

PERSONAL PROTECTIVE EQUIPMENT

Published by

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INTRODUCTION

The aim of this booklet is to assist in providing a safe and healthful workplace by preventing employee exposure to unsafe equipment and situations. Words such as "must," "shall," "required" and "necessary" indicate requirements under the OSHA standards. Procedures indicated by "should," "may," "suggested" and "recommended" constitute generally accepted good practices.

This booklet along with safety and health consultation services are provided at no cost to owners, proprietors, and managers of small businesses by the Illinois Onsite Consultation Service, under a program funded largely by the Occupational Safety and Health Administration (OSHA), an agency of the U.S. Department of Labor. The service is provided without penalty or citations to any employer who requests consultation.

Much of the personal protective equipment (PPE) information in this booklet is framed in general terms and is intended to complement relevant regulations and manufacturers' requirements. For more specific information, refer to the OSHA standards collected in Title 29, Code of Federal Regulations (CFR), Part 1900-1999. In some instances, the standards or this booklet refer to specifications by the American National Standards Institute (ANSI), 11 West 42 St., New York, NY 10036, and the American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103. Employers are encouraged to use the most recent ANSI consensus standards and resolutions to provide protection equal to or greater than Federal OSHA regulations.

Personal protective equipment should not be used as a substitute for engineering, work practice and/or administrative controls. Rather it should be used in conjunction with these controls to provide for employee safety and health in the workplace. Personal protective equipment includes all clothing and other work accessories designed to create a barrier against workplace hazards. The basic element of any management program for personal protective equipment should be an indepth assessment of the equipment needed to protect against the hazards at the workplace. A worksheet, located on page 32, is provided to assist employers in completing a meaningful assessment. We thank KRMS/NATLSCO, Long Grove, Illinois, for allowing us to adapt the worksheet they developed. This worksheet is a valuable resource in assessing workplace hazards relative to the need for personal protective equipment. Management dedicated to the safety and health of employees should use the completed assessment to set a standard operating procedure for personnel, then train employees on the protective limitations of personal protective equipment and on its proper use and maintenance.

Using personal protective equipment requires hazard awareness and training on the part of the user. Employees must be aware that the equipment does not eliminate the hazard. If the equipment fails, exposure will occur. To reduce the possibility of failure, equipment must be properly fitted and maintained in a clean and serviceable condition.

Selection of the proper personal protective equipment for a job is important. Employers and employees must understand the equipment's purpose and its limitations. The equipment must not be altered or removed even though an employee may find it uncomfortable. Sometimes equipment may be uncomfortable simply because it does not fit properly.

This booklet discusses those types of equipment most commonly used for protection of the head, including eyes and ears and the torso, arms, hands and feet. The use of equipment to protect against life-threatening hazards also is discussed. Information on respiratory protective equipment may be found in Title 29 CFR Part 1910.134. The standard should be consulted for information on specialized equipment such as that used by firefighters.

HAZARD ASSESSMENT

Employers are required to assess the workplace to determine if hazards that require the use of personal protective equipment are present or are likely to be present. If hazards or the likelihood of hazards are found, employers must select and have affected employees use properly fitted personal protective equipment suitable for protection from existing hazards.

Employers must certify in writing that a workplace hazard assessment has been performed. Defective or damaged personal protective equipment shall not be used.

TRAINING

Before doing work requiring use of personal protective equipment, employees must be trained to know:

- when personal protective equipment is necessary;
- what type is necessary;
- how it is to be worn; and
- what its limitations are, as well as know its proper care, maintenance, useful life, and disposal.

Employers are required to certify in writing that training has been carried out and that employees understand it. Each written certification shall contain the name of each employee trained, the date(s) of training and identify the subject certified.

PURCHASING EQUIPMENT

In most cases, the employer must provide and pay for workers' personal protective equipment required by the company to do his or her job safely and in compliance with the OSHA standards.

If the equipment is very personal in nature and is usable by the employees off the job, the matter of payment may be left to labor-management negotiations.

Examples of personal protective equipment that would not normally be used away from the worksite include, but are not limited to welding gloves, wire mesh gloves, respirators, hard hats, specialty glasses and goggles (such as those designed for laser or ultraviolet radiation protection), specialty foot protection (such as metatarsal shoes and linemen's shoes with build-in gaffs), face shields and rubber gloves, blankets, cover-ups, hot sticks and other live-line tools used by power generation workers.

Examples of personal protective equipment that is personal in nature and often used away from the worksite include non-specialty safety glasses, safety shoes and cold-weather outer wear of the type worn by construction workers. However, shoes or outerwear subject to contamination by carcinogens or other toxic or hazardous substances which cannot be safely worn off-site must be paid for by the employer.

HEAD PROTECTION

Prevention of head injuries is an important factor in every safety program. A single injury can handicap an employee for life, or it can be fatal. A survey by the Bureau of Labor Statistics (BLS) of accidents and injuries noted that most workers who suffered impact injuries to the head were not wearing head protection. The majority of workers were injured while performing their normal jobs at their regular worksites.

The survey showed that in most instances where head injuries occurred employers had not required their employees to wear head protection. Of those workers wearing hard hats, all but five percent indicated that they were required by their employers to wear them. It was found that the vast majority of those who wore hard hats all or most of the time at work believed that hard hats were practical for their jobs. According to the report, in almost half of the accidents involving head injuries, employees knew of no actions taken by employers to prevent such injuries from recurring.

The BLS survey noted that more than one-half of the workers were struck on the head while they were looking down and almost three-tenths were looking straight ahead. While a third of the unprotected workers were injured when bumping into stationary objects, such actions injured only one-eighth of hard hat wearers.

Elimination or control of a hazard leading to an accident should, of course, be given first consideration, but many accident-causing head injuries are of a type difficult to anticipate and control. Where these conditions exist, head protection must be provided to eliminate injury.

Head injuries are caused by falling or flying objects, or by bumping the head against a fixed object. Head protection, in the form of protective hats, must do two things - resist penetration and absorb the shock of a blow. This is accomplished by making the shell of the hat of a material hard enough to resist the blow, and by utilizing a shock-absorbing lining composed of headband and crown straps to keep the shell away from the wearer's skull. Protective hats also are used to protect against electrical shock.

The standards recognized by OSHA for protective hats purchased prior to July 5, 1994, are contained in *ANSI Requirements for Industrial Head Protection, Z89.1-1969*, and *ANSI Requirements for Industrial Protective Helmets for Electrical Workers, Z89.2-1971*. These should be consulted for details. The standards for protective hats purchased after July 5, 1994, are contained in *ANSI Personal Protection - Protective Headwear for Industrial Workers - Requirements, Z89.1-1986*. Later editions of these standards are available and acceptable for use.

Selection

Each type and class of head protectors is intended to provide protection against specific hazardous conditions. An understanding of these conditions will help in selecting the right hat for the particular situation. Protective hats are made in the following types and classes:

Type 1-helmets with full brim, not less than 1 and 1/4 inches wide; and
Type 2-brimless helmets with a peak extending forward from the crown.

For industrial purposes, three classes are recognized:

Class A-General service, limited voltage protection;
Class B-Utility service, high-voltage helmets; and
Class C-Special service, no voltage protection.

For firefighters, head protection must consist of a protective head device with ear flaps and a chin strap that meet the performance, construction, and testing requirements stated in Title 29 CFR, 1910.156 (e)(5).

Hats and caps under Class A are intended for protection against impact hazards. They are made from insulating material to protect against falling objects and electric shock by voltages of up to 2,200 volts. They are used in mining, construction, shipbuilding, tunneling, lumbering, and manufacturing.

Class B utility service hats and caps are made from insulating materials to protect

the wearer's head from impact and penetration by falling or flying objects and from high-voltage shock and burn of up to 20,000 volts. They are used extensively by electrical workers.

The safety hat or cap in Class C is designed specifically for lightweight comfort and impact protection. This class is usually manufactured from aluminum and offers no dielectric protection. They are designed to protect from falling objects, but are not designed for use around live electrical wires or where corrosive substances are present. Class C helmets are used in certain construction and manufacturing occupations, oil fields, refineries, and chemical plants where there is no danger from electrical hazards or corrosion. They also are used on occasions where there is a possibility of bumping the head against a fixed object.

Materials used in helmets should be water-resistant and slow burning. Each helmet consists essentially of a shell and suspension. Ventilation is provided by a space between the headband and the shell. Each helmet should be accompanied by instructions explaining the proper method of adjusting and replacing the suspension and headband.

The wearer should be able to identify the type of helmet by looking inside the shell for the manufacturer, ANSI designation and class. For example:

Manufacturer's Name
ANSI Z89.1-1969 (or later year)
Class A

Fit

Headbands are adjustable in 1/8 size increments. When the headband is adjusted to the right size, it provides sufficient clearance between the shell and the headband. The removable or replaceable type sweatband should cover at least the forehead portion of the headband. The shell should be of one-piece seamless construction and designed to resist the impact of a blow from falling material. The internal cradle of the headband and sweatband forms the suspension. Any part that comes into contact with the wearer's head must not be irritating to normal skin.

Inspection and Maintenance

Manufacturers should be consulted with regard to paint or cleaning materials for their helmets because some paints and thinners may damage the shell and reduce protection by physically weakening it or negating electrical resistance.

A common method of cleaning shells is dipping them in hot water (approximately 140F) containing a good detergent for at least a minute. Shells should then be scrubbed and rinsed in clear hot water. After rinsing, the shell should be carefully inspected for any signs of damage.

All components, shells, suspensions, headbands, sweatbands and any accessories should be visually inspected daily for signs of dents, cracks, penetration or any other damage that might reduce the degree of safety originally provided. Helmets should not be stored or carried on the rear-window shelf of an automobile, since sunlight and extreme heat may adversely affect the degree of protection.

Users are cautioned that if unusual conditions occur (such as higher or lower extreme temperatures than described in the standards), or if there are signs of abuse or mutilation of the helmet or any component, the margin of safety may be reduced. If damage is suspected, helmets should be replaced or representative samples tested in accordance with procedures contained in ANSI Z89.1-1986. This booklet references national consensus standards, for example, ANSI standards, that were adopted into OSHA regulations. Employers are encouraged to use up-to-date national consensus standards that provide employee protection equal to or greater than that provided by OSHA standards.

EYE AND FACE PROTECTION

Eye and face protective equipment is required by OSHA where there is a reasonable probability of preventing injury when such equipment is used. Employers must provide a type of protector suitable for work to be performed and employees must use the protectors. These stipulations also apply to supervisors and management personnel, and should apply to visitors while they are in hazardous areas.

The BLS study found that about 60 percent of workers who suffered eye injuries were not wearing eye protective equipment. When asked why they were not wearing face protection at the time of the accident, workers indicated that face protection was not normally used or practiced in their type of work, or it was not required for the type of work performed at the time of the accident.

Suitable eye protectors must be provided where there is a potential for eye injury from machines, flying objects, glare, liquids, injurious radiation or a combination of these. Protectors must meet the following minimum requirements:

- Adequately protect against the particular hazards for which they are designed;
- Be reasonably comfortable when worn under the designated conditions;
- Fit snugly without interfering with the movements or vision of the wearer;
- Be durable;
- Be capable of being disinfected;
- Be easily cleanable; and
- Be kept clean and in good repair.

Every protector shall be distinctly marked to facilitate identification only of the manufacturer.

Each affected employee shall use equipment with filter lenses that have a shade number appropriate for the work being performed for protection from injurious light radiation. A listing of appropriate shade numbers for various operations can be found in Standard 1910.133, page 16.

OSHA and the National Society to Prevent Blindness recommend that emergency eyewashes be placed in all hazardous locations. First-aid instructions should be posted close to potential danger spots since any delay to immediate aid or an early mistake in dealing with an eye injury can result in lasting damage.

Selection

Each eye, face, or face-and-eye protector is designed for a particular hazard. In selecting the protector, consideration should be given to the kind and degree of hazard, and the protector should be selected on that basis. Where a choice of protectors is given and the degree of protection required is not an important issue, worker comfort may be a deciding factor. The BLS survey showed that few workers ever complained about poor vision or discomfort with personal eye protection equipment.

The survey noted that the typical injury was caused by flying or falling blunt metal

objects. Lacerations, fractures, broken teeth and contusions were common types of injuries reported.

Persons using corrective spectacles and those who are required by OSHA to wear eye protection must wear face shields, goggles or spectacles of one of the following types:

- Spectacles with protective lenses providing optical correction;
- Goggles worn over corrective spectacles without disturbing the adjustment of the spectacles; or
- Goggles that incorporate corrective lenses mounted behind the protective lenses.

When limitations or precautions are indicated by the manufacturer, they should be transmitted to the user and strictly observed.

Over the years, many types and styles of eye and face-and-eye protective equipment have been developed to meet the demands for protection against a variety of hazards.

Goggles come in a number of different styles: Eyecups, flexible or cushioned goggles, plastic eyeshield goggles and foundrymen's goggles. Goggles are manufactured in several styles for specific uses such as protecting against dusts and splashes, and in chipper's, welder's and cutter's models.

Safety spectacles require special frames. Combinations of normal streetwear frames with safety lenses are not in compliance.

Many hard hats and nonrigid helmets are designed with face and eye protective equipment.

Design, construction, tests and use of eye and face protection purchased prior to July 5, 1994, must be in accordance with ANSI Z87.1-1968, *USA Standard Practice for Occupational and Educational Eye and Face Protection*. Protective eye and face devices purchased after July 5, 1994, must comply with ANSI Z87.1-1989, *American National Standard Practice for Occupational and Educational Eye and Face Protection*.

Fit

Fitting goggles and safety spectacles should be done by someone skilled in the procedure. Prescription safety spectacles should be fitted only by qualified optical personnel.

Inspection and Maintenance

It is essential that the lenses of eye protectors be kept clean. Continuous vision

through dirty lenses can cause eye strain -- often an excuse for not wearing the eye protectors. Daily inspection and cleaning of the eye protector with soap and hot water or with a cleaning solution and tissue is recommended.

Pitted lenses, like dirty lenses, can be a source of reduced vision. They should be replaced. Deep scratches or excessively pitted lenses are apt to break more readily.

Slack, worn-out, sweat-soaked or twisted headbands do not hold the eye protector in proper position. Visual inspection can determine when the headband elasticity is reduced to a point beyond proper function.

Goggles should be kept in a case when not in use. Spectacles, in particular, should be given the same care as one's own glasses, since the frame, nose pads and temples can be damaged by rough usage.

Personal protective equipment that has been previously used should be disinfected before being issued to another employee. Even when each employee is assigned protective equipment for extended periods, it is recommended that such equipment be cleaned and disinfected regularly.

Several methods for disinfecting equipment for eye protection are acceptable. The most effective method is to disassemble the goggles or spectacles and thoroughly clean all parts with soap and warm water. Carefully rinse all traces of soap and replace defective parts with new ones. Swab thoroughly or completely and immerse all parts for 10 minutes in a solution of germicidal deodorant fungicide. Remove parts from solution and suspend in a clean place for air drying at room temperature or with heated air. Do not rinse after removing parts from the solution because this will remove the germicidal residue which retains its effectiveness after drying.

The dry parts or items should be placed in a clean, dust-proof container, such as a box, bag or plastic envelope to protect them until reissue.

EAR PROTECTION

Exposure to high noise levels can cause hearing loss or impairment. It can create physical and psychological stress. There is no cure for noise-induced hearing loss, so the prevention of excessive noise exposure is the only way to avoid hearing damage. Specifically designed protection is required, depending on the type of noise encountered and the auditory condition of employee.

Preformed or molded earplugs should be individually fitted by a professional. Waxed cotton, foam, or fiberglass wool earplugs are self-forming. When properly inserted, they work as well as most molded earplugs.

Some earplugs are disposable, to be used one time and then thrown away. The

non-disposable type should be cleaned after each use for proper protection. Plain cotton is ineffective as protection against hazardous noise.

Earmuffs need to make a perfect seal around the ear to be effective. Glasses, long sideburns, long hair and facial movements, such as chewing, can reduce protection. Special equipment is available for use with glasses or beards.

For more specific information on a hearing conservation program see Title 29 CFR 1910.95, *Occupational Noise Exposure*.

RESPIRATORY PROTECTION

Regulations concerning the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, vapors, or in oxygen deficient environments can be found in title 29 CFR Part 1910.134. Selection of a respirator should be made according to the guidelines in the National Institute for Occupational Safety and Health, *Respirator Decision Logic*, HHS/PHS/CDC DHHS (NIOSH), Publication No, 87-108, May 1987.

TORSO PROTECTION

Many hazards can threaten the torso: heat, splashes from hot metals and liquids, impacts, cuts, acids and radiation. A variety of protective clothing is available: vests, jackets, aprons, coveralls and full body suits.

Selection

Wool and specially treated cotton are two natural fibers that are fire-resistant and comfortable since they adapt well to changing workplace temperatures.

Duck, a closely woven cotton fabric, is good for light-duty protective clothing. It can protect against cuts and bruises on jobs where employees handle heavy, sharp or rough material.

Heat-resistant material, such as leather, is often used in protective clothing to guard against dry heat and flame. Rubber and rubberized fabrics, neoprene and plastics give protection against some acids and chemicals.

It is important to refer to the manufacturer's selection guides for the effectiveness of specific materials against specific chemicals.

Disposable suits of paperlike material are particularly important for protection from dusty materials or materials that can splash. If the substance is extremely toxic, a completely enclosed suit may be necessary. The clothing should be inspected to ensure proper fit and function for continued protection.

ARM AND HAND PROTECTION

Examples of injuries to arms and hands are burns, cuts, electrical shock, amputation and absorption of chemicals. There is a wide assortment of gloves, hand pads, sleeves and wristlets for protection against various hazardous situations.

Employers need to determine what hand protection their employees need. The work activities of the employees should be studied to determine the degree of dexterity required, the duration, frequency and degree of exposure to hazards and the physical stresses that will be applied.

Also, it is important to know the performance characteristics of gloves relative to the specific hazard anticipated; e.g., exposure to chemicals, heat or flames. Gloves' performance characteristics should be assessed by using standard test procedures.

Before purchasing gloves, the employer should request documentation from the manufacturer that the gloves meet the appropriate test standard(s) for the hazard(s) anticipated. For example, for protection against chemical hazards, the toxic properties of the chemical(s) must be determined -- particularly, the ability of the chemical(s) to pass through the skin and cause systemic effects. There is no one glove available that is resistant to all chemicals. Different glove materials offer varying protection to different chemicals. Examples:

- **Neoprene:** resistant to mineral acids, organic acids, caustics, alcohols and petroleum solvents.
- **Nitrile:** resistant to mineral acids, caustics and petroleum solvents.
- **Natural rubber:** resistant to ketones, alcohols, caustics and organic acids.
- **Polyvinyl chloride (PVC):** resistant to mineral acids, caustics, organic acids and alcohols.
- **Polyvinyl alcohol (PVA):** resistant to chlorinated solvents, petroleum solvents and aromatics.

The protective device should be selected to fit the job. For example, some gloves are designed to protect against specific chemical hazards. Employees may need

to use gloves, such as wire mesh, leather and canvas, that have been tested and provide insulation from burns and cuts. The employee should become acquainted with the limitations of the clothing used.

Certain occupations require special protection. For example, electricians need special protection from shocks and burns. Rubber is considered the best material for insulating gloves and sleeves from these hazards.

Rubber protective equipment for electrical workers must conform to the requirements established in the American Society for Testing and Materials (ASTM) as specified in Standard 29 1910.137.

FOOT AND LEG PROTECTION

According to the BLS survey, most of the workers in selected occupations who suffered foot injuries were not wearing protective footwear. Furthermore, most of their employers did not require them to wear safety shoes. The typical foot injury was caused by objects falling fewer than four feet and the median weight was about 65 pounds. Again, most workers were injured while performing their normal job activities.

For protection of feet and legs from falling or rolling objects, sharp objects, molten metal, hot surfaces and wet slippery surfaces, workers should use appropriate footguards, safety shoes, or boots and leggings. Leggings protect the lower leg and feet from molten metal or welding sparks. Safety snaps permit their rapid removal.

Aluminum alloy, fiberglass, or galvanized steel footguards can be worn over usual work shoes, although they may present the possibility of catching on something and causing workers to trip. Heat-resistant soled shoes protect against hot surfaces like those found in the roofing, paving and hot metal industries.

Safety shoes should be sturdy and have an impact-resistant toe. In some shoes, metal insoles protect against puncture wounds. Additional protection, such as metatarsal guards, may be found in some types of footwear. Safety shoes come in a variety of styles and materials, such as leather and rubber boots and oxfords.

Safety footwear is classified according to its ability to meet minimum requirements for both compression and impact tests. These requirements and testing procedures may be found in American National Standards Institute standards. Protective footwear purchased prior to July 5, 1994, must comply with ANSI Z41-1967, *USA Standard for Men's Safety-Toe Footwear*. Protective footwear purchased after July 5, 1994, must comply with ANSI Z41-1991, *American National Standard for Personal Protection-Protective Footwear*.

OTHER RELATED ISSUES

A Coast Guard-approved life jacket or buoyant work vest should be used if there is danger of falling into water while working. For emergency rescue operations, boats and ring buoys with at least 90 feet of line must be provided.

Night workers and flagmen who might be struck by moving vehicles need suits or vests designed to reflect light.

CONCLUSION

To have an effective safety program, one manager must be responsible for its coordination. First-line supervisors must be convinced of the hazard and must be held accountable for their employees' use of personal protective equipment. A safety program for new employees is a necessary part of any orientation program. An on-going safety program should be used to motivate employees to continue to use protective gear.

Teaming the correct personal protective equipment with a good training program can give the worker a large measure of safety where other controls are inadequate or impossible.

Personal protective equipment can be effective only if the equipment is selected based on its intended use, employees are trained in its use and the equipment is properly tested, maintained and worn.

In the final analysis, the best protection comes from an interested management and work force committed to sound work practices.

OSHA Regulations (Standards)

Part Number & Standard Number 29 CFR 1910.132

Title: General Requirements.

(a) ²Application. Protective equipment, including personal protective equipment for eyes, face, head and extremities, protective clothing, respiratory devices and protective shields and barriers shall be provided, used and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological 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) Employee-owned equipment. Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance and sanitation of such equipment.

(c) Design. All personal protective equipment shall be of safe design and construction for the work to be performed.

(d) Hazard assessment and equipment selection.

(1) The employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE). If such hazards are present, or likely to be present, the employer shall:

(i) Select and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment;

(ii) Communicate selection decisions to each affected employee; and,

(iii) Select PPE that properly fits each affected employee.

Note:

Non-mandatory Appendix B contains an example of procedures that would comply with the requirement for a hazard assessment.

(2) The employer shall verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated; the person certifying that the evaluation has been

²Paragraphs (d) and (f) of this section apply only to 1910.133, 1910.135, 1910.136 and 1910.138. Paragraphs (d) and (f) of this section do not apply to 1910.134 and 1910.137.

performed; the date(s) of the hazard assessment; and, which identifies the document as a certification of hazard assessment.

(e) Defective and damaged equipment. Defective or damaged personal protective equipment shall not be used.

(f) Training.

(1) The employer shall provide training to each employee who is required by this section to use PPE. Each such employee shall be trained to know at least the following:

- (i) When PPE is necessary;
- (ii) What PPE is necessary;
- (iii) How to properly don, doff, adjust and wear PPE;
- (iv) The limitations of the PPE; and,
- (v) The proper care, maintenance, useful life and disposal of the PPE.

(2) Each affected employee shall demonstrate an understanding of the training specified in paragraph (f)(1) of this section and the ability to use PPE properly before being allowed to perform work requiring the use of PPE.

(3) When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by paragraph (f)(2) of this section, the employer shall retrain each such employee. Circumstances where retraining is required include, but are not limited to, situations where:

- (i) Changes in the workplace render previous training obsolete; or
- (ii) Changes in the types of PPE to be used render previous training obsolete; or
- (iii) Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.

(4) The employer shall verify that each affected employee has received and understood the required training through a written certification that contains the name of each employee trained, the date(s) of training and that identifies the subject of the certification.

Part Number & Standard Number 29 CFR 1910.133

Title: Eye and Face Protection.

(a) General requirements.

(1) Each affected employee shall use appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

(2) Each affected employee shall use eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g. clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable.

(3) Each affected employee who wears prescription lenses while engaged in operations that involve eye hazards shall wear eye protection that incorporates the prescription in its design, or shall wear eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.

(4) Eye and face PPE shall be distinctly marked to facilitate identification of the manufacturer.

(5) Each affected employee shall use equipment with filter lenses that have a shade number appropriate for the work being performed for protection from injurious light radiation. The following is a listing of appropriate shade numbers for various operations.

Filter Lenses for Protection Against Radiant Energy				
Operations	Electrode Size (1/32-inch diameter standard)	Arc Current (Amps)	Minimum* Protective Shade	
Shielded metal arc welding	Less than 3/32	Less than 60	7	
	3/32 - 5/32	60-160	8	
	5/32-8/32	150-250	10	
	More than 8/32	250-550	11	
Gas metal arc welding and flux cored arc welding		Less than 60	7	
		60-160	10	
		150-250	10	
		250-550	10	
Gas Tungsten arc welding		Less than 50	8	
		50-150	8	
		150-500	10	
Air carbon Arc cutting	(light)	Less than 500	10	
	(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	
Plate Thickness				
	inches	mm		
Gas Welding:				
	Light	Less than 1/8	Less than 3.2	4
	Medium	1/8 to 1/2	3.2 to 150	5
Heavy	More than 1/2	More than 12.7	6	
Oxygen cutting:				
	Light	Less than 1	Less than 25	3
	Medium	1 to 6	25 to 150	4
Heavy	More than 6	More than 150	5	

* As a rule of thumb, start with a shade that is too dark to see the weld zone (the darkest lens carries a value of 10). 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.

**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.

(b) Criteria for protective eye and face devices.

(1) Protective eye and face devices purchased after July 5, 1994 shall comply with ANSI Z87.1-1989, "American National Standard Practice for Occupational and Educational Eye and Face Protection," which is incorporated by reference, or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American National Standards Institute. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., Room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., Suite 700, Washington, D.C.

(2) Eye and face protective devices purchased before July 5, 1994 shall comply with the ANSI "USA Standard for Occupational and Educational Eye and Face Protection," Z87.1-1968 or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., Room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street N.W., Suite 700, Washington, D.C.

Part Number & Standard Number 29 CFR 1910.135

Title: Head Protection.

(a) General requirements.

(1) 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.

(2) Protective helmets designed to reduce electrical shock hazard shall be worn by each such affected employee when near exposed electrical conductors which could contact the head.

(b) Criteria for protective helmets.

(1) Protective helmets purchased after July 5, 1994 shall comply with ANSI Z89.1-1986, "American National Standard for Personal Protection-Protective Headwear for Industrial Workers-Requirements," which is incorporated by reference, or shall be demonstrated to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American National Standards Institute. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., Room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., Suite 700, Washington, D.C.

(2) Protective helmets purchased before July 5, 1994 shall comply with the ANSI standard "American National Standard Safety Requirements for Industrial Head Protection," ANSI Z89.1-1969, or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., Room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., Suite 700, Washington, D.C.

Part Number & Standard Number 29 CFR 1910.136

Title: Occupational Foot Protection.

(a) General requirements. Each affected employee shall wear protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, objects piercing the sole and where such employee's feet are exposed to electrical hazards.

(b) Criteria for protective footwear.

(1) Protective footwear purchased after July 5, 1994 shall comply with ANSI Z41-1991, "American National Standard for Personal Protection-Protective Footwear," which is incorporated by reference, or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American National Standards Institute. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., Room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., Suite 700, Washington, D.C.

(2) Protective footwear purchased before July 5, 1994 shall comply with the ANSI standard "USA Standard for Men's Safety-Toe Footwear," Z41.1-1967, which is incorporated by reference, or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., Room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., Suite 700, Washington, D.C.

Part Number & Standard Number 29 CFR 1910.138

Title: Hand Protection.

(a) General requirements. Employers shall select and require employees to use appropriate hand protection when employees' hands 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) Selection. Employers shall base the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use and the hazards and potential hazards identified.

Part Number & Standard Number 29 CFR 1910 Subpart I Appendix B

Title: Non-mandatory Compliance Guidelines for Hazard Assessment and Personal Protective Equipment Selection.

This Appendix is intended to provide compliance assistance for employers and employees in implementing requirements for a hazard assessment and the selection of personal protective equipment.

1. Controlling hazards. PPE devices alone should not be relied on to provide protection against hazards, but should be used in conjunction with guards, engineering controls and sound manufacturing practices.

2. Assessment and selection. It is necessary to consider certain general guidelines for assessing the foot, head, eye and face and hand hazard situations that exist in an occupational or educational operation or process and to match the protective devices to the particular hazard. It should be the responsibility of the safety officer to exercise common sense and appropriate expertise to accomplish these tasks.

3. Assessment guidelines. In order to assess the need for PPE, the following steps should be taken:

a. Survey. Conduct a walk-through survey of the areas in question. The purpose of the survey is to identify sources of hazards to workers and co-workers. Consideration should be given to the basic hazard categories: (a) Impact; (b) Penetration; (c) Compression (roll-over); (d) Chemical; (e) Heat; (f) Harmful dust; (g) Light (optical) radiation.

b. Sources. During the walk-through survey, the safety officer should observe: (a) sources of motion; i.e., machinery or processes where any movement of tools, machine elements or particles could exist, or movement of personnel that could result in collision with stationary objects; (b) sources of high temperatures that could result in burns, eye injury or ignition of protective equipment, etc.; (c) types of chemical exposures; (d) sources of harmful dust; (e) sources of light radiation, i.e., welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc.; (f) sources of falling objects or potential for dropping objects; (g) sources of sharp objects which might pierce the feet or cut the hands; (h) sources of rolling or pinching objects which could crush the feet; (i) layout of workplace and location of co-workers; and (j) any electrical hazards. In addition, injury/accident data should be reviewed to help identify problem areas.

c. Organize data. Following the walk-through survey, it is necessary to organize the data and information for use in the assessment of hazards. The objective is to prepare for an analysis of the hazards in the environment to enable proper selection of protective equipment.

d. Analyze data. Having gathered and organized data on a workplace, an estimate of the potential for injuries should be made. Each of the basic hazards (paragraph 3.a.) should be reviewed and a determination made as to the type, level of risk and seriousness of potential injury from each of the hazards found in the area. The possibility of exposure to several hazards simultaneously should be considered.

4. Selection guidelines. After completion of the procedures in paragraph 3, the general procedure for selection of protective equipment is to: a) Become familiar with the potential hazards and the type of protective equipment that is available and what it can do; i.e., splash protection, impact protection, etc.; b) compare the hazards associated with the environment with the capabilities of the available protective equipment; i.e., impact velocities, masses, projectile shape, radiation intensities; c) select the protective equipment which ensures a level of protection greater than the minimum required to protect employees from the hazards; and d) fit the user with the protective device and give instructions on care and use of the PPE. It is very important that end users be made aware of all warning labels for and limitations of their PPE.

5. Fitting the device. Careful consideration must be given to comfort and fit. PPE that fits poorly will not afford the necessary protection. Continued wearing of the device is more likely if it fits the wearer comfortably. Protective devices are generally available in a variety of sizes. Care should be taken to ensure that the right size is selected.

6. Devices with adjustable features. Adjustments should be made on an individual basis for a comfortable fit that will maintain the protective device in the proper position. Particular care should be taken in fitting devices for eye protection against dust and chemical splash to ensure that the devices are sealed to the face. In addition, proper fitting of helmets is important to ensure that it will not fall off during work operations.

In some cases a chin strap may be necessary to keep the helmet on an employee's head. (Chin straps should break at a reasonably low force, however, so as to prevent a strangulation hazard). Where manufacturer's instructions are available, they should be followed carefully.

7. Reassessment of hazards. It is the responsibility of the safety officer to reassess the workplace hazard situation as necessary, by identifying and evaluating new equipment and processes, reviewing accident records and reevaluating the suitability of previously selected PPE.

8. Selection chart guidelines for eye and face protection. Some occupations (not a complete list) for which eye protection should be routinely considered are: carpenters, electricians, machinists, mechanics and repairers, millwrights, plumbers and pipe fitters, sheet metal workers and tinsmiths, assemblers,

sanders, grinding machine operators, lathe and milling machine operators, sawyers, welders, laborers, chemical process operators and handlers and timber cutting and logging workers. The following chart provides general guidance for the proper selection of eye and face protection to protect against hazards associated with the listed hazard "source" operations.

Eye and Face Protection Selection Chart		
Source	Assessment of Hazard	Protection
IMPACT - Chipping, grinding, machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, riveting and sanding	Flying fragments, objects, large chips, particles, sand, dirt, etc....	Spectacles with side protection, goggles, face shields. See notes (1), (3), (5), (6), (10). For severe exposure, use face shield.
HEAT -Furnace operations, pouring, casting, hot dipping and welding.	Hot sparks Splash from molten metals. High temperature exposure	Face shields, goggles, spectacles with side protection. See notes (1), (2), (3). Face shields worn over goggles. See notes (1), (2), (3). Screen face shields, reflective face shields. See notes (1), (2), (3).
CHEMICALS - Acid and chemical handling, degreasing, plating.	Splash Irritating mists	Goggles, eyecup and cover types. For severe exposure, use face shield. See notes (3), (11). Special-purpose goggles
DUST - Woodworking, buffing, general dusty conditions.	Nuisance dust	Goggles, eyecup and cover types. See note (8).
LIGHT and/or RADIATION - Welding: Electric arc Welding: Gas Cutting, Torch brazing, Torch soldering Glare	Optical radiation Optical radiation Optical radiation Poor vision	Welding helmets or welding shields. Typical shades: 10-14. See notes (9), (12). Welding goggles or welding face shield. Typical shades: gas welding 4-8; cutting 3-6; brazing 3-4. See note (9). Spectacles or welding face shield. Typical shades, 1.5-3. See notes (3), (9). Spectacles with shaded or special-purpose lenses, as suitable. See notes (9), (10).

Notes to Eye and Face Protection Selection Chart:

(1) Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards should be provided. Protective devices do not provide unlimited protection.

(2) Operations involving heat may also involve light radiation. As required by the standard, protection from both hazards must be provided.

(3) Face shields should only be worn over primary eye protection (spectacles or goggles).

(4) As required by the standard, filter lenses must meet the requirements for shade designations in 1910.133(a)(5). Tinted and shaded lenses are not filter lenses unless they are marked or identified as such.

(5) As required by the standard, persons whose vision requires the use of prescription (Rx) lenses must wear either protective devices fitted with prescription (Rx) lenses or protective devices designed to be worn over regular prescription (Rx) eyewear.

(6) Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.

(7) Caution should be exercised in the use of metal frame protective devices in electrical hazard areas.

(8) Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.

(9) Welding helmets or face shields should be used only over primary eye protection (spectacles or goggles).

(10) Non-sideshield spectacles are available for frontal protection only, but are not acceptable eye protection for the sources and operations listed for "impact."

(11) Ventilation should be adequate but well protected from splash entry. Eye and face protection should be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.

(12) Protection from light radiation is directly related to filter lens density. See note (4). Select the darkest shade that allows task performance.

9. Selection guidelines for head protection. All head protection (helmets) is designed to provide protection from impact and penetration hazards caused by falling objects. Head protection is also available which provides protection from electric shock and burn. When selecting head protection, knowledge of potential electrical hazards is important. Class A helmets, in addition to impact and penetration resistance, provide electrical protection from low-voltage conductors (they are proof tested to 2,200 volts). Class B helmets, in addition to impact and

penetration resistance, provide electrical protection from high-voltage conductors (they are proof tested to 20,000 volts). Class C helmets provide impact and penetration resistance (they are usually made of aluminum which conducts electricity) and should not be used around electrical hazards.

Where falling object hazards are present, helmets must be worn. Some examples include: working below other workers who are using tools and materials which could fall; working around or under conveyor belts which are carrying parts or materials; working below machinery or processes which might cause material or objects to fall; and working on exposed energized conductors. Some examples of occupations for which head protection should be routinely considered are: carpenters, electricians, linemen, mechanics and repairers, plumbers and pipe fitters, assemblers, packers, wrappers, sawyers, welders, laborers, freight handlers, timber cutting and logging, stock handlers and warehouse laborers.

10. Selection guidelines for foot protection. Safety shoes and boots which meet the ANSI Z41-1991 standard provide both impact and compression protection. Where necessary, safety shoes can be obtained which provide puncture protection. In some work situations, metatarsal protection should be provided and in other special situations electrical conductive or insulating safety shoes would be appropriate.

Safety shoes or boots with impact protection would be required for carrying or handling materials such as packages, objects, parts or heavy tools which could be dropped and for other activities where objects might fall onto the feet. Safety shoes or boots with compression protection would be required for work activities involving skid trucks (manual material handling carts) around bulk rolls (such as paper rolls) and around heavy pipes, all of which could potentially roll over an employee's feet. Safety shoes or boots with puncture protection would be required where sharp objects such as nails, wire, tacks, screws, large staples, scrap metal etc. could be stepped on by employees causing a foot injury.

Some occupations (not a complete list) for which foot protection should be routinely considered are: shipping and receiving clerks, stock clerks, carpenters, electricians, machinists, mechanics and repairers, plumbers and pipe fitters, structural metal workers, assemblers, drywall installers and lathers, packers, wrappers, craters, punch and stamping press operators, sawyers, welders, laborers, freight handlers, gardeners and grounds keepers, timber cutting and logging workers, stock handlers and warehouse laborers.

11. Selection guidelines for hand protection. Gloves are often relied upon to prevent cuts, abrasions, burns and skin contact with chemicals that are capable of causing local or systemic effects following dermal exposure. OSHA is unaware of any gloves that provide protection against all potential hand hazards and commonly available glove materials provide only limited protection against many chemicals. Therefore, it is important to select the most appropriate glove for a particular application and to determine how long it can be worn and whether it can

be reused.

It is also important to know the performance characteristics of gloves relative to the specific hazard anticipated; e.g., chemical hazards, cut hazards, flame hazards, etc. These performance characteristics should be assessed by using standard test procedures. Before purchasing gloves, the employer should request documentation from the manufacturer that the gloves meet the appropriate test standard(s) for the hazard(s) anticipated. Other factors to be considered for glove selection in general include:

(A) As long as the performance characteristics are acceptable, in certain circumstances, it may be more cost effective to regularly change cheaper gloves than to reuse more expensive types; and,

(B) The work activities of the employee should be studied to determine the degree of dexterity required, the duration, frequency and degree of exposure of the hazard and the physical stresses that will be applied.

With respect to selection of gloves for protection against chemical hazards:

(A) The toxic properties of the chemical(s) must be determined; in particular, the ability of the chemical to cause local effects on the skin and/or to pass through the skin and cause systemic effects;

(B) Generally, any "chemical resistant" glove can be used for dry powders;

(C) For mixtures and formulated products (unless specific test data are available), a glove should be selected on the basis of the chemical component with the shortest breakthrough time, since it is possible for solvents to carry active ingredients through polymeric materials; and,

(D) Employees must be able to remove the gloves in such a manner as to prevent skin contamination.

12. Cleaning and maintenance. It is important that all PPE be kept clean and properly maintained. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision. For the purposes of compliance with 1910.132 (a) and (b), PPE should be inspected, cleaned and maintained at regular intervals so that the PPE provides the requisite protection. It is also important to ensure that contaminated PPE which cannot be decontaminated is disposed of in a manner that protects employees from exposure to hazards.

CERTIFICATION OF PPE HAZARD ASSESSMENT

Date of Assessment: _____

Job Task or Work Area: _____

I certify that a hazard assessment meeting the requirements of 29 CFR 1910.132 was conducted at the job task or work area indicated above. This assessment was conducted to identify hazards present or likely to be present which necessitate the use of personal protective equipment.

Signature of Individual Making Certification

PERSONAL PROTECTIVE EQUIPMENT HAZARD REVIEW

Date of Review _____ Name of Reviewer _____

Location of personnel involved in review _____

List Job Tasks or Work Areas Observed:

HAZARD INDEX

In all cases, engineering modifications are strongly recommended. Personal protective equipment (PPE) cannot be used in lieu of feasible engineering controls.

1. PPE is required.
2. PPE is strongly recommended.
3. PPE may not be necessary.

	HAZARD SEVERITY		
	CRITICAL May cause severe injury	MARGINAL May cause minor injury	NEGLIGIBLE Probably would not affect personnel or may cause first aid visit
HAZARD PROBABILITY			
A - Likely to occur immediately or within a short period of time	1	1	2
B - Probably will occur in time	1	2	2
C - May occur in time	2	2	3
D - Unlikely to occur	2	3	3

PERSONAL PROTECTIVE EQUIPMENT REVIEW

ITEM	YES/NO	HAZARD SOURCE	HAZARD SEVERITY	HAZARD PROBABILITY	HAZARD INDEX	FREQUENCY	APPROPRIATE PPE	COMMENTS (Identify Hazard & Job Step)
<p>EYE & FACE PROTECTION</p> <p>Employees are exposed to flying particles, molten metal, liquid chemicals, acids, caustic liquids, chemical gases or vapors, or potentially harmful light radiation.</p>								
<p>HEAD PROTECTION</p> <p>The employee works in an area where there is a potential for injury to the head from a falling object.</p> <p>The employee works in an area near exposed electrical conductors which could contact the head.</p> <p>The employee works in an area where a "caught on" hazard exists for hair.</p>								
<p>FOOT PROTECTION</p> <p>The employee works in an area where there is potential exposure to foot injury due to falling or rolling objects.</p> <p>The employee works in an area where there is potential exposure to foot injury due to an object piercing the sole of the shoe.</p> <p>Employees are working in an area where floor surfaces are such that they may create a slip hazard.</p>								

