be found at the following Internet addresses:

http://www-r.llnl.gov/es_and_h/lessons/workers_rec.html

http://www-r.llnl.gov/es_and_h/lessons/use_prot_cloth.html

http://www-r.llnl.gov/es_and_h/lessons/emp_fatal.html

7.3 Other Sources

42 CFR 84, "Approval of Respiratory Protective Devices."

ANSI Z41.1-1991, "Personal Protection—Protective Footwear."

ANSI Z87.1-1989, 'Practice for Occupational and Educational Eye and Face Protection."

ANSI Z89.1-1997, "Industrial Head Protection."

Chong, Y. P.; Staggs, K. J.; Wilson, K. R.; Eadens, D. P.; Stengel, J. W., *Evaluation of anti-contaminant garments in use at LLNL*, UCRL-ID-128830 (1997).

DOE O 5480.16A, Chapter 1, "Firearms Safety Training."

LLNL Respiratory Protection Program, Lawrence Livermore National Laboratory, Livermore, CA.