# CHAPTER 6 PERSONAL PROTECTIVE EQUIPMENT

## 6.1 INTRODUCTION

The use of personal protective equipment (PPE) is required in some parts of the Laboratory for protection of workers from various occupational hazards. PPE is not a substitute for adequate engineering or administrative controls and should be used only if no other measures are adequate or feasible. PPE typically includes: gloves, coveralls, eye protection, respirators, etc. Respirators will be covered separately in Chapter 7. Hearing protection will be discussed in Chapter 8.

## 6.2 SCOPE

This section covers the selection, care, and use of personal protective equipment at PPPL, and applies to all Laboratory personnel, contractors and subcontractors.

## 6.3 DEFINITIONS

6.3.1 **Personal Protective Equipment (PPE)** - Devices worn by the worker to protect against exposure to hazards in the environment.

6.3.2 **Administrative Controls** - Methods of controlling employee exposures by job rotation, work assignment, or time periods away from the hazard.

6.3.3 **Attenuation** - The reduction, expressed in decibels, of the sound intensity.

6.3.4 **Engineering Controls** - Methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the workroom environment.

6.3.5 **Exposure** - Contact with a chemical, biological, or physical hazard.

## 6.4 RESPONSIBILITIES

6.4.1 Department /Division Heads are responsible for ensuring implementation of this section.

6.4.2 Line Supervisors are responsible for:

A. Conducting, with the assistance of the Industrial Hygienist (IH) as appropriate, a workplace assessment to identify those employees or jobs that may need PPE. PPE may be required due to hazards of processes or environment, chemical hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

B. Documenting the workplace assessment with a certificate identifying the workplace evaluated, the person certifying the evaluation, and the date(s) of the hazard assessment.

C. Enforcing the use of PPE in areas where its use is required.

D. Ensuring that the PPE is used in accordance with instructions and training provided by the supervisor and the IH.

E. Ensuring that the proper PPE is on hand in sufficient amounts for employees and visitors.

F. Selecting PPE that properly fits each affected employee.

G. Ensuring that the PPE is provided, used, and maintained in a sanitary and reliable condition.

6.4.3 The Industrial Hygienist (IH) is responsible for:

A. Assisting Line Supervisors in investigating, identifying, and evaluating hazards where PPE may be necessary.

B. Arranging for instructions and training in the proper use of PPE.

C. Assisting supervisors in the selection of the proper PPE.

D. Periodically monitoring to ensure that the PPE is being used properly.

6.4.4 All employees are responsible for:

A. Wearing and using the issued PPE in accordance with instructions and training provided by the IH and their supervisors.

B. Cleaning, maintaining, and properly storing the PPE issued to them.

C. Informing their supervisors of any personal health problem that would be aggravated by the use of PPE.

D. Inspecting all PPE prior to each use and reporting any damaged PPE to their supervisor.

E. Using only those types of PPE that have been designated for that job.

## 6.5 REQUIREMENTS

6.5.1 PPE shall be used only when the use of engineering and administrative controls are not feasible or effective.

6.5.2 PPE shall not be used in any area or on any job until the Line Supervisor conducts a workplace hazard assessment (see 6.4.2.A above) and determines the required PPE.

## 6.6 PRACTICES AND PROCEDURES

6.6.1 Hand Protection

A. Appropriate hand protection shall be issued and worn when affected employees are exposed to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, and harmful temperature extremes.

B. The Laboratory's stockroom supplies both cloth and various rubber like gloves for distribution. Consult the IH for the proper selection of glove material for the hazards involved.

C. Cloth gloves should never be used when handling chemicals in any form.

D. Leather gloves are effective for use when handling rough materials, but are not effective in preventing punctures or cuts from sharp objects. Special puncture or cut resistant gloves, such as those made from Kevlar® shall be worn to protect against those hazards.

6.6.2 Face and eye protection

A. Eye and face protection shall be used when hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation are present.

B. Face shields, welding masks, chemical splash goggles, and non-prescription safety glasses can be obtained in the Laboratory's stockrooms. See Table 8.6.1 for lens shades for welding masks and goggles.

C. Prescription safety eyeglasses may be ordered at a reduced rate through the Occupational Medicine Office (OMO)

D. Supervisors shall ensure the use of eye and face protection in designated areas.

E. Signs shall be posted in designated eye protection areas.

F. Design, construction, testing and the use of devices for eye and face protection shall be in accordance with the "American National Standard for Occupational and Educational Eye and Face Protection", ANSI Z87.1-1989 (or latest edition).

G. All safety glasses shall be equipped with side shields to provide protection from hazards not directly in front of the employee.

6.6.3 Foot protection

A. Protective footwear shall be worn when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, where there are chemical or electrical hazards to the feet, or where slip hazards exist on regular basis.

B. Safety shoes - The Laboratory will reimburse the employee towards the purchase of safety shoes. The employee must get his/her supervisor's approval on forms provided by the stockroom.

C. Chemical resistant boots - These boots are not supplied by the stockrooms. Supervisors shall consult with the IH for selection and purchase.

D. Other foot protection - Supervisors shall consult with the IH for their particular needs.

E. Protective footwear ("Safety Shoes")- Employees shall have footwear which meet the requirements and specifications in the "American National Standard for Personal Protection - Protective Footwear", ANSI Z41-1991 (or latest edition).

6.6.4 Head Protection

A. Each affected employee shall wear a protective helmet when working in areas where there is a potential for injury to the head from falling objects.

B. Protective helmets shall be designed to reduce electrical shock hazard when worn by employees exposed to electrical conductors which could contact the head.

C. Head protection shall comply with ANSI Z89.1-1986 (or latest version), "American National Standard for Personnel Protection - Protective Headwear for Industrial Workers - Requirements".

6.6.5 Other protective clothing - the use of aprons, chemical suits, throw-away suits, shoe covers, etc. shall be evaluated by the IH.

6.6.6 Respirators shall be selected, used, and maintained in accordance with Chapter 7 of this Section.

6.6.7 Hearing Protection - The Laboratory's stockroom supplies both ear muffs and ear plugs. Consult Chapter 8 of this Section on Noise and Hearing Conservation.

6.6.8 Lasers - Special eye protection information is available for various types of lasers. A single glass is not available for protection from all laser outputs. The maximum energy which the glasses will withstand and the spectral frequencies against which they will provide protection are imprinted on the frames of the laser glass (see Section 3 on Laser Safety).

## 6.9 TRAINING

6.9.1 Each employee required to wear Personal Protective Equipment shall be trained to understand the following:

A. When PPE is necessary

B. What PPE is necessary

C. How to properly don, doff, adjust, and wear PPE

D. The limitations of the PPE

E. The proper care, maintenance, useful life and disposal of the PPE

6.9.2 Each affected employee shall demonstrate the understanding of the training, and the ability to use PPE properly before being allowed to perform work requiring the use of PPE.

6.9.3 Retraining shall be required if any of the following situations occur:

A. Changes in the workplace render previous training obsolete

B. Changes in the types of PPE to be used render the training obsolete

C. The employee demonstrates a lack of knowledge in the use of PPE by improper use.

6.9.4 Human Resources and Training and the supervisor shall maintain records documenting the training which shall identify the PPE, the employee(s) trained, and the date of the training.

**TABLE 8.6.1**

Filter Lenses for Protection Against Radiant Energy

| Operations | Electrode Size 1/32 in. | Arc Current | Minimum(*) Protective Shade |
|---|---|---|---|
| Shielded metal arc welding | | | |
| | Less than 3 | Less than 60 | 7 |
| | 3-5 | 60-160 | 8 |
| | 5-8 | 160-250 | 10 |
| | More than 8 | 250-550 | 11 |
| Gas metal arc welding and flux cored arc welding | | | |
| | | less than 60 | 7 |
| | | 60-160 | 10 |
| | | 160-250 | 10 |
| | | 250-500 | 10 |
| Gas Tungsten arc welding | | | |
| | | less than 50 | 8 |
| | | 50-150 | 8 |
| | | 150-500 | 10 |
| Air carbon | (Light) | less than 500 | 10 |
| Arc cutting | (Heavy) | 500-1000 | 11 |
| Plasma arc welding | | | |
| | | less than 20 | 6 |
| | | 20-100 | 8 |
| | | 100-400 | 10 |
| | | 400-800 | 11 |
| Plasma arc cutting | | | |
| | (light)(**) | less than 300 | 8 |
| | (medium)(**) | 300-400 | 9 |
| | (heavy)(**) | 400-800 | 10 |
| Torch brazing | | | 3 |
| Torch soldering | | | 2 |
| Carbon arc welding | | | 14 |
| Gas Welding: | | | |
| Light | Under 1/8 | Under 3.2 | 4 |
| Medium | 1/8 to 1/2 | 3.2 to 12.7 | 5 |
| Heavy | Over 1/2 | Over 12.7 | 6 |
| Oxygen cutting: | | | |
| Light | Under 1 | Under 25 | 3 |
| Medium | 1 to 6 | 25 to 150 | 4 |
| Heavy | Over 6 | Over 150 | 5 |

Footnote(*) As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

Footnote(**) These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.