PERSONAL PROTECTIVE EQUIPMENT
SUBPART I

Introduction

Hard hats, goggles, face shields, steel-toed shoes, respirators, aprons, gloves, full body suits! What do all these items have in common? They are all various forms of personal protective equipment (PPE).

Personal protective equipment should not be used as a substitute for engineering, work practice, and/or administrative controls. Personal protective equipment 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 PPE should be an in-depth evaluation of the equipment needed to protect against the hazards at the workplace. Management dedicated to the safety and health of employees should use that evaluation to set a standard operating procedure for personnel, then train employees on the protective limitations of PPE, 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

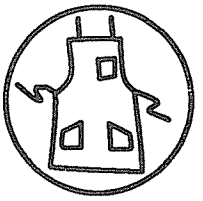
eliminate the hazard. If the equipment fails, exposure will occur. To reduce the possibility of failure, equipment must be properly fitted and maintained in a clean and serviceable condition.

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. In fact, sometimes equipment may be uncomfortable simply because it does not fit properly.

GENERAL REQUIREMENTS - 1910.132

Application

This regulation requires employers to ensure that personal protective equipment be "provided, used, and maintained in a sanitary and reliable condition wherever it is necessary ...." to prevent injury. This includes protection of any part of the body from hazards through absorption, inhalation or physical contact.



For example, 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.

Wool and specially treated cotton are two natural fibers that are fire-resistant, comfortable and adapt well to a variety of 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 manufacturer's selection guides for effectiveness of specific materials against specific chemicals.

Disposable suits of plastic-like or other similar synthetic material are particularly important for protection from dusty materials or materials that can splash. If

the substance is extremely toxic, a completely enclosed chemical suit may be necessary. The clothing should be inspected to ensure proper fit and function for continued protection.

Employee-Owned Equipment

When employees provide their own equipment, the employer shall assure the adequacy, including the proper maintenance and sanitation, of such equipment.

Design

All personal protective equipment must be of safe design and construction for the work to be performed.

Hazard Assessment and Equipment Selection

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 PPE suitable for protection from existing hazards.

Employers must certify in writing that a workplace hazard assessment has been performed.

Defective and Damaged Equipment

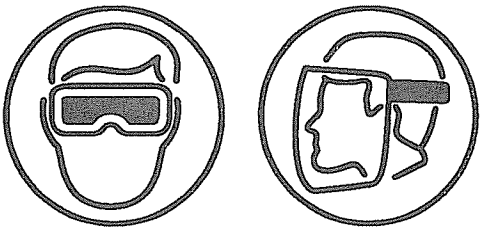
Defective or damaged personal protective equipment shall not be used.

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.

EYE AND FACE PROTECTION - 1910.133



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.

Suitable eye protectors must be provided where there is a potential for injury to the eyes or face from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, potentially injurious light radiation or a combination of these. Protectors must meet the following minimum requirements:

- Provide adequate protection against the particular hazard;
- 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 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. The following is a listing of appropriate shade numbers for various operations.

Filter Lenses for Protection Against Radiant Energy			
Operations	Electrode Size (inches diameter)	Arc Current (Amperes)	Minimum* Protective Shade
Shielded metal arc welding	Less than 3/32 3/32 - 5/32 5/32 - 8/32 More than 8/32	Less than 60 60-160 160-250 250-550	7 8 10 11
Gas metal arc welding and flux cored arc welding		Less than 60 60-160 160-250 250-500	7 10 10 10
Gas Tungsten arc welding		Less than 50 50-150 150-500	8 8 10
Air carbon Arc cutting	(light) (heavy)	Less than 500 500-1000	10 11
Plasma arc welding		Less than 20 20-100 100-400 400-800	6 8 10 11
Plasma arc cutting	(light)** (medium)** (heavy)**	Less than 300 300-400 400-800	8 9 10
Torch brazing		-	3
Torch soldering		-	2
Carbon arc welding		-	14
Plate Thickness			
	inches	mm	
Gas Welding: Light Medium Heavy	Less than 1/8 1/8 to 1/2 More than 1/2	Less than 3.2 3.2 to 12.7 More than 12.7	4 5 6
Oxygen cutting: Light Medium Heavy	Less than 1 1 to 6 More than 6	Less than 25 25 to 150 More than 150	3 4 5

* 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.

** 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.

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.

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 of 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.

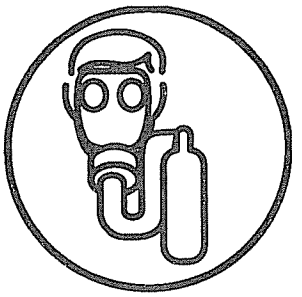
Personal protective equipment that has been previously used should be disinfected before being issued to another employee.

Also, 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 eye-protective equipment 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.

RESPIRATORY PROTECTION - 1910.134



OSHA standards require employers to establish and maintain a respiratory protective program whenever respirators are necessary to protect the health of employees. Before discussing the requirements of OSHA's respirator standard, it will be useful to review the various types of available respirators.

Respiratory protective devices fall into three classes: air-purifying; atmosphere- or air-supplying; and combination air-purifying and air-supplying devices. A brief discussion of each follows.

Class 1. Air-Purifying Devices

The air-purifying device cleanses the contaminated atmosphere. Chemicals can be used to remove specific gases and vapors and mechanical filters can remove particulate matter. This type of respirator is limited in its use to those environments where the air contaminant level is within the specified concentration limitation of the device. These devices do not protect against oxygen deficiency.

> "Oxygen deficiency" means that concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

The various types of air-purifying devices include mechanical-filter cartridge; chemical-cartridge, combination mechanical-filter/chemical-cartridge; gas masks; and powered air-purifying respirators.

Mechanical-filter respirators offer respiratory protection against airborne particulate matter, including dusts, mists, metal fumes, and smokes, but do not provide protection against gases or vapors.

Chemical-cartridge respirators afford protection against low concentrations of certain gases and vapors by using various chemical filters to purify the inhaled air. They differ from mechanical-filter respirators in that they use cartridges containing chemicals to remove harmful gases and vapors.

Combination mechanical-filter/chemical-cartridge respirators use dust, mist, or fume filters with a chemical cartridge for dual or multiple exposures.

Gas masks afford respiratory protection against certain gases, vapors, and particulate matter. Gas masks are designed solely to remove specific contaminants from the air; therefore, it is essential that their use be restricted to atmospheres which contain sufficient oxygen to support life. Gas masks may be used for escape only from atmospheres that are immediately dangerous to life or health (IDLH), but never for entry into such environments.

> "IDLH" means an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

Canisters for gas masks are color-coded according to the contaminant against which they provide protection. This information is included in the standard.

Powered air-purifying respirators protect against particulates, gases and vapors, or particulates and gases and vapors. The air-purifying element may be a filter, chemical cartridge, combination filter and chemical cartridge, or canister. The powered air-purifying respirator uses a power source (usually a battery pack) to operate a blower that passes air across the air-cleaning element to supply purified air to the respirator. The great advantage of the powered air-purifying respirator is that it usually supplies air at positive pressure (relative to atmospheric) so that any leakage is outward from the facepiece. However, it is possible at high work rates to create a negative pressure in the facepiece, thereby increasing facepiece leakage.

Class 2. Atmosphere- or Air-Supplying Devices

Atmosphere- or air-supplying devices are the class of respirators that provide a respirable atmosphere to the wearer, independent of the ambient air. Atmosphere-supplying respirators fall into three groups: supplied-air respirators, self-contained breathing apparatus (SCBA), and combination-SCBA and supplied-air respirators. A brief discussion of each follows.

Supplied-air respirators deliver breathing air through a supply hose connected to the wearer's facepiece or enclosure. The air delivered must be free of contaminants and must be from a source located in clean air. The OSHA requirements for compressed air used for breathing, including monitoring for carbon monoxide, are listed in 1910.134(d). Supplied-air

respirators should only be used in non-IDLH atmospheres.

There are three types of supplied-air respirators: Type A, Type B and Type C. Type A supplied-air respirators are also known as hose masks with blower. Air is supplied by a motor-driven or hand-operated blower through a strong, large diameter hose. Type B supplied-air respirators are hose masks as described above without a blower. The wearer draws air through the hose by breathing. Type C supplied-air respirators are commonly referred to as air-line respirators. An air-line respirator must be supplied with respirable air conforming to Grade D Compressed Gas Association's Standard CGA G-7.1-73, *Commodity Specification for Air*, 1973. This standard requires air to have the oxygen content normally present in the atmosphere, no more than 5 mg/M^3 of condensed hydrocarbon contamination, no more than 20 ppm carbon monoxide, no pronounced odor, and a maximum of 1,000 ppm of carbon dioxide.

There are three basic classes of air-line respirators - continuous-flow, demand-flow, and pressure-demand-flow.

Continuous flow. A continuous-flow unit has a regulated amount of air fed to the facepiece and is normally used where there is an ample air supply such as that provided by an air compressor.

Demand flow. These air-line respirators deliver air flow only during inhalation. Such respirators are normally used when the air supply is restricted to high-pressure compressed air cylinders. A suitable pressure regulator is required to make sure that the air is reduced to the proper pressure for breathing.

Pressure-demand flow. For those conditions where the possible inward leakage (caused by the negative pressure during inhalation that is always present in demand systems) is unacceptable and where there cannot be the relatively high air consumption of the continuous-flow units, a pressure-demand air-line respirator may be the best choice. It provides a positive pressure during both inhalation and exhalation.

Types A, B, and C that are approved for abrasive blasting are designated AE, BE, and CE respectively. These respirators are equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material and with shielding to protect the windows of facepieces, hoods, and helmets.

Self-contained breathing apparatus provide complete respiratory protection against toxic gases and an oxygen deficiency. The wearer is independent of the surrounding atmosphere because he or she is breathing with a system that is portable and admits no outside air. The oxygen or air supply of the apparatus itself takes care of respiratory requirements.

There are two basic types of self-contained breathing apparatus: closed-circuit and open-circuit. In the closed-circuit apparatus, the exhalation is rebreathed by the wearer after the carbon dioxide has been effectively removed and a suitable oxygen concentration restored from sources composed of: compressed oxygen; or chemical oxygen; or liquid-oxygen. In the open-circuit apparatus, exhalation is vented to the atmosphere and is not rebreathed. There are two types of open-circuit SCBAs: demand and pressure-demand.

Combination-SCBA and supplied-air respirators are air-line respirators with and auxiliary self-contained air supply. An auxiliary SCBA is an independent air supply that allows a person to evacuate an area or enter such an area for a very short period of time where a connection to an outside air supply can be made. These devices are approved for use in IDLH atmospheres. The auxiliary air supply can be switched to in the event the primary air supply fails to operate. This allows the wearer to escape from the IDLH atmosphere. Combination air-line respirators with auxiliary SCBA are designed to operate in three modes: continuous-flow, demand-flow, and pressure-demand flow.

Class 3. Combination Air-Purifying and Atmosphere-Supplying Devices

Lately, another type of respirator is gaining in popularity. It is a device that is a combination of an air-line respirator with an auxiliary air-purifying attachment, which provides protection in the event the air supply fails. These respirators are available in either continuous-flow or pressure-demand flow and are most often used with a high-efficiency filter as the air purifying element. Use in the filtering mode is allowed for escape only. Because of the positive-pressure and escape provisions, these respirators have been recommended for asbestos work.

A summary of the classification of respiratory protective devices follows.

I. Air-Purifying Devices

A. Mechanical-filter cartridge
B. Chemical-cartridge
C. Combination mechanical-filter/chemical cartridge
D. Gas masks
E. Powered air-purifying

II. Atmosphere- or Air-Supplying Devices

A. Supplied-air
    1. Type A and AE
    2. Type B and BE
    3. Type C and CE (Airline)
        a. Continuous-flow
        b. Demand-flow
        c. Pressure-demand flow

B. Self-contained breathing apparatus (SCBA)
    1. Closed-circuit
    2. Open-circuit
        a. Demand
        b. Pressure-demand

C. Combination-SCBA and supplied-air
    1. Continuous-flow
    2. Demand-flow
    3. Pressure-demand flow

III. Combination Air-Purifying and Atmosphere Supplying Devices

A. Continuous-flow
B. Pressure-demand flow

Requirements for a minimal acceptable respirator program are specified in 1910.134 (b)(1) through (b)(11). Other sections of the standard also refer to these requirements as shown in the table below.

MINIMAL ACCEPTABLE RESPIRATOR PROGRAM	
Requirement	**Standard**
Written Operating Procedures	.134(b)(1), (e)(1), and (e)(3)
Proper Selection	.134(b)(2), (c), and (e)(2)
Training and Fitting	.134(b)(3), (e)(5), and (e)(5)(i-iii)
Cleaning and Disinfecting	.134(b)(5) and (f)(3)
Storage	.134(b)(6), and (f)(5)(i-iii)
Inspection and Maintenance	.134(b)(7), (e)(4), (f)(2)(i-iv), and (f)(4)
Work Area Surveillance	.134(b)(8) only
Inspection/Evaluation of Program	.134(b)(9) only
Medical Examinations	.134(b)(10) only
Approved Respirators	.134(b)(11) only

Written Operating Procedures

OSHA standards state that the employer is responsible not only for providing appropriate respirators, but also for developing written standard operating procedures for their selection, use and care. The procedures must include a discussion or explanation of all items specified in 29 CFR 1910.134(b).

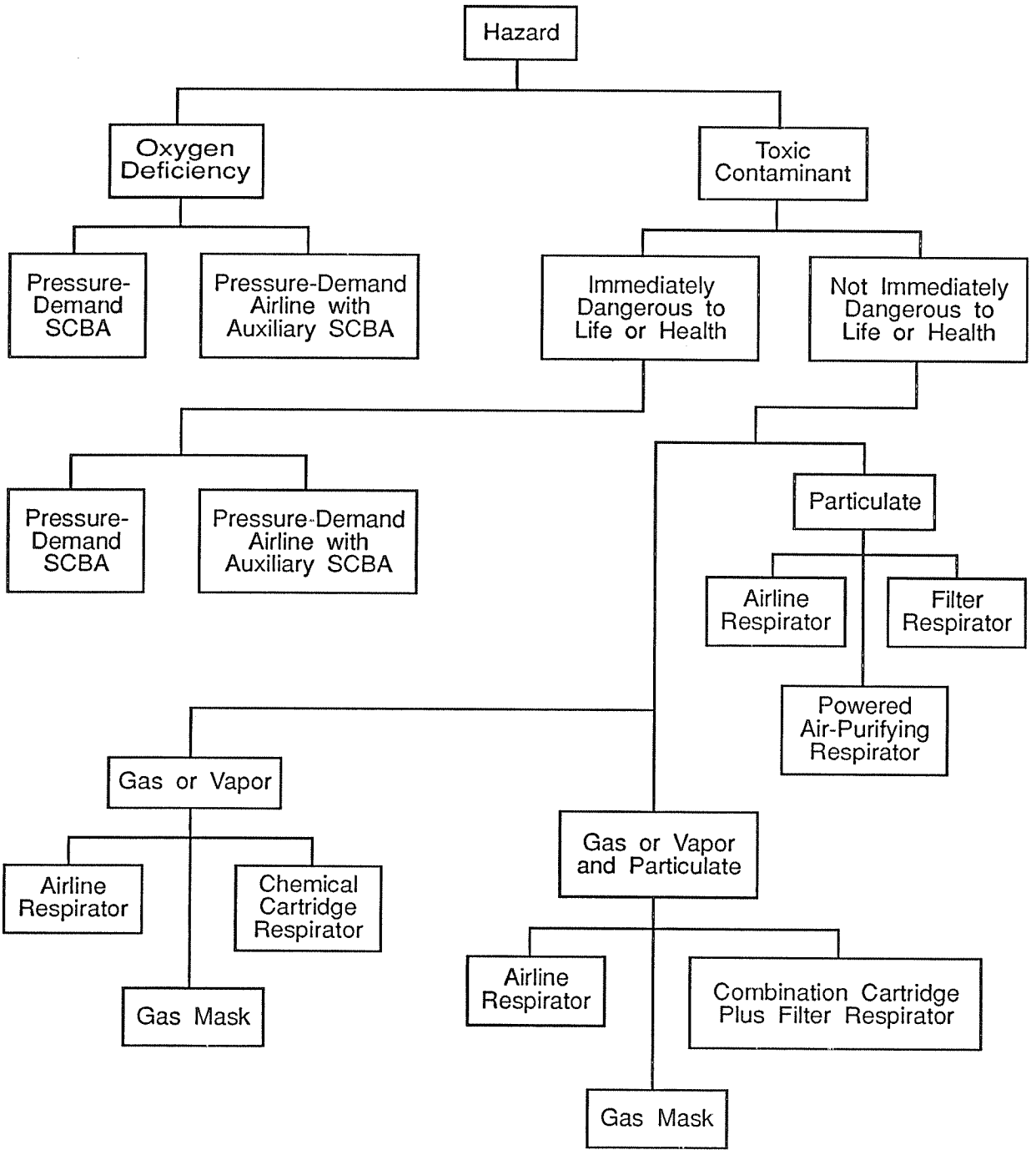
Proper Selection

Respirators shall be selected on the basis of hazards to which the worker is exposed. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued.

In selecting the correct respirator for a given circumstance, many factors must be taken into consideration, e.g., the nature of the hazard, location of the hazardous area, employee's health, work activity, and respirator characteristics, capabilities, and limitations.

In order to make subsequent decisions, the nature of the hazard must be identified to ensure that an overexposure does not occur. One very important factor to consider is oxygen deficiency. NIOSH/MSHA approval for supplied-air and air-purifying respirators is valid only for atmospheres containing greater than 19.5 percent oxygen. If oxygen deficiency is not an issue, then the contaminant(s) and their concentration(s) must be determined. The figure below presents an outline for the selection process based on these criteria.

RESPIRATORY SELECTION FOR ROUTINE USE OF RESPIRATORS



Training and Fitting

The user must be instructed and trained in the selection, use and maintenance of respirators. Every respirator user shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly.

Cleaning and Disinfecting

Respirators must be regularly cleaned and disinfected. Those issued for the exclusive use of one worker should be cleaned after each day's use or more often if necessary.

Storage

OSHA standards require that respirators "be stored in a convenient, clean, and sanitary location." The purpose of good respirator storage is to ensure that the respirator will function properly when used. Care must be taken to ensure that respirators are stored in such a manner as to protect against dust, harmful chemicals, sunlight, excessive heat or cold, and moisture.

Inspection and Maintenance

Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices, shall be thoroughly inspected at least once a month and after each use.

Work Area Surveillance

The OSHA standard requires that "appropriate surveillance of work area conditions and degree of employee exposure or stress be maintained." This should include identification of the contaminant, nature of the hazard, and concentration at the breathing zone.

Inspection and Evaluation of the Program

The standard requires regular inspection and evaluation to determine the continued effectiveness of the respirator program. Many factors affect the employee's acceptance of respirators, including comfort, ability to breathe without objectionable effort, adequate visibility under all conditions, provisions for wearing prescription glasses (if necessary), ability to communicate, ability to perform all tasks without undue interference, and confidence in the facepiece fit.

Failure to consider these factors is likely to reduce cooperation of the users in promoting a satisfactory program.

Medical Examinations

Persons should not be assigned to tasks requiring the use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A physician shall determine the health and physical conditions that are pertinent for an employee's ability to work while wearing a respirator. The user's medical status should be reviewed periodically.

Approved Respirators

The standard states that "approved or accepted respirators shall be used when they are available." A respirator is approved as the whole unit with specific components. OSHA recognizes a respirator as approved if it has been jointly approved by NIOSH and the Mine Safety and Health Administration (MSHA).

OCCUPATIONAL HEAD PROTECTION - 1910.135

Introduction

Prevention of head injuries is an important factor in every safety program. 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 5 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 action taken by employers to prevent such injuries from recurring.

Elimination or control of a hazard leading to an accident should, of course, be given first consideration, but many accidents 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.

Criteria for Head Protection

The standards recognized by OSHA for head protection 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 helmets purchased after July 5, 1994, are contained in ANSI *Personnel Protection-Protective Headware 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 protection for the particular situation.

Head protection is 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).

Helmets under Class A are intended for protection against impact hazards. They are used in mining, construction, shipbuilding, tunneling, lumbering, and manufacturing.

Class B, utility service helmets protect the wearer's head from impact and penetration by falling or flying objects and from high-voltage shock and burn. They are used extensively by electrical workers.

The safety helmets in Class C are designed specifically for lightweight comfort and impact protection. This class is usually manufactured from aluminum and offers no dielectric protection. Class C helmets are used in certain construction and manufacturing occupations, oil fields, refineries, and chemical plants where there is not 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 140°F) containing a good detergent for at least a minute. Shells should then be scrubbed and rinsed in clear hot water. After rinsing, the shell

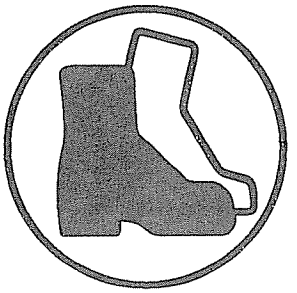
should be carefully inspected for any signs of damage.

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.

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 discussion 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.

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.

OCCUPATIONAL FOOT PROTECTION - 1910.136



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. Again, most workers were injured while performing their normal job activities at their worksites.

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 Z41.1-1967, *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.*

ELECTRICAL PROTECTIVE DEVICES - 1910.137

Design Requirements

Insulating blankets, matting, covers, line hose, gloves, and sleeves made of rubber shall meet specified requirements for manufacture, marking, electrical properties, workmanship and finish.

In-service Care and Use

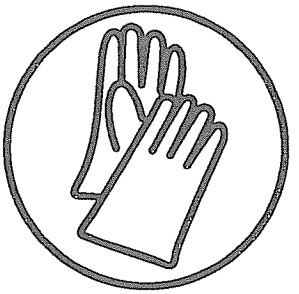
Electrical protective equipment shall be maintained in a safe, reliable condition.

Specific requirements for in-service care and use are given for insulating blankets, covers, line hose, gloves, and sleeves made of rubber.

HAND PROTECTION - 1910.138

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.



Selection

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.

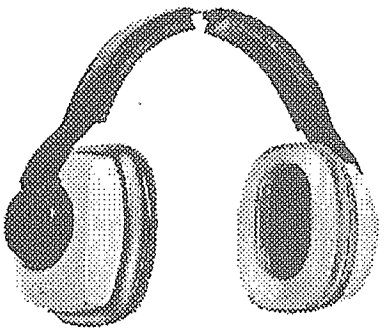
Also, it is important to know the performance characteristics of gloves relative to the specific hazard anticipated; e.g., exposure to chemicals, heat, or flames. Gloves' performance characteristics should be assessed by using standard test procedures.

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.

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.

HEARING PROTECTION - 1910.95



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. Specially designed protection is required, depending on the type of noise encountered.

Preformed or molded ear plugs 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 extremely noisy situations, earplugs should be worn in addition to earmuffs. When used together, earplugs and earmuffs change the nature of sounds; all sounds are reduced including one's own voice, but other voices or warning devices are easier to hear.

For more specific information on a hearing conservation program, see OSHA standard 29 CFR 1910.95 - Occupational Noise Exposure.

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 and maintained, and worn.

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