Foot Protection

Course Number: HS-02-402

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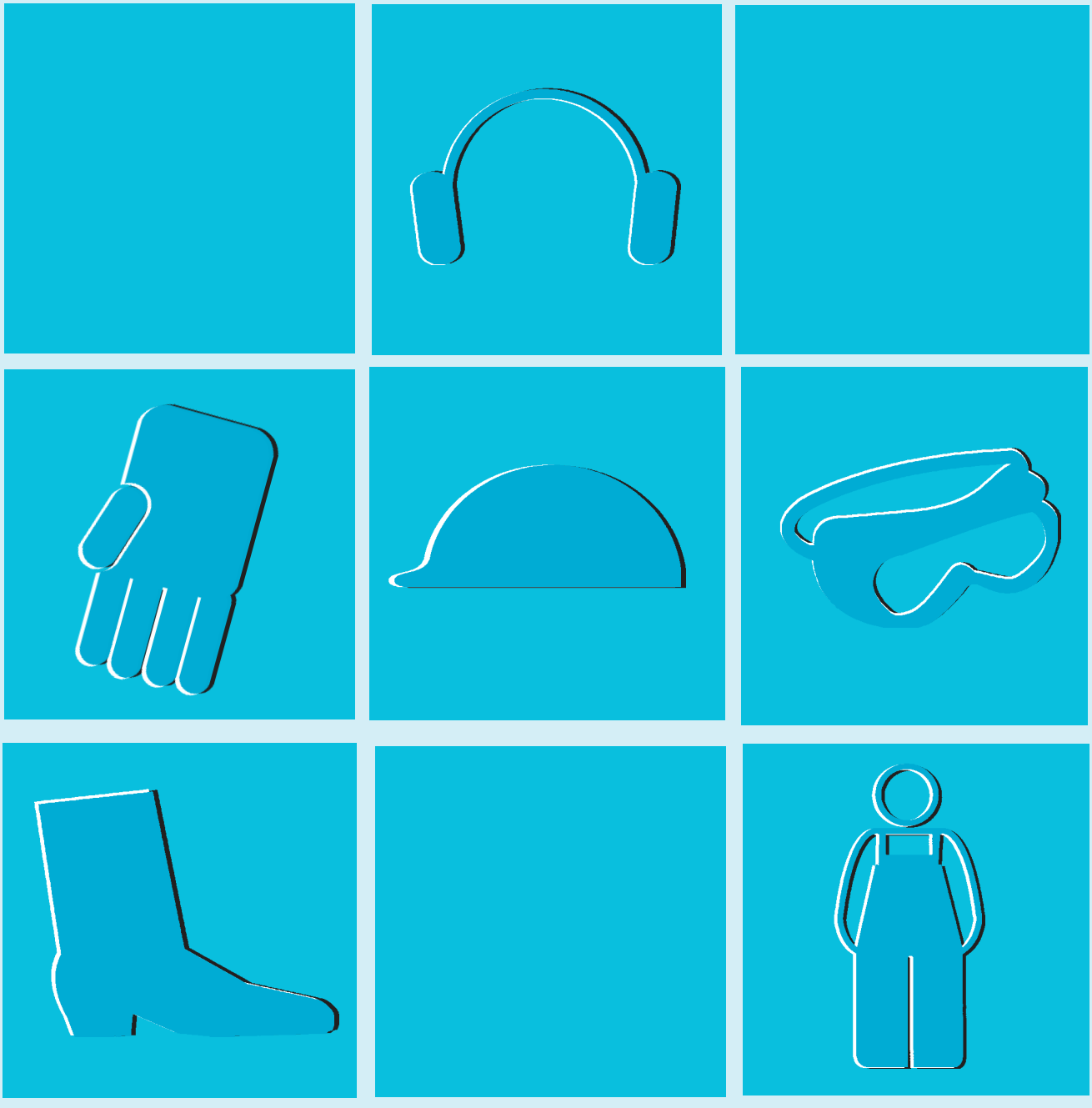
Assessing the Need for Personal Protective Equipment: A Guide for Small Business Employers

Small Business Safety Management Series

U.S. Department of Labor
Occupational Safety and Health Administration

OSHA 3151
2000 (Reprinted)



About This Booklet

The materials in this handbook are based upon the federal OSHA standards and other requirements in effect at the time of publication, and upon generally accepted principles and activities within the job safety and health field, but should not be considered as a substitute for the standards.

This booklet is not intended to be a legal interpretation of the provisions of the *Occupational Safety and Health Act of 1970* or to place any additional requirements on employers or employees.

The material presented herein will be useful to small business owners or managers and can be adapted to individual establishments.

All employers should be aware that there are certain states (and similar jurisdictions) which operate their own programs under agreement with the U.S. Department of Labor, pursuant to section 18 of the Act. The programs in these jurisdiction may differ in some details from the federal program.

This information will be made available to sensory impaired individuals upon request. Voice phone: (202) 693-1999.

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Who should read this guide?

If you employ one or more persons, you should read this guide.

How will this guide help protect my employees?

The Occupational Safety and Health Administration (OSHA) requires employers to protect their employees from workplace hazards such as machines, work procedures, and hazardous substances that can cause injury. The preferred way to do this is through engineering controls or work practice and administrative controls, but when these controls are not feasible or do not provide sufficient protection, an alternative or supplementary method of protection is to provide workers with personal protective equipment (PPE) and the know-how to use it properly.

This guide will help you to

- Examine your workplace,
- Review the work procedures you require your employees to follow,
- Select appropriate PPE (except for respirators and insulating rubber equipment) to protect your employees, and
- Teach your employees how to wear and care for the PPE you provide.

This guide will help you comply with OSHA's general PPE requirements, but it is not a substitute for OSHA standards requiring PPE (*Title 29, Code of Federal Regulations* [CFR] 1910.132).* This standard requires employers to establish general procedures, called a PPE program, to give employees necessary protective equipment and to train them to use it properly. Respirators and insulating devices are not included in this guide because OSHA requires employers to develop separate programs specifically addressing the issues associated with those types of protective devices (29 CFR 1910.134 and 29 CFR 1910.137, respectively). Although not specifically directed to construction and maritime industry, the information, methods, and procedures in this guide are also applicable to, and will help you comply with, OSHA's general PPE requirements for the construction industry at 29 CFR 1926.95 and for the maritime industry at 29 CFR 1915.152.

Although the checklists and other information presented in this guide are intended to help you to the greatest extent possible, please keep in mind that this publication is general in nature and does not address all workplace hazards or PPE requirements.

What is personal protective equipment?

Personal protective equipment, or PPE, includes a variety of devices and garments to protect workers from injuries. You can find PPE designed to protect

- Eyes,
- Face,
- Head,
- Ears,
- Feet,
- Hands and arms, and
- Whole body.

PPE includes such items as

- Goggles,
- Face shields,
- Safety glasses,
- Hard hats,
- Safety shoes,
- Gloves,
- Vests,
- Earplugs, and
- Earmuffs.

**To obtain copies of the CFR, see the order form at the end of this publication.*

Respirators and rubber insulating equipment (gloves, sleeves, blankets) are also considered PPE, but because OSHA has specific requirements for those kinds of PPE, this general guide does not address such equipment. For assistance in determining the need for and the appropriate choice of respiratory protection for your employees, see OSHA Instruction CPL 2-2.54, *Respiratory Protection Program Manual*.*

What is a PPE program?

This program sets out procedures for selecting, providing, and using PPE as part of your routine operation. A written PPE program is easier to establish and maintain as company policy and easier to evaluate than an unwritten one.

How do I develop a PPE program for my company?

You have already begun to establish a PPE program by thinking about how best to protect your employees from potential hazards. Use *Checklist A* for information on establishing a PPE program. Working through the PPE selection process in this guide will produce the foundation for your program. Then you will need to decide how to enforce PPE use at your facility, provide for any required medical examinations, and evaluate your PPE program.

Checklist A: Establishing a PPE Program

- ☐ Identify steps taken to assess potential hazards in every employee's work space and in workplace operating procedures
- ☐ Identify appropriate PPE selection criteria
- ☐ Identify how you will train employees on the use of PPE, including
  - ☐ What PPE is necessary
  - ☐ When PPE is necessary
  - ☐ How to properly inspect PPE for wear or damage
  - ☐ How to properly put on and adjust the fit of PPE
  - ☐ How to properly take off PPE
  - ☐ The limitations of the PPE
  - ☐ How to properly care for and store PPE
- ☐ Identify how you will assess employee understanding of PPE training
- ☐ Identify how you will enforce proper PPE use
- ☐ Identify how you will provide for any required medical examinations
- ☐ Identify how and when to evaluate the PPE program

CPL 2-2.54, 2/10/1992, on http//:www.osha-slc.gov/. See **Other OSHA Documents, at http://www.osha.gov/ or contact your nearest OSHA regional or area office listed at the end of this publication.*

Who must provide PPE?

You must provide PPE for your employees if

- Their work environment presents a hazard or is likely to present a hazard to any part of their bodies;

OR

- Their work processes present a hazard or are likely to present a hazard to any part of their bodies;

OR

- During their work, they might come into contact with hazardous chemicals, radiation, or mechanical irritants;

AND

- You are unable to eliminate their exposure or potential exposure to the hazard by engineering, work practice, or administrative controls.

How do I identify potential hazards in my workplace?

Begin with a survey of your workplace. Observe the environment in which your employees work. Ask employees how they perform their tasks. Look for sources of potential injury such as the following:

- Objects that might fall from above.
- Exposed pipes or beams at work level.
- Exposed liquid chemicals.
- Sources of heat, intense light, noise, or dust.
- Equipment or materials that could produce flying particles.

Checklist B at the end of this section will help you conduct this survey.

I have identified potential hazards. Now what?

Determine if there are feasible engineering and work practice controls that could be used to avoid hazards.

What are work practice and engineering controls?

These controls can be described by the following examples once you've identified a potential hazard on a machine or in the room in which your employees work

If...	Then...
You can physically change the machine or work environment to prevent employee exposure to the potential hazard (adding a guard to the machine or building a barrier in the room between employees and the hazard).	You have eliminated the hazard with an engineering control.
You can remove your employees from exposure to the potential hazard by changing the way they do their jobs.	You have eliminated the hazard with a work practice control.

Employers should institute all feasible engineering, work practice, and administrative controls to eliminate or reduce hazards *before* using PPE to protect employees against hazards.

All feasible engineering and work practice controls are in place, but my employees are still exposed to potential hazards. Is now the time to provide PPE?

Yes. You must examine each likely hazard very carefully and determine the nature of the threat the hazard poses to your employees. Then choose the appropriate PPE for protection against that hazard, and make sure that any PPE you choose will fit the employee(s) who must wear it. Next, train your employees in the proper use and care of the PPE you provide.

How do I get started assessing my workplace operations for PPE needs?

Use *Checklist B* to assess the work environment and procedures. Keep in mind, though, that this is not an exhaustive list of operations that could cause injury. Many workplace operations create hazards; all of them could not be listed here. If you don't find a specific task on the checklist

- Look for similarities between your workplace operations and those listed here
- Try to anticipate whether such operations also might create similar hazards, and
- Remember, an operation need only have the *potential* to cause injury to require PPE.

Once you have identified the tasks that require PPE, read the specific sections in the checklist to help you choose the appropriate PPE for your employees.

Machine Shop

In a machine shop, a milling operation produces large quantities of metal chips that fly all over the surrounding work areas. Recognizing that flying metal chips were a potential hazard to employees in the surrounding areas, the machine shop owner had to decide how best to protect the workers.

Option 1—PPE:

Provide employees with safety goggles or safety glasses with side shields.

Option 2—Engineering and administrative controls:

Enclose the milling operation or install a deflector to contain the metal chips and prevent them from flying into the surrounding areas (engineering control).

Operate the machine only at certain times of the day when adjacent operations have stopped (administrative/work practice control).

Option 2 is more effective since enclosing the operation will eliminate the hazard of flying metal chips. Providing a deflector will contain most, if not all, of the flying chips. In a machine shop, however, safety glasses should also be required for added protection.

Checklist B: Need for PPE

Suggested Questions	Typical Operations of Concern	Yes	No
Eyes			
Do employees perform tasks, or work near employees who perform tasks, that might produce airborne dust or flying particles?	Sawing, cutting, drilling, sanding, grinding, hammering, chopping, abrasive blasting, and punch press operations.	☐	☐
Do your employees handle, or work near employees who handle, hazardous liquid chemicals or encounter blood splashes?	Pouring, mixing, painting, cleaning, syphoning, dip tank operations, and dental and health care services.	☐	☐
Are your employees' eyes exposed to other potential physical or chemical irritants?	Battery charging, installing fiberglass insulation, and compressed air or gas operations.	☐	☐
Are your employees exposed to intense light or lasers?	Welding, cutting, and laser operations.	☐	☐
Face			
Do your employees handle, or work near employees who handle, hazardous liquid chemicals?	Pouring, mixing, painting, cleaning, syphoning, and dip tank operations.	☐	☐
Are your employees' faces exposed to extreme heat?	Welding, pouring molten metal, smithing, baking, cooking, and drying.	☐	☐
Are your employees' faces exposed to other potential irritants?	Cutting, sanding, grinding, hammering, chopping, pouring, mixing, painting, cleaning, and syphoning.	☐	☐
Head			
Might tools or other objects fall from above and strike your employees on the head?	Work stations or traffic routes located under catwalks or conveyor belts, construction, trenching, and utility work.	☐	☐

Checklist B:
Need for PPE (continued)

Suggested Questions	Typical Operations of Concern	Yes	No
When your employees stand or bend, are their heads near exposed beams, machine parts, or pipes?	Construction, confined space operations, and building maintenance.	☐	☐
Do your employees work with or near exposed electrical wiring or components?	Building maintenance; utility work; construction; wiring; work on or near communications, computer, or other high-tech equipment; and arc or resistance welding.	☐	☐
Feet			
Could tools, heavy equipment, or other objects roll, fall onto, or strike your employees' feet?	Construction, plumbing, smithing, building maintenance, trenching, utility work, and grass cutting.	☐	☐
Do your employees work with or near exposed electrical wiring or components?	Building maintenance; utility work; construction; wiring; work on or near communications, computer, or other high-tech equipment; and arc or resistance welding.	☐	☐
Do your employees work with explosives or in explosive atmospheres?	Demolition, explosives manufacturing, grain milling, spray painting, abrasive blasting, and work with highly flammable materials	☐	☐
Hands			
Do your employees' hands come into contact with tools or materials that might scrape, bruise, or cut?	Grinding, sanding, sawing, hammering, and material handling.	☐	☐
Do your employees handle chemicals that might irritate skin, or come into contact with blood?	Pouring, mixing, painting, cleaning, syphoning, dip tank operations, and health care and dental services.	☐	☐
Do work procedures require your employees to place their hands and arms near extreme heat?	Welding, pouring molten metal, smithing, baking, cooking, and drying.	☐	☐

Checklist B:
Need for PPE (continued)

Suggested Questions	Typical Operations of Concern	Yes	No
Are your employees' hands and arms placed near exposed electrical wiring or components?	Building maintenance; utility work; construction; wiring; work on or near communications, computer, or other high-tech equipment; and arc or resistance welding.	☐	☐
Body			
Are your employees' bodies exposed to irritating dust or chemical splashes?	Pouring, mixing, painting, cleaning, syphoning, dip tank operations, machining, sawing, battery charging, installing fiberglass insulation, and compressed air or gas operations.	☐	☐
Are your employees' bodies exposed to sharp or rough surfaces?	Cutting, grinding, sanding, sawing, glazing, and material handling.	☐	☐
Are your employees' bodies exposed to extreme heat?	Welding, pouring molten metal, smithing, baking, cooking, and drying.	☐	☐
Are your employees' bodies exposed to acids or other hazardous substances?	Pouring, mixing, painting, cleaning, syphoning, and dip tank operations.	☐	☐
Ears/Hearing			
Are your employees exposed to loud noise from machines, tools, or music systems?	Machining, grinding, sanding, work near conveyors, pneumatic equipment, generators, ventilation fans, motors, and punch and brake presses.	☐	☐

When must I provide eye protection for employees?

You must provide eye protection for employees whenever they are exposed to potential eye injuries during their work if work practice or engineering controls do not eliminate the risk of injury. Some of the things that might cause eye injuries include the following:

- Dust and other flying particles, such as metal shavings or wool fibers.
- Molten metal that might splash.
- Acids and other caustic liquid chemicals that might splash.
- Blood and other potentially infectious body fluids that might splash, spray, or splatter.
- Intense light such as that created by welding arcs and lasers.

How do I select the proper protective eyewear for employees?

Begin with the following criteria:

- Eye protection must protect against the specific hazard(s) encountered in the workplace.
- It must be reasonably comfortable to wear.
- Eye protection must not restrict vision or movement.
- Eye protection must be durable and easy to clean and disinfect.
- Eye protection must not interfere with the function of other required PPE.

In addition, the American National Standards Institute, Inc. (ANSI)* has issued standard requirements for the design, construction, testing, and use of protective devices for eyes and face.

OSHA requires that all protective eyewear you purchase for your employees meet the requirements of ANSI Z87.1-1989 for devices purchased after July 5, 1994, and ANSI Z87.1-1968 for devices purchased before that date.**

*ANSI, 11 West 42nd St., New York, NY 10035.
**ANSI, Z87.1, *Occupational and Educational Eye and Face Protection.*

If employees wear eyeglasses with prescription lenses, may I consider these eye protection?

No. Eyeglasses designed for ordinary wear do not provide the level of protection necessary to protect against workplace hazards. Special care must be taken when choosing eye protectors for employees who wear eyeglasses with corrective lenses such as the following:

- Prescription spectacles, with side shields and protective lenses meeting the requirements of ANSI Z87.1, that also correct the individual employee's vision.
- Goggles that can fit comfortably over corrective eyeglasses without disturbing the alignment of the eyeglasses.
- Goggles that incorporate corrective lenses mounted behind protective lenses.

You also must provide protective eyewear to employees who wear contact lenses and are exposed to potential eye injury. Eye protection provided to these employees may also incorporate corrective eyeglasses. Thus, if an employee must don eyeglasses in the event of contact lens failure or loss, he or she will still be able to use the same protective eyewear.

What kind of eye and face protectors are there? What are they for?

- **Safety spectacles.** These protective eyeglasses are made with safety frames constructed of metal and/or plastic and are fitted with either corrective or plano impact-resistant lenses. They come with and without side shields, but most workplace operations will require side shields.
- **Impact-resistant spectacles.** This eyewear can be used for moderate impact from particles produced by such jobs as carpentry, woodworking, grinding, and scaling.
- **Side shields.** These protect against particles that might enter the eyes from the side. Side shields are made of wire mesh or plastic. Eyecup type side shields provide the best protection.

- **Goggles.** You may choose from many different types of goggles, each designed for specific hazards. Generally, goggles protect eyes, eye sockets, and the facial area immediately surrounding the eyes from impact, dust, and splashes. Some goggles fit over corrective lenses.
- **Welding shields.** Constructed of vulcanized fiber or fiberglass and fitted with a filtered lens, these protective devices are designed for the specific hazards associated with welding. Welding shields protect your employees' eyes from burns caused by infrared or intense radiant light, and they protect face and eyes from flying sparks, metal spatter, and slag chips produced during welding, brazing, soldering, and cutting. See *Table 1* for assistance in choosing the appropriate filter for your employees' tasks.
- **Laser safety goggles.** Laser safety goggles provide a range of protection against the intense concentrations of light produced by lasers. The type of laser safety goggles you choose will depend upon the equipment and operating conditions in your workplace. *Table 2* of this document and Chapter II:6, "Laser Hazards," in the *OSHA Technical Manual** will help you select the appropriate protection for your employees.
- **Face shields.** These transparent sheets of plastic extend from the brow to below the chin across the entire width of the employee's head. Some are polarized for glare protection. Choose face shields to protect your employees' faces from nuisance dusts and potential splashes or sprays of hazardous liquids.

Can face shields protect employees instead of goggles or protective spectacles?

Face shields do not protect employees from impact hazards. You may use however, face shields in combination with goggles or safety spectacles, to protect against impact hazards, even in the absence of dust or potential splashes, for additional protection beyond that offered by goggles or spectacles alone.

How do I choose the correct eye protection from among all the different types?

Each kind of protective eyewear is designed to protect against specific hazards. By completing the hazard assessment of your workplace outlined in the previous section, you will identify the specific workplace hazards that pose a threat to your employees' eyes and faces. *Tables 1 through 3* and *Figure 1* will help you find the protective devices most suited for your employees and your workplace. Locate the operations and hazards most similar to those in your workplace in *Table 1* and match the number to the corresponding drawing in *Figure 1*. Welding and laser operations require lenses to be tinted to a degree sufficient to protect against the specific intensity of light present during that tasks your employees perform (see *Tables 2* and *3*).

*TED1-0.15A, *January 20, 1999. See OSHA Technical Manual under* ***Other OSHA Documents*** *at http//:www.osha.gov. Copies of the manual may also be purchased from the Superintendent of Documents, Goernment Printing Office, Washington, DC 20402. The price of the subscription is $40 and the order number is 929-060-0000-8. GPO's phone number is (202) 512-1800; the fax number is (202) 512-2250.*

Table 1.
Eye and Face Protector Selection Guide

Operation	Hazards	Recommended protectors: (numbers refer to Figure 1)
Acetylene-burning, acetylene-cutting, acetylene-welding	Sparks, harmful rays, molten metal, flying particles	7,8,9
Chemical handling	Splash, acid burns, fumes	2,10 (for severe exposure add 10 over 2)
Chipping	Flying particles	1,3,4,5,6,7A,8A
Electric (arc) welding	Sparks, intense rays, molten metal	9,11 (11 in combination with 4,5,6 in tinted lenses advisable)
Furnace operations	Glare, heat, molten metal	7,8,9 (for severe exposure add 10)
Grinding - light	Flying particles	1,3,4,5,6,10
Grinding - heavy	Flying particles	1,3,7A,8A (for severe exposure add 10)
Laboratory	Chemical splash, glass breakage	2 (10 when in combination with 4,5,6)
Machining	Flying particles	1,3,4,5,6,10
Molten metals	Heat, glare, sparks, splash	7,8 (10 in combination with 4,5,6 in tinted lenses)
Spot welding	Flying particles, sparks	1,3,4,5,6,10

Source: 29 CFR 1926.102(a)(5)

How dark do lenses on welding helmets and goggles need to be?

The intensity of light or radiant energy produced by welding, cutting, or brazing operations varies according to a number of factors including the task producing the light, the electrode size, and the arc current. Table 2 shows the minimum protective shade for a variety of welding, cutting, and brazing operations. To protect employees who are exposed to intense radiant energy, begin by selecting a shade too dark to see the welding zone. Then try lighter shades until you find one that allows a sufficient view of the welding zone without going below the minimum protective shade.

Table 2.
Filter Lenses for Protection Against Radiant Energy

Operations	Electrode size in 1/32" (0.8mm)	Arc current	Minimum* protective shade
Shielded metal arc welding	<3	<60	7
	3-5	60-160	8
	5-8	160-250	10
	>8	250-550	11
Gas metal-arc welding and flux-cored arc welding		<60	7
		60-160	10
		160-250	10
		250-500	10
Gas tungsten-arc welding		<50	8
		50-150	8
		150-500	10
Air carbon arc cutting	(light)	<500	10
	(heavy)	500-1,000	11
Plasma arc welding		<20	6
		20-100	8
		100-400	10
		400-800	11
Plasma arc cutting	(light)**	<300	8
	(medium)**	300-400	9
	(heavy)**	400-800	10
Torch blazing			3
Torch soldering			2
Carbon arc welding			14
Gas welding:			
Light	<1/8	<3.2	4
Medium	1/8-1/2	3.2-12.7	5
Heavy	>1/2	>12.7	6
Oxygen cutting:			
Light	<1	<25	3
Medium	1-6	25-150	4
Heavy	>6	>150	5

Source: 29 CFR 1910.133(a)(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.*

How do I protect employees from exposure to laser beams?

You must provide safety goggles specifically designed to protect the employees' eyes from the specific intensity of light produced by the laser. The level of protection will vary according the level of radiation emitted by the laser. If your employees are exposed to laser beams, you must determine the maximum power density, or intensity, that the lasers can produce.* Based on this knowledge, you must select lenses that will protect against this maximum intensity. *Table 3* shows the minimum optical density of lenses required for various laser intensities. Employers with lasers emitting radiation between two measures of power density (or light blocking capability) must provide lenses that offer protection against the higher of the two intensities.

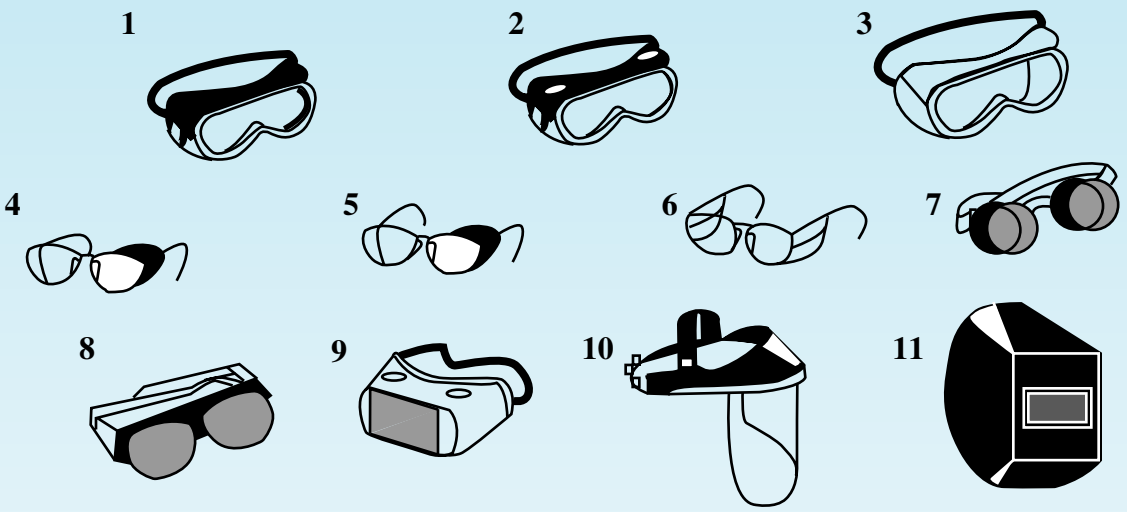
Table 3.
Selecting Laser Safety Glass

Intensity, CW maximum power density (watts/cm^2)	Optical density (O.D.)	Attenuation factor
10^{-2}	5	10^5
10^{-1}	6	10^6
1	7	10^7
10	8	10^8

Source: 29 CFR 1926.102(b)(2)(i)

**The manufacturer usually provides this information on the laser.*

Figure 1. Recommended Eye and Face Protectors



Eye and face protectors are identified below by number and type. Refer to *Table 1* for recommended usage applications.

1. **Goggles,** flexible fitting, regular ventilation
2. **Goggles,** flexible fitting, hooded ventilation
3. **Goggles,** cushioned fitting, rigid body
4. **Spectacles,** metal frame, with side shields*
5. **Spectacles,** plastic frame, with side shields*
6. **Spectacles,** metal-plastic frame, with flatfold side shields*
7. **Welding Goggles,** eyecup type, tinted lenses**

7A. **Chipping Goggles,** eyecup type, clear safety lenses (not illustrated)

8. **Welding Goggles,** coverspec type, tinted lens**

8A. **Chipping Goggles,** coverspec type, clear safety lenses (not illustrated)

9. **Welding Goggles,** coverspec type, tinted plate lens**
10. **Face Shield** (available with plastic or mesh window, tinted/transparent)
11. **Welding Helmets****

Source: 29 CFR 1926.102 (a)(5) Table E-1.
**These are also available without side shields for limited use requiring only frontal protection.*
*** See Table 2, Filter Lenses for Protection Against Radiant Energy.*

How can I be sure that laser safety goggles provide enough protection?

Every pair of safety goggles intended for use with laser beams must bear a label with the following information:

- The laser wavelengths for which they are intended to be used.
- The optical density of those wavelengths.
- The visible light transmission.

Once I have selected the appropriate eye-protection equipment, how do I make sure employees use it properly?

Train your employees to use the protective eyewear. *Checklist C* will help you prepare your employees to use and care for the eye protection you provide.

Checklist C: Use and Care of Eye and Face Protection

Train your employees to know…

- ☐ Why eye protection is necessary—i.e., the workplace hazards that threaten their eyes
- ☐ How the eye protection will protect them
- ☐ The limitations of the eye protection
- ☐ When they must wear the eye protectors
- ☐ How to put the protective eyewear on properly
- ☐ How to adjust straps and other parts for a comfortable and effective fit
- ☐ How the protective eyewear fits over or contains an employee's corrective lenses
- ☐ How to identify signs of wear such as
  - ☐ Chipped, scratched, or scraped lenses
  - ☐ Loss of elasticity or fraying of head bands
- ☐ How to clean and disinfect the safety eyewear

My workplace gets pretty dirty. How will my employees keep their protective eyewear clean and effective?

Train your employees how to clean the eye protectors. Allow them time at the end of their shifts to do the following:

- Disassemble goggles or spectacles,
- Thoroughly clean all parts with soap and warm water,
- Carefully rinse off all traces of soap, and
- Replace all defective parts.

Occasionally, you must disinfect the protective eyewear. To do so, after cleaning you can do the following:

- Immerse and swab all parts for 10 minutes in a germicidal solution.
- Remove all parts from the solution and hang in a clean place to air dry at room temperature or with heated air.
- Do not rinse the parts after submerging them in the disinfectant. Rinsing will remove the germicidal residue that remains after drying.
- You may also use ultraviolet disinfecting and spray-type disinfecting solutions after washing.

My employees work in shifts. Could I provide one pair of protective eyewear for each position instead of each employee?

Yes. If you do this, however, you must disinfect shared protective eyewear after each use. If the goggles or spectacles do not have to be individually designed to incorporate an employee's corrective lenses and you disinfect the eyewear between uses by different employees, more than one employee may use the same set of protective eyewear.

If a Wood Chip Chips...

Eight employees work four at a time during two shifts in a custom woodworking shop. During the course of their shifts, the employees might saw, lathe, sand, and finish wood.

Before beginning shop operations, their employer conducted a hazard assessment and determined that flying sawdust and wood chips presented an impact hazard to workers' eyes. In addition, stains, polyurethane finishes, and liquid waxes might splash into employees' eyes.

The employer purchased four flexible-fitting, ventilated goggles to be shared by employees on different shifts. The employer trained each employee to use and care for the goggles and required the employees to wear them when in the shop. In addition, the employer made face shields available for employee comfort and added protection.

During the final 15 minutes of each shift, employees wash the goggles they wore in warm water and soap. After rinsing the goggles clean, the employees douse them in disinfecting solution for 10 minutes and then place them under a blower to dry before the next shift arrives to don the goggles.

When do my employees need head protection?

You must provide head protection for your employees if:

- Objects might fall from above and strike them on the head;
- They might bump their heads against fixed objects, such as exposed pipes or beams; or
- They work near exposed electrical conductors.

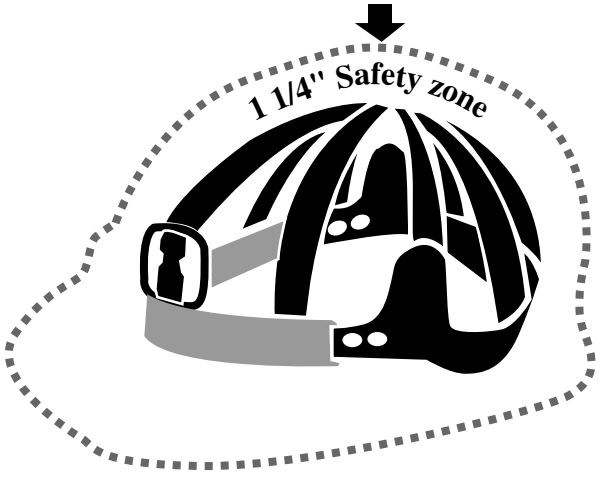
What should I look for in head protection?

In general, protective helmets, or hard hats, should

- Resist penetration by objects,
- Absorb the shock of a blow,
- Be water resistant and slow burning, and
- Come with instructions explaining proper adjustment and replacement of the suspension and headband.

Hard hats require a hard outer shell and a shock-absorbing lining. The lining should incorporate a head band and straps that suspend the shell from 1 to $1^{1}/_{4}$ inches (2.54 cm to 3.18 cm) away from the user's head. This design provides shock absorption during impact and ventilation during wear.

Figure 2. Hard Hat



As with devices designed to protect eyes, the design, construction, testing, and use of protective helmets must meet standards established by ANSI. Protective helmets purchased after July 5, 1994, must comply with ANSI Z89.1-1986,* whereas, those purchased before this date must meet the ANSI Z89.1-1969 standard.

What types of head protection are available?

Hard hats are divided into three industrial classes:

- **Class A.** These helmets are for general service. They provide good impact protection but limited voltage protection. They are used mainly in mining, building construction, shipbuilding, lumbering, and manufacturing.
- **Class B.** Choose Class B helmets if your employees are engaged in electrical work. They protect against falling objects and high-voltage shock and burns.
- **Class C.** Designed for comfort, these light-weight helmets offer limited protection. They protect workers from bumping against fixed objects but do not protect against falling objects or electric shock.

Look at the inside of any protective helmet you are considering for your employees, and you should see a label showing the manufacturer's name, the ANSI standard it meets, and its class. *Figure 2* shows the basic design of hard hats.

**ANSI Z89.1, Protective Headwear for Industrial Workers.*

The Sky is Falling…

An employer contracted with cable television providers to string coaxial cable on utility poles. The employer hired work crews of two. Generally, one employee worked aloft in an aerial lift, or cherry picker, while the other employee worked at ground level. Employees alternated these tasks.

The employer's assessment determined that, among other hazards, certain aspects of the work posed a potential for head injuries.

Ground-level employees risked being struck by falling tools from the work basket above, as well as from the basket and the lift boom when they maneuvered into position. Employees aloft risked impact with utility poles and high-voltage electrical transformers.

Employees with long hair faced additional hazards. On the ground, long hair could get tangled in lift machinery. On the lift, the wind could blow long hair and tangle it with cables and electrical hazards.

To protect employees' heads, the employer provided Class B hard hats. These helmets protect against impact and contact with electrical hazards. The employer also issued bandanas of sufficient size to cover the long hair of employees.

As part of initial training, the employer introduced all new employees to the reasons why they must wear hard hats and the procedures for the proper care and maintenance of the hard hats. In addition, the employer periodically reviews these procedures with employees during refresher training sessions.

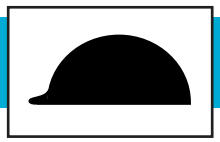
How do I choose the correct protective helmets from among the different types?

Each kind of protective helmet is designed to protect against specific hazards. By completing the hazard assessment outlined above, you will identify the specific workplace hazards that pose a threat to your employee's head.

I have purchased new hard hats that meet the ANSI requirements. Have I fulfilled my responsibility to protect my employees' heads?

No. Issuing appropriate head protection to employees is a major first step, but you must make sure that the hard hats continue to provide sufficient protection to your employees. Do this by training your employees in the proper use and maintenance of hard hats including daily inspection of them. If your employees identify any of the following defects, remove the hard hats from service:

- The suspension system shows signs of deterioration such as:
  - Cracking,
  - Tearing, or
  - Fraying.
- The suspension system no longer holds the shell from 1 inch to $1\frac{1}{4}$ inches (2.54cm - 3.18cm) away from the employee's head.
- The brim or shell is cracked, perforated, or deformed.
- The brim or shell shows signs of exposure to heat, chemicals, ultraviolet light, or other radiation. Such signs include:
  - Loss of surface gloss,
  - Chalking, or
  - Flaking (a sign of advanced deterioration).



Could employees wearing hard hats and working at elevations create a potential hazard for the employees working below?

To protect employees working below, you must provide chin straps for the protective helmets worn by employees working at higher elevations, whether in an aerial lift or at the edge of a pit. The chin straps should be designed to prevent the hard hats from being bumped off the employees' heads.

Can I require employees to cut their hair if it is long enough to get tangled in machinery?

Long hair (longer than four inches) can be drawn into machine parts such as chains, belts, rotating devices, suction devices, and blowers. Hair may even be drawn into machines otherwise guarded with mesh. Although you ***need not*** require your employees to cut their hair, you ***must*** require them to ***cover and protect*** their hair with bandanas, hair nets, turbans, soft caps, or the like. These items, however, must not themselves present a hazard.

Once I have selected helmets to protect my employees' heads, how do I make sure they use them properly?

Train your employees to use the hard hats. *Checklist D* will help you instruct your employees to use and care for the head protection you provide.

How do I make sure that the hard hats I provide will be kept in good condition?

You must train your employees to maintain and care for the head protection. Your training communicates the importance of wearing head protection and taking proper care of it. Important information you will want to consider when training employees on how to care for their hard hats includes the following:

- Paints, paint thinners, and some cleaning agents can weaken the shell of the hard hat and may eliminate electrical resistance. Consult the helmet manufacturer for information on the effects of paint and cleaning materials on their hard hats. Keep in mind that paint and stickers can also hide signs of deterioration in the hard hat shell. Limit their use.
- Ultraviolet light and extreme heat, such as that generated by sunlight, can reduce the strength of the hard hats. Therefore, employees should not store or transport hard hats on the rear-window shelves of automobiles or otherwise in direct sunlight.

Also, instruct employees to clean the protective helmets periodically by:

- Immersing for one minute in hot (approximately 140^0 F, or 60^0 C) water and detergent,
- Scrubbing, and
- Rinsing in clear hot water.

Checklist D: Use and Care of Head Protection

Train your employees to know…

- ☐ Why head protection is necessary—i.e., the workplace hazards threatening their heads
- ☐ How the head protection will protect them
- ☐ The limitations of the head protection
- ☐ When they must wear the head protection
- ☐ How to wear the protective head gear properly
- ☐ How to adjust straps and other parts for a comfortable and effective fit

How to identify signs of wear, such as

- ☐ Cracked, torn, frayed, or otherwise deteriorated suspension systems
- ☐ Deformed, cracked, or perforated brims or shells
- ☐ Flaking, chalking, or loss of surface gloss

- ☐ How to clean and disinfect the hard hats you provide for them.

When must I provide foot and leg protection?

You must provide foot and leg protection if your workplace hazard assessment reveals potential dangers to these parts of the body. Some of the potential hazards you might identify include the following:

- Heavy objects such as barrels or tools that might roll onto or fall on employees' feet.
- Sharp objects such as nails or spikes that might pierce the soles or uppers of ordinary shoes.
- Molten metal that might splash on feet or legs.
- Hot or wet surfaces.
- Slippery surfaces.

What are the types of protection and where do I use them?

The type of foot and leg protection you provide your employees will depend upon the specific workplace hazards you identify and the specific parts of the feet or legs exposed to potential injury. Safety footwear must meet minimum compression and impact performance standards and testing requirements established by ANSI. Protective footwear purchased after July 5, 1994, must meet the requirements of ANSI Z41-1991.* Protective footwear bought before that date must comply with ANSI Z41-1967. Foot and leg protection choices includes the following:

- **Leggings.** Use these to protect the lower legs and feet from heat hazards, like molten metal or welding sparks. Safety snaps allow leggings to be removed quickly.
- **Metatarsal guards.** Made of aluminum, steel, fiber, or plastic, these guards may be strapped to the outside of shoes to protect the instep area from impact and compression.
- **Toe guards.** Toe guards may be made of steel, aluminum, or plastic. They fit over the toes of regular shoes. These guards protect only the toes from impact and compression hazards.
- **Combination foot and shin guards.** These guards may be used in combination with toe guards when greater protection is needed.
- **Safety shoes.** These sturdy shoes have impact-resistant toes and heat-resistant soles that protect against hot work surfaces common in roofing, paving, and hot metal industries. The metal insoles of some safety shoes protect against puncture wounds. Safety shoes may also be designed to be electrically conductive to prevent the buildup of static electricity in areas with the potential for explosive atmospheres, or nonconductive to protect workers from workplace electrical hazards.

A Shoe Thing…

A small foundry employs workers to cast metal rods. Although engineering controls and work practice procedures eliminated most employee exposure to molten metal, a hazard assessment conducted by the employer revealed that during pouring, spatters of the molten metal could reach employees' legs and feet. In addition, the wheels of the material handling equipment that lift the rods pass near employee work areas and constitute a compression hazard to employees' feet.

The employer provided employees with leggings and foundry shoes. The leggings fit over the shoes and provide protection against molten metal spatters to the employees' legs, while the shoes keep the burning material from making contact with employees' feet. The mandatory safety toes built into the foundry shoes provide protection against the possibility that heavy machinery could injure employees if it rolls onto their feet.

The employer also trained employees to use and care for the protective gear properly, according to the manufacturers' instructions.

** ANSI Z41, Protective Footwear.*

What should I look for when choosing safety shoes for my employees?

Generally, safety shoes must be sturdy and must have impact-resistant safety toes, instep protection, and heat-resistant soles (see *Figure 3*). All safety shoes must comply with the ANSI standard(s) mentioned above. In addition, depending on the types of worker exposures, you may need to provide specially designed safety shoes such as conductive or electrical-hazard safety shoes.

Conductive Shoes

Electrically conductive shoes protect against the buildup of static electricity. Essentially, these shoes ground the employees wearing them. Employees working in explosive and hazardous locations such as explosives manufacturing facilities or grain elevators must wear conductive shoes to reduce the risk of static electricity buildup on an employee's body that could produce a spark and cause an explosion or fire. During training, employees must be instructed not to use foot powder or wear socks made of silk, wool, or nylon with conductive shoes. Foot powder insulates and retards the conductive ability of the shoes. Silk, wool, and nylon produce static electricity.

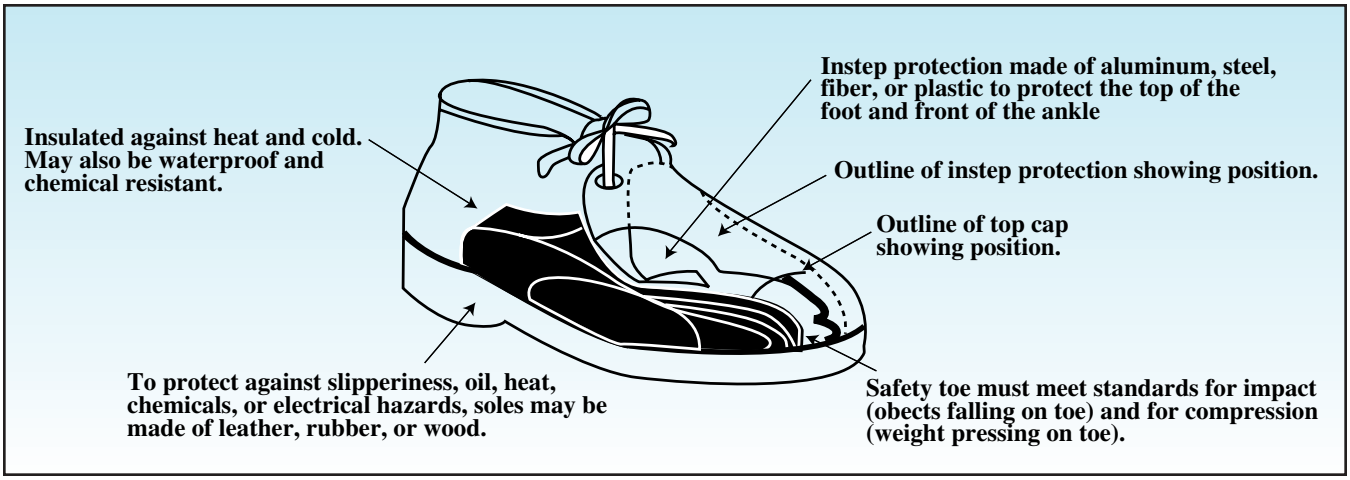
Conductive shoes are not general-purpose shoes and must be removed upon completion of the tasks for which they are required. Employees exposed to electrical hazards must never wear conductive shoes.

Electrical Hazard, Safety-Toe Shoes

Electrical hazard, safety-toe shoes are **nonconductive** and will prevent your employees' feet from completing an electrical circuit to the ground. They can protect employees against open circuits of up to 600 volts in dry conditions. Electrical hazard,

If your employees...	Then...
Work near explosive or hazardous atmosphere.	You must provide them with conductive shoes.
Work near exposed electrical conductors or components.	You must provide them with electrical-hazard, safety-toe shoes.
Work with molten metal.	You must provide them with foundry shoes.

Figure 3. Safety Shoes



safety-toe shoes should be used in conjunction with other insulating equipment and precautions to reduce or eliminate the potential for your employees' bodies or parts of their bodies to provide a path for hazardous electrical energy. *Note:* **Nonconductive** footwear must **not** be used in explosive or hazardous locations; in such locations, **electrically conductive** shoes are required.

Train your employees to recognize that the insulating protection of electrical hazard, safety-toe shoes may be compromised if

- The shoe is wet,
- The rubber sole is worn through,
- Metal particles become embedded in the sole or heel, or
- Other parts of the employees' bodies come into contact with conductive, grounded items.

Foundry Shoes

In addition to insulating your employees' feet from the extreme heat of molten metal, foundry shoes prohibit hot metal from lodging in shoe eyelets, tongues, or other parts. These snug-fitting leather or leather-substitute shoes have leather or rubber soles and rubber heels. In addition, all foundry shoes must have built-in safety toes.

Once I have selected equipment to protect my employees' feet and legs, how do I make sure they use it properly?

Train your employees to use the protective footwear. *Checklist E* will help you instruct your employees to use and care for the foot and leg protection you provide.

Checklist E: Use and Care of Foot and Leg Protection

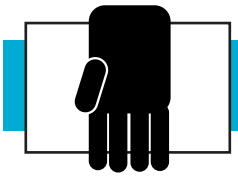
Train your employees to know...

- ☐ Why foot or leg protection is necessary—i.e., the workplace hazards that threaten the feet or legs
- ☐ How the equipment you provide will protect your employees
- ☐ The limitations of the foot or leg protection
- ☐ When employees must wear the protective leggings, guards, or shoes
- ☐ How to properly put on the protective equipment
- ☐ How to adjust straps, laces, and other parts for a comfortable and effective fit

How to identify signs of wear such as

- ☐ Scuffed, cracked, or lacerated uppers
- ☐ Signs of separation between soles and uppers
- ☐ Holes or cracks in soles or heel
- ☐ Metal embedded in heels or soles of electrical hazard, safety-toe shoes

- ☐ How to clean and maintain the leg and foot protection you provide



When must I provide hand and arm protection?

If your workplace hazard assessment reveals that your employees risk injury to their hands and arms, and engineering and work practice controls do not eliminate the hazards, you must provide your employees with appropriate protection. The injuries you may need to guard against in your workplace include the following:

- Burns
- Bruises
- Abrasions
- Cuts
- Punctures
- Fractures
- Amputations
- Chemical exposures.

What kind of equipment is necessary to protect the hands and arms?

For many workplace operations, machine guards such as point-of-operation guards will be sufficient. For example, install a barrier that makes it impossible for employees to put their hands at the point where a table saw blade makes contact with the wood it cuts. For other hazardous operations, you may be able to institute work procedures that eliminate the risk of injury to your employees' hands or arms. When such measures fail to eliminate the hazard, however, protective gloves will be the primary means of protecting employees' hands. When the risk of injury includes the arm, protective sleeves, often attached to the gloves, may be appropriate.

Is there one kind of glove that will protect against all workplace hazards?

No. The nature of the hazard(s) and the operation to be performed will determine your selection of gloves. The variety of potential occupational hand injuries may make selecting the appropriate pair of gloves more difficult than choosing other protective equipment. Take care to choose gloves designed for the particular circumstances of your workplace.

What kinds of protective gloves are available?

Gloves made from a wide variety of materials are designed for virtually every workplace hazard. In general, however, they may be divided into four groups:

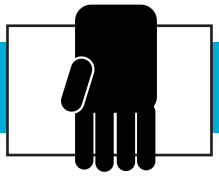
- Durable work gloves made of metal mesh, leather, or canvas.
- Fabric and coated fabric gloves.
- Chemical and liquid resistant gloves.
- Insulating rubber gloves.*

Metal Mesh, Leather, or Canvas Gloves

Sturdy gloves made from metal mesh, leather, or canvas provide protection against cuts, burns, and sustained heat.

- **Leather gloves.** Leather gloves protect against sparks, moderate heat, blows, chips, and rough objects. Welders in particular need the durability of higher-quality leather gloves.
- **Aluminized gloves.** These gloves usually are used for welding, furnace, and foundry work because they provide reflective and insulating protection against heat. Aluminized gloves require an insert made of synthetic materials that protect against heat and cold.
- **Aramid fiber gloves.** Aramid is a synthetic material that protects against heat and cold. Many glove manufacturers use aramid fiber to make gloves that are cut- and abrasive-resistant and wear well.
- **Other synthetic materials.** Several manufacturers make gloves with other synthetic fabrics that offer protection against heat and cold. In addition to protection against temperature extremes, gloves made with other synthetic materials are cut- and abrasive-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.

**See 29 CFR 1910.137 for detailed requirements for the selection and use of insulating rubber gloves.*



Fabric and Coated Fabric Gloves

These gloves are made of cotton or other fabric to provide varying degrees of protection.

- **Fabric gloves.** These gloves can protect against dirt, slivers, chafing, and abrasion. These gloves do not provide sufficient protection, however, to be used with rough, sharp, or heavy meterials.

Adding a plastic coating to some fabric gloves strengthens them and makes them effective protection for a variety of tasks.

- **Coated fabric gloves.** Manufacturers normally make these gloves from cotton flannel with napping on one side. By coating the unnapped side with plastic, fabric gloves are transformed into general-purpose hand protection offering slip-resistant qualities. These gloves are used for tasks ranging from handling bricks and wire rope to handling chemical containers in laboratory operations. When selecting gloves to protect against chemical exposure hazards, always check with the manufacturer (or review the manufacturer's product literature) to determine the gloves' effectiveness against the specific chemicals and conditions in the workplace.

Chemical- and Liquid-Resistant Gloves

Gloves made of rubber (latex, nitrile, or butyl), plastic, or synthetic rubber-like material such as neoprene protect workers from burns, irritation, and dermatitis caused by contact with oils, greases, solvents, and other chemicals. The use of rubber gloves also reduces the risk of exposure to blood and other potentially infectious substances. Some common gloves used for chemical protection are described below. In addition, *Table 4* rates various gloves as protectors against specific chemicals and will help you select the most appropriate gloves to protect your employees.

- **Butyl rubber gloves.** These gloves protect against nitric acid, sulfuric acid, hydrofluoric acid, red fuming nitric acid, rocket fuels, and peroxide. Highly impermeable to gases, chemicals, and water vapor, butyl rubber gloves also resist oxidation and ozone corrosion. In addition, they resist abrasion and remain flexible at low temperatures.
- **Natural latex or rubber gloves.** The comfortable wear and pliability of latex gloves as well as their protective qualities make them a popular general-purpose glove. In addition to resisting abrasions caused by sandblasting, grinding, and polishing, these gloves protect workers' hands from most water solutions of acids, alkalis, salts, and ketones. When selecting hand protection, you should be aware that latex gloves have caused allergic reactions in some individuals and thus may not be appropriate for all of your employees. Hypoallergenic gloves, glove liners, and powderless gloves are possible alternatives for individuals who are allergic to latex gloves.
- **Neoprene gloves.** These gloves have good pliability, finger dexterity, high density, and tear resistance which protect against hydraulic fluids, gasoline, alcohols, organic acids, and alkalis.
- **Nitrile rubber gloves.** These sturdy gloves provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. Although intended for jobs requiring dexterity and sensitivity, nitrile gloves stand up to heavy use even after prolonged exposure to substances that cause other gloves to deteriorate. In addition, nitrile gloves resist abrasions, punctures, snags, and tears.

Helping Hands...

An independent laboratory employs 25 chemists and technicians. The technicians handle small amounts of organic acids and solvents during tasks that require dexterity and accuracy. Lab coats provide sufficient protection to the technicians' arms and bodies.

The employer supplies the technicians with neoprene gloves. The gloves allow employees full dexterity and are particularly good at protecting their hands from the acids.

Table 4.
Glove Chemical Resistance Selection Chart

Chemical	Neoprene gloves	Latex or rubber gloves	Butyl gloves	Nitrile latex gloves
Acetaldehyde*	VG	G	VG	G
Acetic acid	VG	VG	VG	VG
Acetone	G	VG	VG	P
Ammonium hydroxide	VG	VG	VG	VG
Amy acetate*	F	P	F	P
Aniline	G	F	F	P
Benzaldehyde*	F	F	G	G
Benzene*	P	P	P	F
Butyl acetate	G	F	F	P
Butyl alcohol	VG	VG	VG	VG
Carbon disulfide	F	F	F	F
Carbon tetrachloride*	F	P	P	G
Castor oil	F	P	F	VG
Chlorobenzene*	F	P	F	P
Chloroform*	G	P	P	F
Chloronaphthalene	F	P	F	F
Chromic acid (50%)	F	P	F	F
Citric acid (10%)	VG	VG	VG	VG
Cyclohexanol	G	F	G	VG
Dibutyl phthalate*	G	P	G	G
Diesel fuel	G	P	P	VG
Diisobutyl ketone	P	F	G	P
Dimethylformamide	F	F	G	G
Dioctyl phthalate	G	P	F	VG
Dioxane	VG	G	G	G
Epoxy resins, dry	VG	VG	VG	VG
Ethyl acetate*	G	F	G	F
Ethyl alcohol	VG	VG	VG	VG
Ethyl ether*	VG	G	VG	G
Ethylene dichloride*	F	P	F	P
Ethylene glycol	VG	VG	VG	VG
Formaldehyde	VG	VG	VG	VG
Formic acid	VG	VG	VG	VG
Freon 11	G	P	F	G
Freon 12	G	P	F	G
Freon 21	G	P	F	G
Freon 22	G	P	F	G
Furfural*	G	G	G	G

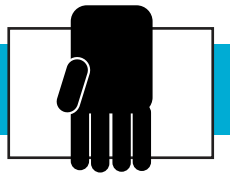


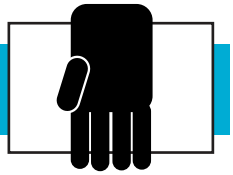
Table 4. Glove Chemical Resistance Selection Chart (Continued)

Chemical	Neoprene gloves	Latex or rubber gloves	Butyl gloves	Nitrile latex gloves
Gasoline, leaded	G	P	F	VG
Gasoline, unleaded	G	P	F	VG
Glycerin	VG	VG	VG	VG
Hexane	F	P	P	G
Hydrazine (65%)	F	G	G	G
Hydrochloric acid	VG	G	G	G
Hydrofluoric acid (48%)	VG	G	G	G
Hydrogen peroxide (30%)	G	G	G	G
Hydroquinone	G	G	G	F
Isooctane	F	P	P	VG
Kerosene	VG	F	F	VG
Ketones	V	VG	VG	P
Lacquer thinners	V	F	F	P
Lactic acid (85%)	VG	VG	VG	VG
Lauric acid (36%)	VG	F	VG	VG
Lineolic acid	VG	P	F	G
Linseed oil	VG	P	F	VG
Maleic acid	VG	VG	VG	VG
Methyl alcohol	VG	VG	VG	VG
Methylamine	F	F	G	G
Methyl bromide	G	F	G	F
Methyl chloride*	P	P	P	P
Methyl ethyl ketone*	G	G	VG	P
Methyl isobutyl ketone*	F	F	VG	P
Methyl metharcrylate	G	G	VG	F
Monoethanolamine	VG	G	VG	VG
Morpholine	VG	VG	VG	G
Naphthalene	G	F	F	G
Napthas, alaphatic	VG	F	F	VG
Naphthas, aromatic	G	P	P	G
Nitric acid*	G	F	F	F
Nitric acid, red and white fuming	P	P	P	P
Nitromethane (95.5%)*	F	P	F	F
Nitropropane (95.5%)	F	P	F	F
Octyl alcohol	VG	VG	VG	VG
Oleic acid	VG	F	G	VG

Table 4. Glove Chemical Resistance Selection Chart (Continued)

Chemical	Neoprene gloves	Latex or rubber gloves	Butyl gloves	Nitrile latex gloves
Oxalic acid	VG	VG	VG	VG
Palmitic acid	VG	VG	VG	VG
Perchloric acid (60%)	VG	F	G	G
Perchloroethylene	F	P	P	G
Petroleum distillates (naphtha)	G	P	P	VG
Phenol	VG	F	G	F
Phosphoric acid	VG	G	VG	VG
Potassium hydroxide	VG	VG	VG	VG
Propyl acetate	G	F	G	F
Propyl alcohol	VG	VG	VG	VG
Propyl alcohol (iso)	VG	VG	VG	VG
Sodium hyrdoxide	VG	VG	VG	VG
Styrene	P	P	P	F
Styrene (100%)	P	P	P	F
Sulfuric acid	G	G	G	G
Tannic acid (65)	VG	VG	VG	VG
Tetrahydrofuran	P	F	F	F
Toluene*	F	P	P	F
Toluene diisocyanate (TDI)	F	G	G	F
Trichloroethylene*	F	F	P	G
Triethanolamine (85%)	VG	G	G	VG
Tung oil	VG	P	F	VG
Turpentine	G	F	F	VG
Xylene*	P	P	P	F

Source: OSH Technical Reference Manual, U.S. Department of Energy
**Limited service.*
VG=Very Good; G=Good; F=Fair; P=Poor (not recommended).



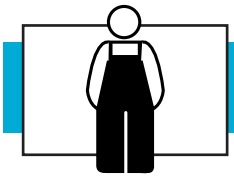
How do I make sure my employees properly use the equipment I have selected?

Train your employees to use the protective gloves and sleeves. *Checklist F* will help you teach your employees how to use and care for the equipment.

Checklist F: Use and Care of Hand and Arm Protection

Train your employees to know…

- ☐ Why hand and arm protection is necessary—i.e., the workplace hazards that threaten their hands and arms.
- ☐ How the protective gloves and sleeves will protect them
- ☐ The limitation of the protective equipment you've supplied
- ☐ When they must wear the gloves and sleeves
- ☐ How to wear the protective gloves and sleeves properly
- ☐ How to ensure a comfortable and effective fit
- ☐ How to identify signs of wear, such as
  - ☐ Cracks, scrapes, or lacerations
  - ☐ Thinning or discoloration
  - ☐ Break through to the skin
- ☐ How to clean and disinfect the nondisposable protective gloves and sleeves



When must I provide my employees with full body protection?

You must provide body protection for employees if they are threatened with bodily injury of one kind or another while performing their jobs, and if engineering, work practice, and administrative controls have failed to eliminate these hazards. Workplace hazards that could cause bodily injury include the following:

- Intense heat
- Splashes of hot metals and other hot liquids
- Impacts from tools, machinery, and materials
- Cuts
- Hazardous chemicals
- Contact with potentially infectious materials, like blood
- Radiation.

If only part of the body faces potential injury, must I provide my employees with full body protection?

As with all protective equipment, protective clothing is available to protect against specific hazards. You need to provide personal protective equipment only for the parts of the body exposed to possible injury. Depending upon hazards in your workplace, you may need to provide your employees with one or more of the following:

- Vests
- Jackets
- Aprons
- Coveralls
- Surgical gowns
- Full body suits.

If your hazard assessment indicates that you must provide full body protection against toxic substances or harmful physical agents, you must:

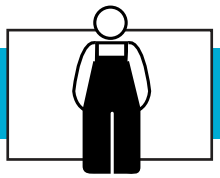
- Inspect the clothing carefully,
- Ensure proper fit, and
- Make sure the protective clothing functions properly.

From what material should protective clothing be made?

Protective clothing comes in a variety of materials, each suited to particular hazards. Conduct your hazard assessment. Identify the sources of any possible bodily injury. Install any feasible engineering controls, and institute work practice controls to eliminate the hazards. If the possibility of bodily injury still exists, provide protective clothing constructed of material that will protect against the specific hazards in your workplace. Materials for protective clothing include the following:

- **Paperlike fiber.** Disposable suits made of this material provide protection against dust and splashes.
- **Treated wool and cotton.** Protective clothing made from treated wool and cotton adapts well to changing workplace temperatures and is comfortable as well as fire resistant. Treated cotton and wool clothing protects against dust, abrasions, and rough and irritating surfaces.
- **Duck.** This closely woven cotton fabric protects employees against cuts and bruises while they handle heavy, sharp, or rough materials.
- **Leather.** Leather protective clothing is often used against dry heat and flame.
- **Rubber, rubberized fabrics, neoprene, and plastics.** Protective clothing made from these materials protects against certain acids and other chemicals.

Be aware that different materials will protect against different chemical and physical hazards. When chemical or physical hazards are present, check with the clothing manufacturer to make sure that the material selected will provide protection from the specific chemical or physical hazards in your workplace.



How do I make sure employees properly use the body protection I provide?

Train your employees to use the protective clothing. *Checklist G* will help you instruct them in the use and care of the body protection.

Avoiding the Itch…

Among the services offered by a general contractor is the installation of fiberglass insulation. In addition to the hazards posed by airborne glass fibers from the insulation, fiberglass insulation irritates skin. Also, the insulation often is installed in attics during the summer heat.

The contractor provides employees with cotton gloves and long-sleeve cotton flannel shirts to wear while installing fiberglass insulation. The heavy cotton protects against the skin irritation while still providing as much breathability as possible.

The contractor also provides employers with respirators selected in accordance with applicable OSHA standards to protect against breathing fiberglass.

Checklist G: Use and Care of Body Protection

Train your employees to know…

- ☐ Why protective clothing is necessary—i.e., the workplace hazards that threaten their bodies
- ☐ How the protective clothing will protect them
- ☐ The limitation of the body protection
- ☐ When they must wear the protective clothing
- ☐ How to put on the protective clothing properly
- ☐ How to adjust parts for a comfortable and effective fit
- ☐ How to identify signs of wear, such as
  - ☐ Rips, tears, scuffs, and
  - ☐ Loss of elasticity in tight-fitting parts
- ☐ How to clean and disinfect the protective clothing

When must I provide hearing protection for my employees?

Determining the need to provide hearing protection can be tricky. Employee exposure to excessive noise depends upon a number of factors:

- How loud is the noise as measured in decibels (dBA)?
- What is the duration of each employee's exposure to the noise?
- Do employees move between separate work areas with different noise levels?
- Is noise generated from one source or multiple sources?

Generally, the louder the noise, the shorter the exposure time before you must provide hearing protection. For instance, employees may be exposed to a noise level of 90 dBA for 8 hours per day before you must provide hearing protection for them. Suppose, however, that the noise level reaches 115 dBA in your workplace. Then you must provide hearing protection if their anticipated exposure exceeds 15 minutes.

Table 5 shows when you must provide hearing protection to employees exposed to occupational noise at specific levels for specific periods. Noises are considered continuous if the interval between occurrences of the maximum noise level is 1 second or less. Noises not meeting this definition are considered impact or impulse noises. Exposure to impact or impulse noises (loud momentary explosions of sound) must not exceed 140 dB. Examples of impact or impulse noises may include the noise from a powder-actuated nail gun, the noise from a punch press, or the noise from drop hammers.

For more information on noise, consult Chapter II:5, "Noise Measurement," of the *OSHA Technical Manual.**

Table 5. Permissible Noise Exposures

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

Source: 29 CFR 1910.95 Table G-16.

Will earplugs reduce employee exposure to high noise levels?

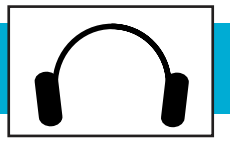
As with other types of hazards, you must implement feasible engineering controls and work practices before resorting to PPE such as earplugs or earmuffs. If engineering and work practice controls do not lower employee exposure to workplace noise to acceptable levels, then you must provide employees with appropriate PPE.

What if my employees are exposed to different levels of noise throughout the day?

If employees move from location to location and the noise level is different in each location, or if the noise levels in an area change throughout the day (e.g., equipment turns on or off), you must calculate an "equivalent noise factor" to determine whether you must provide hearing protection.

- Measure the noise level at each location in which the employee works.
- For each noise level, find the allowable duration in *Table 5.*
- For each location, divide the actual time the employee spends there by the permissible duration for the noise at the measured level, according to *Table 5.*

**TED 1-0.15A, January 20, 1999, on http://www.osha-slc.gov/.*



- Add all the results from your division.
- If the total is greater than one, you must implement engineering controls or work practices or provide hearing protection to your exposed employees.

The formula for calculating this exposure is as follows:

$$F_e = (C_1/T_1)+(C_2/T_2)...(C_n/T_n)$$

Where

F_e = the equivalent noise factor.

C = the period of actual noise exposure at an essentially constant level at each location in which the employee works.

T = the permissible duration of noise exposure at an essentially constant noise level, from *Table 5*.

What kinds of devices protect against high noise levels? Is cotton sufficient as earplugs?

Plain cotton does not effectively protect against occupational noise. You may, however, choose from several products that are effective at protecting your employees' hearing.

- **Single-use earplugs.** Made of waxed cotton, foam, or fiberglass wool, these ear plugs are self- forming and, when properly inserted, work as well as most molded earplugs.
- **Preformed or molded earplugs.** Sometimes single-use and disposable, these plugs must be individually fitted by a professional. Nondisposable plugs should be cleaned after each use.
- **Earmuffs.** Earmuffs require a perfect seal around the ear. Glasses, long sideburns, long hair, and facial movements such as chewing may reduce the protective value of earmuffs. You may purchase special earmuffs designed for use with eyeglasses or beards.

If I provide my employees with hearing protection, can they then work in areas with any level of noise for any period of time?

No. Hearing protectors reduce only the amount of noise that gets through to the ears. The amount of this reduction is referred to as attenuation. Attenuation differs according to the type of hearing protection used and how well they fit. The hearing protectors you choose must be capable of achieving the attenuation needed to reduce the employee's noise exposure to within the acceptable limits noted in Table 5. Appendix B of 29 CFR 1910.95, *Occupational Noise Exposure*, describes methods for estimating the attenuation of a particular hearing protector based on the device's noise reduction rating (NRR). Manufacturers of hearing protection devices must report the device's NRR on the product packaging.

Once I have selected equipment to protect my employees' hearing, how do I make sure they use it properly?

Train your employees to use the hearing protection. *Checklist H* will help you train your employees to use and care for the earplugs or earmuffs that you provide.

Checklist H: Use and Care of Hearing Protection

Train your employees to know…

- ☐ Why hearing protection is necessary—i.e., the workplace hazards that threaten their hearing
- ☐ How the earplugs or earmuffs will protect them
- ☐ The limitations of the hearing protection
- ☐ When they must insert or wear the hearing protectors
- ☐ How to adjust earmuff parts for a comfortable and effective fit, or form the earplugs to fit their ears
- ☐ How special earmuffs fit over an employee's corrective lenses
- ☐ How to clean and disinfect the hearing protection

Once I have provided my employees with hearing protection and training in how to use it, how do I know that it is really protecting their hearing?

If your employees are exposed to occupational noise at or above 85 dBA averaged over an 8-hour period, then you must institute a hearing conservation program that includes regular testing of employees' hearing by qualified professionals. The OSHA occupational noise standard, at 29 CFR 1910.95, sets forth the requirements for a hearing conservation program.

You must consider many factors when selecting PPE to protect your employees from workplace hazards. With all of the types of operations that can present hazards and all of the types of PPE available to protect the different parts of a worker's body from specific types of hazards, this selection process can be confusing and at times overwhelming. Because of this, OSHA requires that you implement a PPE program to help you systematically assess the hazards in the workplace and select the appropriate PPE that will protect your workers from those hazards. As part of this PPE program, you must do the following:

- Assess the workplace to identify equipment, operations, chemicals, and other workplace components that could harm your employees.
- Implement engineering controls and work practices to control or eliminate these hazards to the extent feasible.
- Select the appropriate types of PPE to protect your employees from hazards that cannot be eliminated or controlled through engineering controls and work practices.
- Inform your employees why the PPE is necessary and when it must be worn.
- Train your employees how to use and care for the selected PPE and how to recognize PPE deterioration and failure.
- Require your employees to wear the selected PPE in the workplace.

The basic information presented here attempts to establish and illustrate a logical, structured approach to hazard assessment and PPE selection and application for you to use as a starting point for your PPE program.

Safety and Health Program Management Guidelines

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. To assist employers and employees in developing effective safety and health programs, OSHA published recommended *Safety and Health Program Management Guidelines (Federal Register 54 (18): 3908-3916, January 26, 1989)*. These voluntary guidelines apply to all places of employment covered by OSHA.

The guidelines identify four elements that are critical to the development of a successful safety and health management program:

- Management commitment and employee involvement
- Worksite analysis
- Hazard prevention and control
- Safety and health training.

The guidelines recommend specific actions under each of these general elements to achieve an effective safety and health program. A single free copy of the guidelines can be obtained from the U.S. Department of Labor, OSHA/OSHA Publications, P.O. Box 37535, Washington, DC 20013-7535, by sending a self-addressed mailing label with your request. See also **Federal Register** notices on OSHA's Web site at http://www.osha.gov.

State Programs

The *Occupational Safety and Health Act of 1970* encourages states to develop and operate their own job safety and health plans. States with plans approved under section 18(b) of the Act must adopt standards and enforce requirements that are at least as effective as federal requirements. There are currently 25 state-plan states: 23 of these states administer plans covering both private and public (state and local government) employees; the other two states, Connecticut and New York, cover public employees only. Plan states must adopt standards comparable to Federal requirements within six months of a Federal standard's promulgation. Until a state standard is promulgated, Federal OSHA provides interim enforcement assistance, as appropriate, in these states. A listing of approved state plans appears at the end of this publication.

Free On-Site Consultation

Free on-site safety and health consultation services are available in all states to employers who want help in establishing and maintaining a safe and healthful workplace. Primarily developed for smaller employers with more hazardous operations, the OSHA Consultation Service is largely funded by OSHA and is delivered by state governments employing professional safety consultants and health consultants. The full service assistance that is offered includes an appraisal of all mechanical systems, physical work practices, occupational safety and health hazards of the workplace, and all aspects of the employer's present job safety and health program. In addition, the service offers assistance to employers in developing and implementing an effective workplace safety and health program that corrects and continuously addresses safety and health concerns.

This program is completely separate from OSHA's inspection efforts. No penalties are proposed or citations issued for any safety or health problems identified by the consultant. The service is confidential. The employer's name, the firm's name, and any information about the workplace, plus any unsafe or unhealthful working conditions that the consultant uncovers will not be reported routinely to the OSHA inspection staff.

The only obligation is the employer's commitment to correct serious job safety and health hazards in a timely manner. The employer is asked to make this commitment prior to the actual visit.

For more information concerning consultation services, see the list of state consultation projects at the end of this publication.

Voluntary Protection Programs (VPP)

The Voluntary Protection Programs (VPP) are designed to recognize and promote effective safety

and health program management. In the VPP, management, labor, and OSHA establish cooperative relationships at workplaces that have implemented strong programs.

Sites approved for VPP's Star, Merit, and Demonstration programs have met, and must continue to meet, rigorous participation standards. Benefits of VPP participation include improved employee motivation to work safely, leading to better quality and productivity; lost-workday case rates that generally are 60-80 percent below industry averages; reduced workers' compensation and other injury- and illness-related cost; positive community recognition and interaction; further improvement and revitalization of already good safety and health programs; and partnership with OSHA.

A valuable offshoot of the Voluntary Protection Programs is the Mentoring Program operated by the VPP Participants' Association, a private, nonprofit organization that supports the VPP's goals. Worksites that have qualified for participation in the VPP share their experience and expertise with sites that have requested help in developing and implementing effective worker safety and health programs. Information on mentoring can be obtained from the VPP Participants' Association, 7600-E Leesburg Pike, Suite 440, Falls Church, VA 22043, telephone (703) 761-1148.

Voluntary Protection Programs and on-site consultation services, when coupled with an effective enforcement program, expand worker protection to help meet the goals of the OSH Act.

For additional information about the VPP, contact the VPP Manager in your OSHA Regional Office, listed at the end of this publication.

Training and Education

OSHA's area offices offer a variety of information services such as publications, audiovisual aids, technical advice, and speakers for special engagements. OSHA's Training Institute in Des Plaines, IL, provides basic and advanced courses in safety and health for federal and state compliance officers, state consultants, federal agency personnel, and private-sector employers, employees, and their representatives.

The OSHA Training Institute also has established OSHA Training Institute Education Centers to address the increased demand for its courses from the private sector and from other Federal agencies. These centers are nonprofit colleges, universities, and other organizations that have been selected after a competition for participation in the program. They are located in various parts of the United States.

OSHA also provides grants to nonprofit organizations for workplace training and education in subjects where OSHA believes there is a lack of workplace training. Grants are awarded annually, and grant recipients are expected to contribute 20 percent of the total grant cost.

For more information on grants, training, and education, contact the OSHA Training Institute, Office of Training and Education, 1555 Times Drive, Des Plaines, IL 60018, telephone (847) 297-4810.

For further information on any OSHA program, contact your nearest OSHA area or regional office. A list of these offices is at the end of this publication.

Electronic Information

Internet: OSHA standards, interpretations, directives, and additional information are now on the Worldwide Web at http://www.osha.gov/.

CD-ROM: A wide variety of OSHA materials including standards, interpretations, directives, and more can be purchased on CD-ROM from the Government Printing Office. To order, write to the Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. Specify OSHA Regulations, Documents and Technical Information on CD-ROM, (ORDT), S/N 729-013-000000-5. The price is $46.00 per year; single copy $17.00.

Emergencies

For life-threatening situations, call (800) 321-OSHA. Complaints will go immediately to the nearest OSHA area or state office for help.

For further information on any OSHA program, contact your nearest OSHA area or regional office.

Commissioner
Alaska Department of Labor
1111 West 8th Street
Room 304
Juneau, AK 99801-1149
(907) 465-2700

Director
Industrial Commission of Arizona
800 W. Washinagton
Phoenix, AZ 85007-2922
(602) 542-5795

Director
California Department of Industrial Relations
455 Golder Gate Avenue-10th Floor
San Francisco, CA 94102
(415) 703-5050

Commissioner
Connecticut Department of Labor
200 Folly Brook Boulevard
Wethersfield, CT 06109
(203) 566-5123

Director
Hawaii Department of Labor
and Industrial Relations
830 Punchbowl Street
Honolulu, HI 96813
(808) 586-8844

Commissioner
Indiana Department of Labor
State Office Building
402 West Washington Street
Room W195
Indianapolis, IN 46204-2751
(317) 232-2378

Commissioner
Iowa Division of Labor Services
1000 E. Grand Avenue
Des Moines, IA 50319-0209
(515) 281-3447

Secretary
Kentucky Labor Cabinet
1049 U.S. Highway, 127 South, Suite 4
Frankfort, KY 40601
(502) 564-3070

Commissioner
Maryland Division of Labor and Industry
Department of Labor, Licensing,
and Regulation
1100 N. Eutaw Street, Room 613
Baltimore, MD 21201-2206
(410) 767-2215

Director
Michigan Department of Consumer
and Industry Services
P.O. Box 30643
Lansing, MI 48909-8143
(517) 322-1814

Commissioner
Minnesota Department of Labor
and Industry
443 Lafayette Road
St. Paul, MN 55155-4307
(651) 296-2342

Director
Nevada Division of Industrial Relations
400 West King Street
Carson City, NV 89710
(751) 687-3032

Secretary
New Mexico Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
(505) 827-2850

Commissioner
New York Department of Labor
W. Averell Harriman State Office
Building - 12, Room 500
Albany, NY 12240
(518) 457-2741

Commissioner
North Carolina Department of Labor
4 West Edenton Street
Raleigh, NC 27601-1092
(919) 807-7166

Administrator
Department of Consumer & Business Services
Occupational Safety and Health Division (OR-OSHA)
350 Winter Street, NE, Room 430
Salem, OR 97310-0220
(503) 378-3272

Secretary
Puerto Rico Department of Labor and Human Resources
Prudencio Rivera Martinez Building
505 Munoz Rivera Avenue
Hato Rey, PR 00918
(809) 754-2119

Commissioner
South Carolina Department of Labor, Licensing, and Regulation
Koger Office Park, Kingstree Building
110 Centerview Drive
P.O. Box 11329
Columbia, SC 29210
(803) 896-4300

Commissioner
Tennessee Department of Labor
710 James Robertson Parkway
Nashville, TN 37243-0659
(615) 741-2582

Commissioner
Labor Commission of Utah
160 East 300 South, 3rd Floor
P.O. Box 146650
Salt Lake City, UT 84114-6650
(801) 530-6898

Commissioner
Vermont Department of Labor and Industry
National Life Building - Drawer 20
National Life Drive
Montpelier, VT 05620-3401
(802) 828-5098

Commissioner
Virginia Department of Labor and Industry
Powers-Taylor Building
13 South 13th Street
Richmond, VA 23219
(804) 786-2377

Commissioner
Virgin Islands Department of Labor
2203 Church Street
Christiansted St. Croix, VI 00820-4660
(340) 773-1994

Director
Washington Department of Labor and Industries
P.O. Box 44001
Olympia, WA 98504-4001
(360) 902-4200

Administrator
Worker's Safety and Compensation Division (WSC)
Wyoming Department of Employment
Herschler Building, 2nd Floor East
122 West 25th Street
Cheyenne, WY 82002
(307) 777-7786

Alabama (Region IV)
Safe State Program
University of Alabama
425 Martha Parham West
P.O. Box 870388
Tuscaloosa, AL 35487
(205) 348-3033

Alaska (Region X)
Consultation Section
ADOL/OSHA
3301 Eagle Street
P.O. Box 107022
Anchorage, AK 99510
(907) 269-4957

Arizona (Region IX)
Consultation and Training
Division of Occupational Safety & Health
Industrial Commission of Arizona
800 West Washington
Phoenix, AZ 85007-9070
(602) 542-1695

Arkansas (Region VI)
OSHA Consultation
Arkansas Department of Labor
10421 West Markham
Little Rock, AK 72205
(501) 682-4522

California (Region IX)
CAL/OSHA Consultation Service
Department of Industrial Relations
455 Golden Gate Avenue, 10th Floor
San Francisco, CA 94102
(415) 972-5270

Colorado (Region VIII)
Occupational Safety & Health Section
Colorado State University
115 Environmental Health Building
Fort Collins, CO 80523
(970) 491-6151

Connecticut (Region I)
Division of Occupational Safety & Health
Connecticut Department of Labor
38 Wolcott Hill Road
Wethersfield, CT 06109
(860) 566-4550

Delaware (Region III)
Occupational Safety and Health
Division of Industrial Affairs
Delaware Department of Labor
4425 Market Street
Wilmington, DE 19802
(302) 761-8219

District of Columbia (Region III)
Office of Occupational Safety and Health
D. C. Department of Employment Services
950 Upshur Street, N.W.
Washington, DC 20011
(202) 576-6339

Florida (Region IV)
7(c)(1) Onsite Consultation Program
Division of Safety
Florida Department of Labor
& Employment Security
2002 St. Augustine Road
Building E, Suite 45
Tallahassee, FL 32399-0663
(850) 922-8955

Georgia (Region IV)
7(c)(1) Onsite Consultation Program
Georgia Institute of Technology
151 6th Street, NW
O'Keefe Building, Room 22
Atlanta, GA 30332-0837
(404) 894-2643

Guam (Region IX)
OSHA Onsite Consultation
Department of Labor, Government of Guam
107 F Street
Tiyam, GU 96931
(671) 475-0136

Hawaii (Region IX)
Consultation and Training Branch
Department of Labor and Industrial Relations
830 Punchbowl Street
Honolulu, HI 96813
(808) 586-9100

Idaho (Region X)
Safety and Health Consultation Program
Boise State University
Department of Health Studies
1910 University Drive
Boise, ID 83725
(208) 426-3283

Illinois (Region V)
Illinois Onsite Consultation
Industrial Service Division
Department of Commerce & Community Affairs
State of Illinois Center
Suite 3-400
100 West Randolph Street
Chicago, IL 60601
(312) 814-2337

Indiana (Region V)
Division of Labor
Bureau of Safety, Education, and Training
Room W195
402 West Washington
Indianapolis, IN 46204-2287
(317) 232-2688

Iowa (Region VII)
7(c)(1) Consultation Program
Iowa Bureau of Labor
2016 DMACC Boulevard
Building17, Room 10
Ankeny, IA 50021
(515) 281-5352

Kansas (Region VII)
Kansas 7(c)(1) Consultation Program
Kansas Department of Human Resources
512 South West 6th Street
Topeka, KS 66603-3150
(785) 296-7476

Kentucky (Region IV)
Division of Education and Training
Kentucky Labor Cabinet
1047 U.S. Highway 127, South
Frankfort, KY 40601
(502) 564-6895

Louisiana (Region VI)
7(c)(1) Consultation Program
Louisiana Department of Labor
1001 N. 23rd Street, Room 230
P.O. Box 94094
Baton Rouge, LA 70804-9094
(504) 342-9601

Maine (Region I)
Division of Industrial Safety
Maine Bureau of Labor Standards
Division of Industrial Safety
State House Station #45
Augusta, ME 04333-0045
(207) 624-6460

Maryland (Region III)
MOSH Consultation Services
312 Marshall Avenue, Room 600
Laurel, MD 20707
(410) 880-4970

Massachusetts (Region I)
Division of Occupational Safety and Health
Department of Workforce Development
1001 Watertown Street
West Newton, MA 02165
(617) 727-3982

Michigan (Health) (Region V)
Divison of Occupational Health
7150 Harris Drive
P.O. Box 30649
Lansing, MI 48909
(517) 322-6823

Michigan (Safety) (Region V)
Department of Consumer and
Industry Services
7150 Harris Drive
Lansing, MI 48909
(517) 322-1809

Minnesota (Region V)
Department of Labor and Industry
Conultation Divison
433 LaFayette Road
Saint Paul, MN 55155
(612) 297-2393

Mississippi (Region IV)
Mississippi State University
Center for Safety and Health
2906 North State Street
Sutie 201
Jackson, MS 39216
(601) 987-3981

Missouri (Region VII)
Onsite Consultation Program
Division of Labor Standards
Department of Labor and Industrial Relations
3315 West Truman Boulevard
P.O. Box 449
Jefferson City, MO 65109
(573) 751-3403

Montana (Region VIII)
Department of Labor and Industry
Bureau of Safety
P.O. Box 1728
Helena, MT 59624-1728
(406) 444-6418

Nebraska (Region VII)
Division of Safety and Labor Standards
Nebraska Department of Labor
State Office Building, Lower level
301 Centennial Mall, South
Lincoln, NE 68509-5024
(402) 471-4717

Nevada (Region IX)
Safety Consultation and Training Section
Division of Industrial Relations
Department of Business and Industry
1301 Green Valley Parkway
Henderson, NV 89014
(702) 486-9140

New Hampshire (Region I)
New Hampshire Department of Health
and Human Services
6 Hazen Drive
Concord, NH 03301-6527
(603) 271-2024

New Jersey (Region II)
New Jersey Department of Labor
Division of Public Safety and
Occupational Safety and Health
255 E. State Street, 8th Floor West
P.O. Box 953
Trenton, NJ 08625-0953
(609) 292-3923

New Mexico (Region VI)
New Mexico Environment Department
Occupational Health and Safety Bureau
525 Camino de los Marquez, Suite 3
P.O. Box 26110
Santa Fe, NM 87502
(505) 827-4230

New York (Region II)
Division of Safety and Health
State Office Campus
Building 12, Room 130
Albany, NY 12240
(518) 457-2238

North Carolina (Region IV)
Bureau of Consultative Services
North Carolina Department of Labor
4 West Edenton Street
Raleigh, NC 27603-1092
(919) 807-2905

North Dakota (Region VIII)
Division of Environmental Engineering
Room 304
1200 Missouri Avenue
Bismarck, ND 58504
(701) 328-5188

Ohio (Region V)
Division of Onsite Consultation
Bureau of Employment Services
145 S. Front Street
Columbus, OH 43215
(614) 644-2246

Oklahoma (Region VI)
Oklahoma Department of Labor
OSHA Division
4001 North Lincoln Boulevard
Oklahoma City, OK 73105-5212
(405) 528-1500

Oregon (Region X)
Oregon OSHA
Department of Consumer and
Business Services
350 Winter Street, N.E., Room 430
Salem, OR 97310
(503) 378-3272

Pennsylvania (Region III)
Indiana University of Pennsylvania
Room 210 Walsh Hall
302 East Walk
Indiana, PA 15705-1087
(412) 357-2396

Puerto Rico (Region II)
Occupational Safety and Health Office
Department of Labor and Human Resources
21st Floor
505 Munoz Rivera Avenue
Hato Rey, PR 00918
(787) 754-2171

Rhode Island (Region I)
OSH Consultation Program
Division of Occupational Health and
Radiation Control
Rhode Island Department of Health
3 Capital Hill
Providence, RI 02908
(401) 277-2438

South Carolina (Region IV)
South Carolina Department of Labor, Licensing
and Regulation
3600 Forest Drive
P.O. Box 11329
Columbia, SC 29204
(803) 734-9614

South Dakota (Region VIII)
Engineering Extension
OnsiteTechnical Program
South Dakota State University
West Hall, Box 510
907 Harvey Dunn Street
Brookings, SD 57007
(605) 688-4101

Tennessee (Region IV)
OSHA Consultative Services Division
Tennessee Department of Labor
3rd Floor
710 James Robertson Parkway
Nashville, TN 37243-0659
(615) 741-7036

Texas (Region VI)
Workers' Health and Safety Division
Workers' Compensation Commission
Southfield Building
4000 South I H 35
Austin, TX 78704
(512) 440-4640

Utah (Region VIII)
Utah Labor Commission
Workplace Safety and Health
Consultation Services
160 East 300 South
Salt Lake City, UT 84114-6650
(801) 530-6901

Vermont (Region I)
Division of Occupational Safety and Health
Vermont Department of Labor and Industry
National Life Building, Drawer #20
Montpelier, VT 05602-3401
(802) 828-2765

Virginia (Region III)
Virginia Department of Labor and Industry
Occupational Safety and Health Training
and Consultation
13 South 13th Street
Richmond, VA 23219
(804) 786-6359

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Virgin Islands Department of Labor
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Christiansted
St. Croix, VI 00840
(340) 772-1315

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Olympia, WA 98504
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(304) 558-7890

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Division of Public Health
Section of Occupational Health
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Madison, WI 53703
(608) 266-8579

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Technology Development
Bureau of Manufacturing and Assessment
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Suite B100
Waukesha, WI 53188-1125
(414) 523-3040

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Workers' Safety and Compensation Division
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122 West 25th Street
Cheyenne, WY 82002
(307) 777-7786

Consultation Training Coordinator
OSHA Training Institute
1555 Times Drive
Des Plaines, IL 60018
(847) 297-4810

Laboratory Services Agreement
Wisconsin Occupational Health Lab
979 Jonathan Drive
Madison, WI 53713
(608) 263-8807

New York Public Sector Consultation Project
New York State Department of Labor
Building #12
State Building Campus
Albany, NY 12240
(518) 457-3518

Director of Consultation Support Services
University of Alabama
College of Continuing Studies
425 Martha Parham West
P.O. Box 870388
Tuscaloosa, AL 35487-0388
(205) 348-4585

US Department of Labor - OSHA
2047 Canyon Road - Todd Mall
Birmingham, AL 35216-1981
Telephone: (205) 731-1534

US Department of Labor - OSHA
3737 Government Blvd., Suite 100
Mobile, AL 36693-4309
Telephone: (334) 441-6131

US Department of Labor - OSHA
301 W. Northern Lights Blvd.
Suite 407
Anchorage, AK 99503-7571
Telephone: (907) 271-5152

US Department of Labor - OSHA
3221 North 16th Street, Suite 100
Phoenix, AZ 85016
Telephone: (602) 640-2007

US Department of Labor - OSHA
425 West Capitol
Suite 450
Little Rock, AR 72201
Telephone: (501) 324-6291

US Department of Labor - OSHA
5675 Ruffin Road, Suite 330
San Diego, CA 92123
Telephone: (619) 557-2909

US Department of Labor - OSHA
101 El Camino Plaza, Suite 105
San Francisco, CA 95815
Telephone: (916) 566-7470

US Department of Labor - OSHA
1391 North Speer Boulevard
Suite 210
Denver, CO 80204-2552
Telephone: (303) 844-5285

US Department of Labor - OSHA
7935 E. Prentice Avenue, Suite 209
Englewood, CO 80111-2714
Telephone: (303) 843-4500

US Department of Labor - OSHA
Clark Building
1057 Broad Street
Bridgeport, CT 06604
Telephone: (203) 579-5581

US Department of Labor - OSHA
Federal Office Building
450 Main Street, Room 613
Hartford, CT 06103
Telephone: (203) 240-3152

US Department of Labor - OSHA
1 Rodney Square
920 King Street, Suite 402
Wilmington, DE 19801-3319
(302) 573-6115

US Department of Labor - OSHA
8040 Peters Road
Building H-100
Fort Lauderdale, FL 33324
Telephone: (954) 424-0242

US Department of Labor - OSHA
Ribault Building
1851 Executive Center Drive
Suite 227
Jacksonville, FL 32207
Telephone: (904) 232-2895

US Department of Labor - OSHA
5807 Breckenridge Parkway
Suite A
Tampa, FL 33610-4249
Telephone: (813) 626-1177

US Department of Labor - OSHA
450 Mall Boulevard, Suite J
Savannah, GA 31406
Telephone: (912) 652-4393

US Department of Labor - OSHA
2400 Herodian Way, Suite 250
Smyrna, GA 30080-2968
Telephone: (770) 984-8700

US Department of Labor - OSHA
Building 7, Suite 110
2183 N. Lake Parkway
La Vista Perimeter Office Park
Tucker, GA 30084-4154
Telephone: (770) 493-6644

US Department of Labor - OSHA
300 Ala Moana Boulevard, Suite 5146
Honolulu, HI 96850
Telephone: (808) 541-2685

US Department of Labor - OSHA
1150 N. Curtis Road
Suite 201
Boise, ID 83706
Telephone: (208) 321-2960

US Department of Labor - OSHA
1600 167th Street, Suite 12
Calumet City, IL 60409
Telephone: (708) 891-3800

US Department of Labor - OSHA
2360 E. Devon Avenue
Suite 1010
Des Plaines, IL 60018
Telephone: (847) 803-4800

US Department of Labor - OSHA
11 Executive Drive, Suite 11
Fairview Heights, IL 62208
Telephone: (618) 632-8612

US Department of Labor - OSHA
344 Smoke Tree Business Park
North Aurora, IL 60542
Telephone: (630) 896-8700

US Department of Labor - OSHA
2918 West Willow Knolls Road
Peoria, IL 61614
Telephone: (309) 671-7033

US Department of Labor - OSHA
46 East Ohio Street, Room 423
Indianapolis, IN 46204
Telephone: (317) 226-7290

US Department of Labor - OSHA
210 Walnut Street, Room 815
Des Moines, IA 50309
Telephone: (515) 284-4794

US Department of Labor - OSHA
300 Epic Center
301 N. Main
Wichita, KS 67202
Telephone: (316) 269-6644

US Department of Labor - OSHA
John C. Watts Federal Building, Room 108
330 W. Broadway
Frankfort, KY 40601-1922
Telephone: (502) 227-7024

US Department of Labor - OSHA
9100 Bluebonnet Centre Boulevard
Suite 201
Baton Rouge, LA 70809
Telephone: (225) 389-0474

US Department of Labor - OSHA
40 Western Avenue, Room 608
Augusta, ME 04330
Telephone: (207) 622-8417

US Department of Labor - OSHA
U.S. Federal Building
202 Harlow Street
Room 211
Bangor, ME 04401
Telephone: (207) 941-8177

US Department of Labor - OSHA
1099 Winterson Road, Suite 140
Linthicum, MD 21090-2218
Telephone: (410) 865-2055

US Department of Labor - OSHA
639 Granite Street, 4th Floor
Braintree, MA 02184
Telephone: (617) 565-6924

US Department of Labor - OSHA
Valley Office Park
13 Branch Street
Methuen, MA 01844
Telephone: (617) 565-8110

US Department of Labor - OSHA
1145 Main Street, Room 550
Springfield, MA 01103-1493
Telephone: (413) 785-0123

US Department of Labor - OSHA
801 South Waverly Road
Suite 306
Lansing, MI 48917-4200
Telephone: (517) 377-1892

US Department of Labor - OSHA
300 South 4th Street, Room 1205
Minneapolis, MN 55415
Telephone: (612) 664-5460

US Department of Labor - OSHA
3780 I-55 North
Suite 210
Jackson, MS 39211-6323
Telephone: (601) 965-4606

US Department of Labor - OSHA
6200 Connecticut Avenue, Suite 100
Kansas City, MO 64120
Telephone: (816) 483-9531

US Department of Labor - OSHA
911 Washington Avenue
Room 420
St. Louis, MO 63101
Telephone: (314) 425-4249

US Department of Labor - OSHA
2900 4th Avenue North, Suite 303
Billings, MT 59101
Telephone: (406) 247-7494

US Department of Labor - OSHA
Overland Wolf Building, Room 100
6910 Pacific Street
Omaha, NE 68106
Telephone: (402) 221-3182

US Department of Labor - OSHA
705 North Plaza, Room 204
Carson City, NV 89701
Telephone: (702) 885-6963

US Department of Labor - OSHA
279 Pleasant Street, Suite 201
Concord, NH 03301
Telephone: (603) 225-1629

US Department of Labor - OSHA
1030 Saint Georges Avenue
Plaza 35, Suite 205
Avenel, NJ 07001
Telephone: (732) 750-3270

US Department of Labor - OSHA
500 Route 17 South, 2nd Floor
Hasbrouck Heights, NJ 07604
Telephone: (201) 288-1700

US Department of Labor - OSHA
Marlton Executive Park
701 Route 73 South Building 2
Suite 120
Marlton, NJ 08053
Telephone: (609) 757-5181

US Department of Labor - OSHA
299 Cherry Hill Road, Suite 304
Parsippany, NJ 07054
Telephone: (973) 263-1003

US Department of Labor - OSHA
505 Marquette Avenue, NW
Suite 820
Alburquerque, NM 87102
Telephone: (505) 248-5302

US Department of Labor - OSHA
401 New Karner Road
Suite 300
Albany, NY 12205-3809
Telephone: (518) 464-4338

US Department of Labor - OSHA
42-40 Bell Boulevard
Bayside, NY 11361
Telephone: (718) 279-9060

US Department of Labor - OSHA
5360 Genesee Street
Bowmansville, NY 14026
Telephone: (716) 684-3891

US Department of Labor - OSHA
6 World Trade Center, Room 881
New York, NY 10048
Telephone: (212) 466-2482

US Department of Labor - OSHA
3300 Vikery Road
North Syracuse, NY 13212
Telephone: (315) 451-0808

US Department of Labor - OSHA
660 White Plains Road
4th Floor
Tarrytown, NY 10591-5107
Telephone: (914) 524-7510

US Department of Labor - OSHA
1400 Old Court Road, Room 208
Westbury, NY 11590
Telephone: (516) 334-3344

US Department of Labor - OSHA
Century Station, Room 438
300 Fayetteville Street Mall
Raleigh, NC 27601-9998
Telephone: (919) 856-4770

US Department of Labor - OSHA
1640 East Capitol Avenue
Bismarck, ND 58501
Telephone: (701) 250-4521

US Department of Labor - OSHA
36 Triangle Park Drive
Cincinnati, OH 45246
Telephone: (513) 841-4132

US Department of Labor - OSHA
Federal Office Building, Room 899
1240 East Ninth Street
Cleveland, OH 44199
Telephone: (216) 522-3818

US Department of Labor - OSHA
Federal Office Building, Room 620
200 N. High Street
Columbus, OH 43215
Telephone: (614) 469-5582

US Department of Labor - OSHA
Federal Office Building, Room 734
234 North Summit Street
Toledo, OH 43604
Telephone: (419) 259-7542

US Department of Labor - OSHA
420 West Main Place, Suite 300
Oklahoma City, OK 73102
Telephone: (405) 231-5351

US Department of Labor - OSHA
1220 S.W. Third Avenue, Room 640
Portland, OR 97204
Telephone: (503) 326-2251

US Department of Labor - OSHA
850 N. 5th Street
Allentown, PA 18102
Telephone: (610) 776-0592

US Department of Labor - OSHA
3939 West Ridge Road
Suite B-12
Erie, PA 16506-1887
Telephone: (814) 833-5758

US Department of Labor - OSHA
Progress Plaza
49 N. Progress Avenue
Harrisburg, PA 17109
Telephone: (717) 782-3902

US Department of Labor - OSHA
U.S. Custom House, Room 242
Second and Chestnut Street
Philadelphia, PA 19106-2902
Telephone: (215) 597-4955

US Department of Labor - OSHA
Federal Building, Room 1428
1000 Liberty Avenue
Pittsburgh, PA 15222-4101
Telephone: (412) 395-4903

US Department of Labor - OSHA
Penn Place, Room 2005
20 North Pennsylvania Avenue
Wilkes-Barre, PA 18701-3590
Telephone: (717) 826-6538

US Department of Labor - OSHA
BBV Plaza Building
1510 F.D. Roosevelt Avenue
Guaynabo, PR 00968
Telephone: (787) 277-1560

US Department of Labor - OSHA
380 Westminster Mall, Room 243
Providence, RI 02903
Telephone: (401) 528-4669

US Department of Labor - OSHA
1835 Assembly Street, Room 1468
Columbia, SC 29201-2453
Telephone: (803) 765-5904

US Department of Labor - OSHA
2002 Richard Jones Road
Suite C-205
Nashville, TN 37215-2809
Telephone: (615) 781-5423

US Department of Labor - OSHA
903 San Jacinto Boulevard
Suite 319
Austin, TX 78701
Telephone: (512) 916-5783

US Department of Labor - OSHA
Wilson Plaza
606 N. Carancahua, Suite 700
Corpus Christi, TX 78476
Telephone: (512) 888-3420

US Department of Labor - OSHA
8344 East R.L. Thornton Freeway
Suite 420
Dallas, TX 75228
Telephone: (214) 320-2400

US Department of Labor - OSHA
North Star 2 Building
Suite 302
8713 Airport Freeway
Fort Worth, TX 76180-7610
Telephone: (817) 428-2470

US Department of Labor - OSHA
17625 El Camino Real, Suite 400
Houston, TX 77058
Telephone: (281) 286-0583

US Department of Labor - OSHA
350 North Sam Houston Parkway East
Suite 120
Houston, TX 77060
Telephone: (281) 591-2438

US Department of Labor - OSHA
Federal Building, Room 806
1205 Texas Avenue
Lubbock, TX 79401
Telephone: (806) 472-7681

US Department of Labor - OSHA
1781 South 300 West
Salt Lake City, UT 84115-1802
Telephone: (801) 487-0680

US Department of Labor - OSHA
AFOB, Room 835
200 Granby Mall
Norfolk, VA 23510
Telephone: (757) 441-3820

US Department of Labor - OSHA
505 106th Ave, N.E., Suite 302
Bellevue, WA 98004
Telephone: (360) 553-7520

US Department of Labor - OSHA
405 Capitol Street, Suite 407
Charleston, WV 25301
Telephone: (304) 347-5937

US Department of Labor - OSHA
2618 North Ballard Road
Appleton, WI 54911-8664
Telephone: (920) 734-4521

US Department of Labor - OSHA
Federal Building U.S. Courthouse
500 Barstow Street, Room B-9
Eau Claire, WI 54701
Telephone: (715) 832-9019

US Department of Labor - OSHA
4802 East Broadway
Madison, WI 53716
Telephone: (608) 264-5388

US Department of Labor - OSHA
Henry S. Reuss Building
Suite 1180
310 West Wisconsin Avenue
Milwaukee, WI 53202
Telephone: (414) 297-3315

If you are unable to contact your local OSHA Area Office, you may contact the appropriate OSHA Regional Office for information and/or assistance.

Region I
(CT,* MA, ME, NH, RI, VT*)
JFK Federal Building
RME-340
Boston, MA 02203
Telephone: (617) 565-9860

Region II
(NJ, NY,* PR,* VI*)
201 Varick Street
Room 670
New York, NY 10014
Telephone: (212) 337-2378

Region III
(DC, DE, MD,* PA, VA,* WV)
The Curtis Center - Suite 740 West
170 S. Independence Mall West
Philadelphia, PA 19106-3309
Telephone: (215) 861-4900

Region IV
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Atlanta Federal Center
61 Forsyth Street, SW
Room 6T50
Atlanta, GA 30303
Telephone: (404) 562-2300

Region V
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230 South Dearborn Street
Room 3244
Chicago, IL 60604
Telephone: (312) 353-2220

Region VI
(AR, LA, NM,* OK, TX)
525 Griffin Street
Room 602
Dallas, TX 75202
Telephone: (214) 767-4731

Region VII
(IA,* KS, MO, NE)
City Center Square
1100 Main Street, Suite 800
Kansas City, MO 64105
Telephone: (816) 426-5861

Region VIII
(CO, MT, ND, SD, UT,* WY*)
1999 Broadway, Suite 1690
Denver, CO 80202-5716
Telephone: (303) 844-1600

Region IX
(American Samoa, AZ,* CA,* Guam, HI,* NV,* Trust Territories of the Pacific)
71 Stevenson Street
4th Floor
San Francisco, CA 94105
Telephone: (415) 975-4310

Region X
(AK,* ID, OR,* WA*)
1111 Third Avenue
Suite 715
Seattle, WA 98101-3212
Telephone: (206) 553-5930

**These states and territories operate their own OSHA-approved job safety and health programs (Connecticut and New York plans cover public employees only). States with approved programs must have a standard that is identical to, or at least as effective as, the federal standard.*

OSHA
Occupational
Safety and Health
Administration

www.osha.gov

Personal Protective Equipment

OSHA 3151-12R 2003

This informational booklet provides a general overview of a particular topic related to OSHA standards. It does not alter or determine compliance responsibilities in OSHA standards or the *Occupational Safety and Health Act of 1970*. Because interpretations and enforcement policy may change over time, you should consult current OSHA administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the Courts for additional guidance on OSHA compliance requirements.

This information is available to sensory impaired individuals upon request.
Voice phone: (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

Personal Protective Equipment

U.S. Department of Labor

Occupational Safety and Health Administration

OSHA 3151-12R
2003

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Introduction

Hazards exist in every workplace in many different forms: sharp edges, falling objects, flying sparks, chemicals, noise and a myriad of other potentially dangerous situations. The Occupational Safety and Health Administration (OSHA) requires that employers protect their employees from workplace hazards that can cause injury.

Controlling a hazard at its source is the best way to protect employees. Depending on the hazard or workplace conditions, OSHA recommends the use of engineering or work practice controls to manage or eliminate hazards to the greatest extent possible. For example, building a barrier between the hazard and the employees is an engineering control; changing the way in which employees perform their work is a work practice control.

When engineering, work practice and administrative controls are not feasible or do not provide sufficient protection, employers must provide personal protective equipment (PPE) to their employees and ensure its use. Personal protective equipment, commonly referred to as "PPE", is equipment worn to minimize exposure to a variety of hazards. Examples of PPE include such items as gloves, foot and eye protection, protective hearing devices (earplugs, muffs) hard hats, respirators and full body suits.

This guide will help both employers and employees do the following:

- Understand the types of PPE.
- Know the basics of conducting a "hazard assessment" of the workplace.
- Select appropriate PPE for a variety of circumstances.
- Understand what kind of training is needed in the proper use and care of PPE.

The information in this guide is general in nature and does not address all workplace hazards or PPE requirements. The information, methods and procedures in this guide are based on the OSHA requirements for PPE as set forth in the Code of Federal Regulations (CFR) at 29 CFR 1910.132 (General requirements); 29 CFR 1910.133 (Eye and face protection); 29 CFR 1910.135 (Head protection); 29 CFR 1910.136 (Foot protection); 29 CFR 1910. 137 (Electrical protective equipment); 29 CFR 1910.138 (Hand protection); and regulations that cover the construction industry, at

29 CFR 1926.95 (Criteria for personal protective equipment); 29 CFR 1926.96 (Occupational foot protection); 29 CFR 1926.100 (Head protection); 29 CFR 1926.101 (Hearing protection); and 29 CFR 1926.102 (Eye and face protection); and for the maritime industry at 29 CFR 1915.152 (General requirements); 29 CFR 1915.153 (Eye and face protection); 29 CFR 1915.155 (Head protection); 29 CFR 1915.156 (Foot protection); and 29 CFR 1915.157 (Hand and body protection).

This guide does not address PPE requirements related to respiratory protection (29 CFR 1910.134) as this information is covered in detail in OSHA Publication 3079, "Respiratory Protection". There is a brief discussion of hearing protection in this publication but users should refer to OSHA Publication 3074, "Hearing Conservation" for more detailed information on the requirements to protect employees' hearing in the workplace.

The Requirement for PPE

To ensure the greatest possible protection for employees in the workplace, the cooperative efforts of both employers and employees will help in establishing and maintaining a safe and healthful work environment.

In general, employers are responsible for:

- Performing a "hazard assessment" of the workplace to identify and control physical and health hazards.
- Identifying and providing appropriate PPE for employees.
- Training employees in the use and care of the PPE.
- Maintaining PPE, including replacing worn or damaged PPE.
- Periodically reviewing, updating and evaluating the effectiveness of the PPE program.

In general, employees should:

- Properly wear PPE,
- Attend training sessions on PPE,
- Care for, clean and maintain PPE, and
- Inform a supervisor of the need to repair or replace PPE.

Specific requirements for PPE are presented in many different OSHA standards, published in 29 CFR. Some standards require that employers provide PPE at no cost to the employee while others simply state that the employer must provide PPE. Appendix A at page 40 lists those standards that require the employer to provide PPE and those that require the employer to provide PPE at no cost to the employee.

The Hazard Assessment

A first critical step in developing a comprehensive safety and health program is to identify physical and health hazards in the workplace. This process is known as a "hazard assessment." Potential hazards may be physical or health-related and a comprehensive hazard assessment should identify hazards in both categories. Examples of physical hazards include moving objects, fluctuating temperatures, high intensity lighting, rolling or pinching objects, electrical connections and sharp edges. Examples of health hazards include overexposure to harmful dusts, chemicals or radiation.

The hazard assessment should begin with a walk-through survey of the facility to develop a list of potential hazards in the following basic hazard categories:

- Impact,
- Penetration,
- Compression (roll-over),
- Chemical,
- Heat/cold,
- Harmful dust,
- Light (optical) radiation, and
- Biologic.

In addition to noting the basic layout of the facility and reviewing any history of occupational illnesses or injuries, things to look for during the walk-through survey include:

- Sources of electricity.
- Sources of motion such as machines or processes where

movement may exist that could result in an impact between personnel and equipment.

- Sources of high temperatures that could result in burns, eye injuries or fire.
- Types of chemicals used in the workplace.
- Sources of harmful dusts.
- Sources of light radiation, such as welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc.
- The potential for falling or dropping objects.
- Sharp objects that could poke, cut, stab or puncture.
- Biologic hazards such as blood or other potentially infected material.

When the walk-through is complete, the employer should organize and analyze the data so that it may be efficiently used in determining the proper types of PPE required at the worksite. The employer should become aware of the different types of PPE available and the levels of protection offered. It is definitely a good idea to select PPE that will provide a level of protection greater than the minimum required to protect employees from hazards.

The workplace should be periodically reassessed for any changes in conditions, equipment or operating procedures that could affect occupational hazards. This periodic reassessment should also include a review of injury and illness records to spot any trends or areas of concern and taking appropriate corrective action. The suitability of existing PPE, including an evaluation of its condition and age, should be included in the reassessment.

Documentation of the hazard assessment is required through a written certification that includes the following information:

- Identification of the workplace evaluated;
- Name of the person conducting the assessment;
- Date of the assessment; and
- Identification of the document certifying completion of the hazard assessment.

Selecting PPE

All PPE clothing and equipment should be of safe design and construction, and should be maintained in a clean and reliable fashion. Employers should take the fit and comfort of PPE into consideration when selecting appropriate items for their workplace. PPE that fits well and is comfortable to wear will encourage employee use of PPE. Most protective devices are available in multiple sizes and care should be taken to select the proper size for each employee. If several different types of PPE are worn together, make sure they are compatible. If PPE does not fit properly, it can make the difference between being safely covered or dangerously exposed. It may not provide the level of protection desired and may discourage employee use.

OSHA requires that many categories of PPE meet or be equivalent to standards developed by the American National Standards Institute (ANSI). ANSI has been preparing safety standards since the 1920s, when the first safety standard was approved to protect the heads and eyes of industrial workers. Employers who need to provide PPE in the categories listed below must make certain that any new equipment procured meets the cited ANSI standard. Existing PPE stocks must meet the ANSI standard in effect at the time of its manufacture or provide protection equivalent to PPE manufactured to the ANSI criteria. Employers should inform employees who provide their own PPE of the employer's selection decisions and ensure that any employee-owned PPE used in the workplace conforms to the employer's criteria, based on the hazard assessment, OSHA requirements and ANSI standards. OSHA requires PPE to meet the following ANSI standards:

- Eye and Face Protection: ANSI Z87.1-1989 (USA Standard for Occupational and Educational Eye and Face Protection).
- Head Protection: ANSI Z89.1-1986.
- Foot Protection: ANSI Z41.1-1991.

For hand protection, there is no ANSI standard for gloves but OSHA recommends that selection be based upon the tasks to be performed and the performance and construction characteristics of the glove material. For protection against chemicals, glove selection

must be based on the chemicals encountered, the chemical resistance and the physical properties of the glove material.

Training Employees in the Proper Use of PPE

Employers are required to train each employee who must use PPE. Employees must be trained to know at least the following:

- When PPE is necessary.
- What PPE is necessary.
- How to properly put on, take off, adjust and wear the PPE.
- The limitations of the PPE.
- Proper care, maintenance, useful life and disposal of PPE.

Employers should make sure that each employee demonstrates an understanding of the PPE training as well as the ability to properly wear and use PPE before they are allowed to perform work requiring the use of the PPE. If an employer believes that a previously trained employee is not demonstrating the proper understanding and skill level in the use of PPE, that employee should receive retraining. Other situations that require additional or retraining of employees include the following circumstances: changes in the workplace or in the type of required PPE that make prior training obsolete.

The employer must document the training of each employee required to wear or use PPE by preparing a certification containing the name of each employee trained, the date of training and a clear identification of the subject of the certification.

Eye and Face Protection

Employees can be exposed to a large number of hazards that pose danger to their eyes and face. OSHA requires employers to ensure that employees have appropriate eye or face protection if they are exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, potentially infected material or potentially harmful light radiation.

Many occupational eye injuries occur because workers are not wearing any eye protection while others result from wearing improper or poorly fitting eye protection. Employers must be sure that their employees wear appropriate eye and face protection and that the selected form of protection is appropriate to the work being performed and properly fits each worker exposed to the hazard.

Prescription Lenses

Everyday use of prescription corrective lenses will not provide adequate protection against most occupational eye and face hazards, so employers must make sure that employees with corrective lenses either wear eye protection that incorporates the prescription into the design or wear additional eye protection over their prescription lenses. It is important to ensure that the protective eyewear does not disturb the proper positioning of the prescription lenses so that the employee's vision will not be inhibited or limited. Also, employees who wear contact lenses must wear eye or face PPE when working in hazardous conditions.

Eye Protection for Exposed Workers

OSHA suggests that eye protection be routinely considered for use by carpenters, electricians, machinists, mechanics, millwrights, plumbers and pipefitters, sheetmetal workers and tinsmiths, assemblers, sanders, grinding machine operators, sawyers, welders, laborers, chemical process operators and handlers, and timber cutting and logging workers. Employers of workers in other job categories should decide whether there is a need for eye and face PPE through a hazard assessment.

Examples of potential eye or face injuries include:

- Dust, dirt, metal or wood chips entering the eye from activities such as chipping, grinding, sawing, hammering, the use of power tools or even strong wind forces.
- Chemical splashes from corrosive substances, hot liquids, solvents or other hazardous solutions.
- Objects swinging into the eye or face, such as tree limbs, chains, tools or ropes.
- Radiant energy from welding, harmful rays from the use of lasers or other radiant light (as well as heat, glare, sparks, splash and flying particles).

Types of Eye Protection

Selecting the most suitable eye and face protection for employees should take into consideration the following elements:

- Ability to protect against specific workplace hazards.
- Should fit properly and be reasonably comfortable to wear.
- Should provide unrestricted vision and movement.
- Should be durable and cleanable.
- Should allow unrestricted functioning of any other required PPE.

The eye and face protection selected for employee use must clearly identify the manufacturer. Any new eye and face protective devices must comply with ANSI Z87.1-1989 or be at least as effective as this standard requires. Any equipment purchased before this requirement took effect on July 5, 1994, must comply with the earlier ANSI Standard (ANSI Z87.1-1968) or be shown to be equally effective.

An employer may choose to provide one pair of protective eyewear for each position rather than individual eyewear for each employee. If this is done, the employer must make sure that employees disinfect shared protective eyewear after each use. Protective eyewear with corrective lenses may only be used by the employee for whom the corrective prescription was issued and may not be shared among employees.

Some of the most common types of eye and face protection include the following:

- **Safety spectacles.** These protective eyeglasses have safety frames constructed of metal or plastic and impact-resistant lenses. Side shields are available on some models.
- **Goggles.** These are tight-fitting eye protection that completely cover the eyes, eye sockets and the facial area immediately surrounding the eyes and provide protection from impact, dust and splashes. Some goggles will fit over corrective lenses.
- **Welding shields.** Constructed of vulcanized fiber or fiberglass and fitted with a filtered lens, welding shields protect eyes from burns caused by infrared or intense radiant light; they also protect both the eyes and face from flying sparks, metal spatter and slag chips produced during welding, brazing, soldering and

cutting operations. OSHA requires filter lenses to have a shade number appropriate to protect against the specific hazards of the work being performed in order to protect against harmful light radiation.

- **Laser safety goggles.** These specialty goggles protect against intense concentrations of light produced by lasers. The type of laser safety goggles an employer chooses will depend upon the equipment and operating conditions in the workplace.
- **Face shields.** These transparent sheets of plastic extend from the eyebrows to below the chin and across the entire width of the employee's head. Some are polarized for glare protection. Face shields protect against nuisance dusts and potential splashes or sprays of hazardous liquids but will not provide adequate protection against impact hazards. Face shields used in combination with goggles or safety spectacles will provide additional protection against impact hazards.

Each type of protective eyewear is designed to protect against specific hazards. Employers can identify the specific workplace hazards that threaten employees' eyes and faces by completing a hazard assessment as outlined in the earlier section.

Welding Operations

The intense light associated with welding operations can cause serious and sometimes permanent eye damage if operators do not wear proper eye protection. The intensity of light or radiant energy produced by welding, cutting or brazing operations varies according to a number of factors including the task producing the light, the electrode size and the arc current. The following table shows the minimum protective shades for a variety of welding, cutting and brazing operations in general industry and in the shipbuilding industry.

Table 1
Filter Lenses for Protection Against Radiant Energy

Operations	Electrode size in 1/32" (0.8mm)	Arc current	Minimum* protective shade
Shielded metal arc welding	< 3 3 - 5 5 - 8 > 8	< 60 60 - 160 160 - 250 250 - 550	7 8 10 11
Gas metal arc welding and flux cored arc welding		< 60 60 - 160 160 - 250 250 - 500	7 10 10 10
Gas tungsten arc welding		< 50 50 - 150 150 - 500	8 8 10
Air carbon	(light)	< 500	10
Arc cutting	(heavy)	500 - 1,000	11
Plasma arc welding		< 20 20 - 100 100 - 400 400 - 800	6 8 10 11
Plasma arc cutting	(light)** (medium)** (heavy)**	< 300 300 - 400 400 - 800	8 9 10
Torch brazing			3
Torch soldering			2
Carbon arc welding			14

Table 1 (continued)
Filter Lenses for Protection Against Radiant Energy

Operations	Plate thickness inches	Plate thickness mm	Minimum* protective shade
Gas welding: Light	< 1/8	< 3.2	4
Gas welding: Medium	1/8 - 1/2	3.2 - 12.7	5
Gas welding: Heavy	> 1/2	> 12.7	6
Oxygen cutting: Light	< 1	< 25	3
Oxygen cutting: Medium	1 - 6	25 - 150	4
Oxygen cutting: Heavy	> 6	> 150	5

Source: 29 CFR 1910.133(a)(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.

The construction industry has separate requirements for filter lens protective levels for specific types of welding operations, as indicated in the table below:

Table 2
Construction Industry Requirements for Filter Lens Shade Numbers for Protection Against Radiant Energy

Welding Operation	Shade Number
Shielded metal-arc welding 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	10
Gas-shielded arc welding (nonferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	11
Gas-shielded arc welding (ferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	12
Shielded metal-arc welding 3/16-, 7/32-, 1/4-inch diameter electrodes	12
5/16-, 3/8-inch diameter electrodes	14
Atomic hydrogen welding	10 - 14
Carbon-arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 to 6 inches	4 or 5
Heavy cutting, more than 6 inches	5 or 6
Gas welding (light), up to 1/8-inch	4 or 5
Gas welding (medium), 1/8- to 1/2-inch	5 or 6
Gas welding (heavy), more than 1/2-inch	6 or 8

Source: 29 CFR 1926.102(b)(1).

Laser Operations

Laser light radiation can be extremely dangerous to the unprotected eye and direct or reflected beams can cause permanent eye damage. Laser retinal burns can be painless, so it is essential that all personnel in or around laser operations wear appropriate eye protection.

Laser safety goggles should protect for the specific wavelength of the laser and must be of sufficient optical density for the energy involved. Safety goggles intended for use with laser beams must be labeled with the laser wavelengths for which they are intended to be used, the optical density of those wavelengths and the visible light transmission.

The table below lists maximum power or energy densities and appropriate protection levels for optical densities 5 through 8.

Table 3
Selecting Laser Safety Glass

Intensity, CW maximum power density (watts/cm^2)	Attenuation	
	Optical density (O.D.)	Attenuation factor
10^{-2}	5	10^5
10^{-1}	6	10^6
1.0	7	10^7
10.0	8	10^8

Source: 29 CFR 1926.102(b)(2).

Head Protection

Protecting employees from potential head injuries is a key element of any safety program. A head injury can impair an employee for life or it can be fatal. Wearing a safety helmet or hard hat is one of the easiest ways to protect an employee's head from

injury. Hard hats can protect employees from impact and penetration hazards as well as from electrical shock and burn hazards.

Employers must ensure that their employees wear head protection if any of the following apply:

- Objects might fall from above and strike them on the head;
- They might bump their heads against fixed objects, such as exposed pipes or beams; or
- There is a possibility of accidental head contact with electrical hazards.

Some examples of occupations in which employees should be required to wear head protection include construction workers, carpenters, electricians, linemen, plumbers and pipefitters, timber and log cutters, welders, among many others. Whenever there is a danger of objects falling from above, such as working below others who are using tools or working under a conveyor belt, head protection must be worn. Hard hats must be worn with the bill forward to protect employees properly.

In general, protective helmets or hard hats should do the following:

- Resist penetration by objects.
- Absorb the shock of a blow.
- Be water-resistant and slow burning.
- Have clear instructions explaining proper adjustment and replacement of the suspension and headband.

Hard hats must have a hard outer shell and a shock-absorbing lining that incorporates a headband and straps that suspend the shell from 1 to 1 1/4 inches (2.54 cm to 3.18 cm) away from the head. This type of design provides shock absorption during an impact and ventilation during normal wear.

Protective headgear must meet ANSI Standard Z89.1-1986 (Protective Headgear for Industrial Workers) or provide an equivalent level of protection. Helmets purchased before July 5, 1994 must comply with the earlier ANSI Standard (Z89.1-1969) or provide equivalent protection.

Types of Hard Hats

There are many types of hard hats available in the marketplace today. In addition to selecting protective headgear that meets ANSI standard requirements, employers should ensure that employees wear hard hats that provide appropriate protection against potential workplace hazards. It is important for employers to understand all potential hazards when making this selection, including electrical hazards. This can be done through a comprehensive hazard analysis and an awareness of the different types of protective headgear available.

Hard hats are divided into three industrial classes:

- **Class A hard hats** provide impact and penetration resistance along with limited voltage protection (up to 2,200 volts).
- **Class B hard hats** provide the highest level of protection against electrical hazards, with high-voltage shock and burn protection (up to 20,000 volts). They also provide protection from impact and penetration hazards by flying/falling objects.
- **Class C hard hats** provide lightweight comfort and impact protection but offer no protection from electrical hazards.

Another class of protective headgear on the market is called a "bump hat," designed for use in areas with low head clearance. They are recommended for areas where protection is needed from head bumps and lacerations. These are not designed to protect against falling or flying objects and are not ANSI approved. It is essential to check the type of hard hat employees are using to ensure that the equipment provides appropriate protection. Each hat should bear a label inside the shell that lists the manufacturer, the ANSI designation and the class of the hat.

Size and Care Considerations

Head protection that is either too large or too small is inappropriate for use, even if it meets all other requirements. Protective headgear must fit appropriately on the body and for the head size of each individual. Most protective headgear comes in a variety of sizes with adjustable headbands to ensure a proper fit (many adjust in 1/8-inch increments). A proper fit should allow sufficient clearance between the shell and the suspension system for

ventilation and distribution of an impact. The hat should not bind, slip, fall off or irritate the skin.

Some protective headgear allows for the use of various accessories to help employees deal with changing environmental conditions, such as slots for earmuffs, safety glasses, face shields and mounted lights. Optional brims may provide additional protection from the sun and some hats have channels that guide rainwater away from the face. Protective headgear accessories must not compromise the safety elements of the equipment.

Periodic cleaning and inspection will extend the useful life of protective headgear. A daily inspection of the hard hat shell, suspension system and other accessories for holes, cracks, tears or other damage that might compromise the protective value of the hat is essential. Paints, paint thinners and some cleaning agents can weaken the shells of hard hats and may eliminate electrical resistance. Consult the helmet manufacturer for information on the effects of paint and cleaning materials on their hard hats. Never drill holes, paint or apply labels to protective headgear as this may reduce the integrity of the protection. Do not store protective headgear in direct sunlight, such as on the rear window shelf of a car, since sunlight and extreme heat can damage them.

Hard hats with any of the following defects should be removed from service and replaced:

- Perforation, cracking, or deformity of the brim or shell;
- Indication of exposure of the brim or shell to heat, chemicals or ultraviolet light and other radiation (in addition to a loss of surface gloss, such signs include chalking or flaking).

Always replace a hard hat if it sustains an impact, even if damage is not noticeable. Suspension systems are offered as replacement parts and should be replaced when damaged or when excessive wear is noticed. It is not necessary to replace the entire hard hat when deterioration or tears of the suspension systems are noticed.

Foot and Leg Protection

Employees who face possible foot or leg injuries from falling or rolling objects or from crushing or penetrating materials should

wear protective footwear. Also, employees whose work involves exposure to hot substances or corrosive or poisonous materials must have protective gear to cover exposed body parts, including legs and feet. If an employee's feet may be exposed to electrical hazards, non-conductive footwear should be worn. On the other hand, workplace exposure to static electricity may necessitate the use of conductive footwear.

Examples of situations in which an employee should wear foot and/or leg protection include:

- When heavy objects such as barrels or tools might roll onto or fall on the employee's feet;
- Working with sharp objects such as nails or spikes that could pierce the soles or uppers of ordinary shoes;
- Exposure to molten metal that might splash on feet or legs;
- Working on or around hot, wet or slippery surfaces; and
- Working when electrical hazards are present.

Safety footwear must meet ANSI minimum compression and impact performance standards in ANSI Z41-1991 (American National Standard for Personal Protection-Protective Footwear) or provide equivalent protection. Footwear purchased before July 5, 1994, must meet or provide equivalent protection to the earlier ANSI Standard (ANSI Z41.1-1967). All ANSI approved footwear has a protective toe and offers impact and compression protection. But the type and amount of protection is not always the same. Different footwear protects in different ways. Check the product's labeling or consult the manufacturer to make sure the footwear will protect the user from the hazards they face.

Foot and leg protection choices include the following:

- **Leggings** protect the lower legs and feet from heat hazards such as molten metal or welding sparks. Safety snaps allow leggings to be removed quickly.
- **Metatarsal guards** protect the instep area from impact and compression. Made of aluminum, steel, fiber or plastic, these guards may be strapped to the outside of shoes.
- **Toe guards** fit over the toes of regular shoes to protect the toes from impact and compression hazards. They may be made of steel, aluminum or plastic.

- **Combination foot and shin guards** protect the lower legs and feet, and may be used in combination with toe guards when greater protection is needed.
- **Safety shoes** have impact-resistant toes and heat-resistant soles that protect the feet against hot work surfaces common in roofing, paving and hot metal industries. The metal insoles of some safety shoes protect against puncture wounds. Safety shoes may also be designed to be electrically conductive to prevent the buildup of static electricity in areas with the potential for explosive atmospheres or nonconductive to protect workers from workplace electrical hazards.

Special Purpose Shoes

Electrically conductive shoes provide protection against the buildup of static electricity. Employees working in explosive and hazardous locations such as explosives manufacturing facilities or grain elevators must wear conductive shoes to reduce the risk of static electricity buildup on the body that could produce a spark and cause an explosion or fire. Foot powder should not be used in conjunction with protective conductive footwear because it provides insulation, reducing the conductive ability of the shoes. Silk, wool and nylon socks can produce static electricity and should not be worn with conductive footwear. Conductive shoes must be removed when the task requiring their use is completed. Note: Employees exposed to electrical hazards must never wear conductive shoes.

Electrical hazard, safety-toe shoes are nonconductive and will prevent the wearers' feet from completing an electrical circuit to the ground. These shoes can protect against open circuits of up to 600 volts in dry conditions and should be used in conjunction with other insulating equipment and additional precautions to reduce the risk of a worker becoming a path for hazardous electrical energy. The insulating protection of electrical hazard, safety-toe shoes may be compromised if the shoes become wet, the soles are worn through, metal particles become embedded in the sole or heel, or workers touch conductive, grounded items. Note: Nonconductive footwear must not be used in explosive or hazardous locations.

Foundry Shoes

In addition to insulating the feet from the extreme heat of molten metal, foundry shoes keep hot metal from lodging in shoe eyelets, tongues or other shoe parts. These snug-fitting leather or leather-substitute shoes have leather or rubber soles and rubber heels. All foundry shoes must have built-in safety toes.

Care of Protective Footwear

As with all protective equipment, safety footwear should be inspected prior to each use. Shoes and leggings should be checked for wear and tear at reasonable intervals. This includes looking for cracks or holes, separation of materials, broken buckles or laces. The soles of shoes should be checked for pieces of metal or other embedded items that could present electrical or tripping hazards. Employees should follow the manufacturers' recommendations for cleaning and maintenance of protective footwear.

Hand and Arm Protection

If a workplace hazard assessment reveals that employees face potential injury to hands and arms that cannot be eliminated through engineering and work practice controls, employers must ensure that employees wear appropriate protection. Potential hazards include skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, punctures, fractures and amputations. Protective equipment includes gloves, finger guards and arm coverings or elbow-length gloves.

Employers should explore all possible engineering and work practice controls to eliminate hazards and use PPE to provide additional protection against hazards that cannot be completely eliminated through other means. For example, machine guards may eliminate a hazard. Installing a barrier to prevent workers from placing their hands at the point of contact between a table saw blade and the item being cut is another method.

Types of Protective Gloves

There are many types of gloves available today to protect against a wide variety of hazards. The nature of the hazard and the operation involved will affect the selection of gloves. The variety of potential occupational hand injuries makes selecting the right pair of gloves challenging. It is essential that employees use gloves specifically designed for the hazards and tasks found in their workplace because gloves designed for one function may not protect against a different function even though they may appear to be an appropriate protective device.

The following are examples of some factors that may influence the selection of protective gloves for a workplace.

- Type of chemicals handled.
- Nature of contact (total immersion, splash, etc.).
- Duration of contact.
- Area requiring protection (hand only, forearm, arm).
- Grip requirements (dry, wet, oily).
- Thermal protection.
- Size and comfort.
- Abrasion/resistance requirements.

Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:

- Gloves made of leather, canvas or metal mesh;
- Fabric and coated fabric gloves;
- Chemical- and liquid-resistant gloves;
- Insulating rubber gloves (See 29 CFR 1910.137 and the following section on electrical protective equipment for detailed requirements on the selection, use and care of insulating rubber gloves).

Leather, Canvas or Metal Mesh Gloves

Sturdy gloves made from metal mesh, leather or canvas provide protection against cuts and burns. Leather or canvass gloves also protect against sustained heat.

- **Leather gloves** protect against sparks, moderate heat, blows, chips and rough objects.
- **Aluminized gloves** provide reflective and insulating protection against heat and require an insert made of synthetic materials to protect against heat and cold.
- **Aramid fiber gloves** protect against heat and cold, are cut- and abrasive-resistant and wear well.
- **Synthetic gloves** of various materials offer protection against heat and cold, are cut- and abrasive-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.

Fabric and Coated Fabric Gloves

Fabric and coated fabric gloves are made of cotton or other fabric to provide varying degrees of protection.

- **Fabric gloves** protect against dirt, slivers, chafing and abrasions. They do not provide sufficient protection for use with rough, sharp or heavy materials. Adding a plastic coating will strengthen some fabric gloves.
- **Coated fabric gloves** are normally made from cotton flannel with napping on one side. By coating the unnapped side with plastic, fabric gloves are transformed into general-purpose hand protection offering slip-resistant qualities. These gloves are used for tasks ranging from handling bricks and wire to chemical laboratory containers. When selecting gloves to protect against chemical exposure hazards, always check with the manufacturer or review the manufacturer's product literature to determine the gloves' effectiveness against specific workplace chemicals and conditions.

Chemical- and Liquid-Resistant Gloves

Chemical-resistant gloves are made with different kinds of rubber: natural, butyl, neoprene, nitrile and fluorocarbon (viton); or various kinds of plastic: polyvinyl chloride (PVC), polyvinyl alcohol and polyethylene. These materials can be blended or laminated for

better performance. As a general rule, the thicker the glove material, the greater the chemical resistance but thick gloves may impair grip and dexterity, having a negative impact on safety.

Some examples of chemical-resistant gloves include:

- **Butyl gloves** are made of a synthetic rubber and protect against a wide variety of chemicals, such as peroxide, rocket fuels, highly corrosive acids (nitric acid, sulfuric acid, hydrofluoric acid and red-fuming nitric acid), strong bases, alcohols, aldehydes, ketones, esters and nitrocompounds. Butyl gloves also resist oxidation, ozone corrosion and abrasion, and remain flexible at low temperatures. Butyl rubber does not perform well with aliphatic and aromatic hydrocarbons and halogenated solvents.
- **Natural (latex) rubber gloves** are comfortable to wear, which makes them a popular general-purpose glove. They feature outstanding tensile strength, elasticity and temperature resistance. In addition to resisting abrasions caused by grinding and polishing, these gloves protect workers' hands from most water solutions of acids, alkalis, salts and ketones. Latex gloves have caused allergic reactions in some individuals and may not be appropriate for all employees. Hypoallergenic gloves, glove liners and powderless gloves are possible alternatives for workers who are allergic to latex gloves.
- **Neoprene gloves** are made of synthetic rubber and offer good pliability, finger dexterity, high density and tear resistance. They protect against hydraulic fluids, gasoline, alcohols, organic acids and alkalis. They generally have chemical and wear resistance properties superior to those made of natural rubber.
- **Nitrile gloves** are made of a copolymer and provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. Although intended for jobs requiring dexterity and sensitivity, nitrile gloves stand up to heavy use even after prolonged exposure to substances that cause other gloves to deteriorate. They offer protection when working with oils, greases, acids, caustics and alcohols but are generally not recommended for use with strong oxidizing agents, aromatic solvents, ketones and acetates.

The following table from the U.S. Department of Energy (Occupational Safety and Health Technical Reference Manual) rates various gloves as being protective against specific chemicals and will help you select the most appropriate gloves to protect your employees. The ratings are abbreviated as follows: VG: Very Good; G: Good; F: Fair; P: Poor (not recommended). Chemicals marked with an asterisk (*) are for limited service.

Table 4
Chemical Resistance Selection Chart for Protective Gloves

Chemical	Neoprene	Latex/Rubber	Butyl	Nitrile
Acetaldehyde*	VG	G	VG	G
Acetic acid	VG	VG	VG	VG
Acetone*	G	VG	VG	P
Ammonium hydroxide	VG	VG	VG	VG
Amy acetate*	F	P	F	P
Aniline	G	F	F	P
Benzaldehyde*	F	F	G	G
Benzene*	P	P	P	F
Butyl acetate	G	F	F	P
Butyl alcohol	VG	VG	VG	VG
Carbon disulfide	F	F	F	F
Carbon tetrachloride*	F	P	P	G
Castor oil	F	P	F	VG
Chlorobenzene*	F	P	F	P
Chloroform*	G	P	P	F
Chloronaphthalene	F	P	F	F
Chromic acid (50%)	F	P	F	F
Citric acid (10%)	VG	VG	VG	VG
Cyclohexanol	G	F	G	VG
Dibutyl phthalate*	G	P	G	G
Diesel fuel	G	P	P	VG
Diisobutyl ketone	P	F	G	P
Dimethylformamide	F	F	G	G
Dioctyl phthalate	G	P	F	VG
Dioxane	VG	G	G	G

Table 4 (continued) Chemical Resistance Selection Chart for Protective Gloves

Epoxy resins, dry	VG	VG	VG	VG
Ethyl acetate*	G	F	G	F
Ethyl alcohol	VG	VG	VG	VG
Ethyl ether*	VG	G	VG	G
Ethylene dichloride*	F	P	F	P
Ethylene glycol	VG	VG	VG	VG
Formaldehyde	VG	VG	VG	VG
Formic acid	VG	VG	VG	VG
Freon 11	G	P	F	G
Freon 12	G	P	F	G
Freon 21	G	P	F	G
Freon 22	G	P	F	G
Furfural*	G	G	G	G
Gasoline, leaded	G	P	F	VG
Gasoline, unleaded	G	P	F	VG
Glycerin	VG	VG	VG	VG
Hexane	F	P	P	G
Hydrazine (65%)	F	G	G	G
Hydrochloric acid	VG	G	G	G
Hydrofluoric acid (48%)	VG	G	G	G
Hydrogen peroxide (30%)	G	G	G	G
Hydroquinone	G	G	G	F
Isooctane	F	P	P	VG
Kerosene	VG	F	F	VG
Ketones	G	VG	VG	P
Lacquer thinners	G	F	F	P
Lactic acid (85%)	VG	VG	VG	VG
Lauric acid (36%)	VG	F	VG	VG
Lineolic acid	VG	P	F	G
Linseed oil	VG	P	F	VG
Maleic acid	VG	VG	VG	VG
Methyl alcohol	VG	VG	VG	VG
Methylamine	F	F	G	G
Methyl bromide	G	F	G	F
Methyl chloride*	P	P	P	P

Table 4 (continued) Chemical Resistance Selection Chart for Protective Gloves

Methyl ethyl ketone*	G	G	VG	P
Methyl isobutyl ketone*	F	F	VG	P
Methyl metharcrylate	G	G	VG	F
Monoethanolamine	VG	G	VG	VG
Morpholine	VG	VG	VG	G
Naphthalene	G	F	F	G
Napthas, aliphatic	VG	F	F	VG
Napthas, aromatic	G	P	P	G
Nitric acid*	G	F	F	F
Nitric acid, red and white fuming	P	P	P	P
Nitromethane (95.5%)*	F	P	F	F
Nitropropane (95.5%)	F	P	F	F
Octyl alcohol	VG	VG	VG	VG
Oleic acid	VG	F	G	VG
Oxalic acid	VG	VG	VG	VG
Palmitic acid	VG	VG	VG	VG
Perchloric acid (60%)	VG	F	G	G
Perchloroethylene	F	P	P	G
Petroleum distillates (naphtha)	G	P	P	VG
Phenol	VG	F	G	F
Phosphoric acid	VG	G	VG	VG
Potassium hydroxide	VG	VG	VG	VG
Propyl acetate	G	F	G	F
Propyl alcohol	VG	VG	VG	VG
Propyl alcohol (iso)	VG	VG	VG	VG
Sodium hydroxide	VG	VG	VG	VG
Styrene	P	P	P	F
Styrene (100%)	P	P	P	F
Sulfuric acid	G	G	G	G
Tannic acid (65)	VG	VG	VG	VG
Tetrahydrofuran	P	F	F	F
Toluene*	F	P	P	F
Toluene diisocyanate (TDI)	F	G	G	F

Table 4 (continued) Chemical Resistance Selection Chart for Protective Gloves

Trichloroethylene*	F	F	P	G
Triethanolamine (85%)	VG	G	G	VG
Tung oil	VG	P	F	VG
Turpentine	G	F	F	VG
Xylene*	P	P	P	F

Note: When selecting chemical-resistant gloves be sure to consult the manufacturer's recommendations, especially if the gloved hand(s) will be immersed in the chemical.

Care of Protective Gloves

Protective gloves should be inspected before each use to ensure that they are not torn, punctured or made ineffective in any way. A visual inspection will help detect cuts or tears but a more thorough inspection by filling the gloves with water and tightly rolling the cuff towards the fingers will help reveal any pinhole leaks. Gloves that are discolored or stiff may also indicate deficiencies caused by excessive use or degradation from chemical exposure.

Any gloves with impaired protective ability should be discarded and replaced. Reuse of chemical-resistant gloves should be evaluated carefully, taking into consideration the absorptive qualities of the gloves. A decision to reuse chemically-exposed gloves should take into consideration the toxicity of the chemicals involved and factors such as duration of exposure, storage and temperature.

Body Protection

Employees who face possible bodily injury of any kind that cannot be eliminated through engineering, work practice or administrative controls, must wear appropriate body protection while performing their jobs. In addition to cuts and radiation, the following are examples of workplace hazards that could cause bodily injury:

- Temperature extremes;
- Hot splashes from molten metals and other hot liquids;

- Potential impacts from tools, machinery and materials;
- Hazardous chemicals.

There are many varieties of protective clothing available for specific hazards. Employers are required to ensure that their employees wear personal protective equipment only for the parts of the body exposed to possible injury. Examples of body protection include laboratory coats, coveralls, vests, jackets, aprons, surgical gowns and full body suits.

If a hazard assessment indicates a need for full body protection against toxic substances or harmful physical agents, the clothing should be carefully inspected before each use, it must fit each worker properly and it must function properly and for the purpose for which it is intended.

Protective clothing comes in a variety of materials, each effective against particular hazards, such as:

- **Paper-like fiber** used for disposable suits provide protection against dust and splashes.
- **Treated wool and cotton** adapts well to changing temperatures, is comfortable, and fire-resistant and protects against dust, abrasions and rough and irritating surfaces.
- **Duck** is a closely woven cotton fabric that protects against cuts and bruises when handling heavy, sharp or rough materials.
- **Leather** is often used to protect against dry heat and flames.
- **Rubber, rubberized fabrics, neoprene and plastics** protect against certain chemicals and physical hazards. When chemical or physical hazards are present, check with the clothing manufacturer to ensure that the material selected will provide protection against the specific hazard.

Hearing Protection

Determining the need to provide hearing protection for employees can be challenging. Employee exposure to excessive noise depends upon a number of factors, including:

- The loudness of the noise as measured in decibels (dB).
- The duration of each employee's exposure to the noise.
- Whether employees move between work areas with different noise levels.

- Whether noise is generated from one or multiple sources.

Generally, the louder the noise, the shorter the exposure time before hearing protection is required. For instance, employees may be exposed to a noise level of 90 dB for 8 hours per day (unless they experience a Standard Threshold Shift) before hearing protection is required. On the other hand, if the noise level reaches 115 dB hearing protection is required if the anticipated exposure exceeds 15 minutes.

For a more detailed discussion of the requirements for a comprehensive hearing conservation program, see OSHA Publication 3074 (2002), "Hearing Conservation" or refer to the OSHA standard at 29 CFR 1910.95, Occupational Noise Exposure, section (c).

Table 5, below, shows the permissible noise exposures that require hearing protection for employees exposed to occupational noise at specific decibel levels for specific time periods. Noises are considered continuous if the interval between occurrences of the maximum noise level is one second or less. Noises not meeting this definition are considered impact or impulse noises (loud momentary explosions of sound) and exposures to this type of noise must not exceed 140 dB. Examples of situations or tools that may result in impact or impulse noises are powder-actuated nail guns, a punch press or drop hammers.

Table 5
Permissible Noise Exposures

Duration per day, in hours	Sound level in dB*
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

*When measured on the A scale of a standard sound level meter at slow response.
Source: 29 CFR 1910.95, Table G-16.

If engineering and work practice controls do not lower employee exposure to workplace noise to acceptable levels, employees must wear appropriate hearing protection. It is important to understand that hearing protectors reduce only the amount of noise that gets through to the ears. The amount of this reduction is referred to as attenuation, which differs according to the type of hearing protection used and how well it fits. Hearing protectors worn by employees must reduce an employee's noise exposure to within the acceptable limits noted in Table 5. Refer to Appendix B of 29 CFR 1910.95, Occupational Noise Exposure, for detailed information on methods to estimate the attenuation effectiveness of hearing protectors based on the device's noise reduction rating (NRR). Manufacturers of hearing protection devices must display the device's NRR on the product packaging. If employees are exposed to occupational noise at or above 85 dB averaged over an eight-hour period, the employer is required to institute a hearing conservation program that includes regular testing of employees' hearing by qualified professionals. Refer to 29 CFR 1910.95(c) for a description of the requirements for a hearing conservation program.

Some types of hearing protection include:

- **Single-use earplugs** are made of waxed cotton, foam, silicone rubber or fiberglass wool. They are self-forming and, when properly inserted, they work as well as most molded earplugs.
- **Pre-formed or molded earplugs** must be individually fitted by a professional and can be disposable or reusable. Reusable plugs should be cleaned after each use.
- **Earmuffs** require a perfect seal around the ear. Glasses, facial hair, long hair or facial movements such as chewing may reduce the protective value of earmuffs.

OSHA Assistance

OSHA can provide extensive help through a variety of programs, including technical assistance about effective safety and health programs, state plans, workplace consultations, voluntary protection programs, strategic partnerships, training and education, and more. An overall commitment to workplace safety and health can add value to your business, to your workplace and to your life.

Safety and Health Program Management Guidelines

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. In fact, an effective safety and health program forms the basis of good worker protection and can save time and money (about $4 for every dollar spent) and increase productivity and reduce worker injuries, illnesses and related workers' compensation costs.

To assist employers and employees in developing effective safety and health programs, OSHA published recommended Safety and Health Program Management Guidelines (Federal Register 54 (16): 3904-3916, January 26, 1989). These voluntary guidelines apply to all places of employment covered by OSHA.

The guidelines identify four general elements critical to the development of a successful safety and health management program:

- Management leadership and employee involvement.
- Work analysis.
- Hazard prevention and control.
- Safety and health training.

The guidelines recommend specific actions, under each of these general elements, to achieve an effective safety and health program. The Federal Register notice is available online at www.osha.gov.

State Programs

The Occupational Safety and Health Act of 1970 (OSH Act) encourages states to develop and operate their own job safety and health plans. OSHA approves and monitors these plans. There are currently 26 state plans: 23 cover both private and public (state and local government) employment; 3 states, Connecticut, New Jersey and New York, cover the public sector only. States and territories with their own OSHA-approved occupational safety and health plans must adopt standards identical to, or at least as effective as, the federal standards.

Consultation Services

Consultation assistance is available on request to employers who want help in establishing and maintaining a safe and healthful workplace. Largely funded by OSHA, the service is provided at no cost to the employer. Primarily developed for smaller employers with more hazardous operations, the consultation service is delivered by state governments employing professional safety and health consultants. Comprehensive assistance includes an appraisal of all-mechanical systems, work practices and occupational safety and health hazards of the workplace and all aspects of the employer's present job safety and health program. In addition, the service offers assistance to employers in developing and implementing an effective safety and health program. No penalties are proposed or citations issued for hazards identified by the consultant. OSHA provides consultation assistance to the employer with the assurance that his or her name and firm and any information about the workplace will not be routinely reported to OSHA enforcement staff.

Under the consultation program, certain exemplary employers may request participation in OSHA's Safety and Health Achievement Recognition Program (SHARP). Eligibility for participation in SHARP includes receiving a comprehensive consultation visit, demonstrating exemplary achievements in workplace safety and health by abating all identified hazards and developing an excellent safety and health program.

Employers accepted into SHARP may receive an exemption from programmed inspections (not complaint or accident investigation inspections) for a period of one year. For more information concerning consultation assistance, see the OSHA website at www.osha.gov.

Voluntary Protection Programs (VPP)

Voluntary Protection Programs and onsite consultation services, when coupled with an effective enforcement program, expand worker protection to help meet the goals of the OSH Act. The three levels of VPP are Star, Merit, and Demonstration designed to recognize outstanding achievements by companies that have successfully incorporated comprehensive safety and health programs into their total management system. The VPPs motivate others to achieve excellent safety and health results in the same outstanding

way as they establish a cooperative relationship between employers, employees and OSHA.

For additional information on VPP and how to apply, contact the OSHA regional offices listed at the end of this publication.

Strategic Partnership Program

OSHA's Strategic Partnership Program, the newest member of OSHA's cooperative programs, helps encourage, assist and recognize the efforts of partners to eliminate serious workplace hazards and achieve a high level of worker safety and health. Whereas OSHA's Consultation Program and VPP entail one-on-one relationships between OSHA and individual worksites, most strategic partnerships seek to have a broader impact by building cooperative relationships with groups of employers and employees. These partnerships are voluntary, cooperative relationships between OSHA, employers, employee representatives and others (e.g., trade unions, trade and professional associations, universities and other government agencies).

For more information on this and other cooperative programs, contact your nearest OSHA office, or visit OSHA's website at www.osha.gov.

Alliance Programs

The Alliance Program enables organizations committed to workplace safety and health to collaborate with OSHA to prevent injuries and illnesses in the workplace. OSHA and the Alliance participants work together to reach out to, educate and lead the nation's employers and their employees in improving and advancing workplace safety and health.

Alliances are open to all groups, including trade or professional organizations, businesses, labor organizations, educational institutions and government agencies. In some cases, organizations may be building on existing relationships with OSHA that were developed through other cooperative programs.

There are few formal program requirements for Alliances and the agreements do not include an enforcement component. However, OSHA and the participating organizations must define, implement and meet a set of short- and long-term goals that fall into three categories: training and education; outreach and commu-

nication; and promoting the national dialogue on workplace safety and health.

OSHA Training and Education

OSHA area offices offer a variety of information services, such as compliance assistance, technical advice, publications, audiovisual aids and speakers for special engagements. OSHA's Training Institute in Arlington Heights, Ill., provides basic and advanced courses in safety and health for federal and state compliance officers, state consultants, federal agency personnel, and private sector employers, employees and their representatives.

The OSHA Training Institute also has established OSHA Training Institute Education Centers to address the increased demand for its courses from the private sector and from other federal agencies. These centers are nonprofit colleges, universities and other organizations that have been selected after a competition for participation in the program.

OSHA also provides funds to nonprofit organizations, through grants, to conduct workplace training and education in subjects where OSHA believes there is a lack of workplace training. Grants are awarded annually. Grant recipients are expected to contribute 20 percent of the total grant cost.

For more information on grants, training and education, contact the OSHA Training Institute, Office of Training and Education, 2020 South Arlington Heights Road, Arlington Heights, IL 60005, (847) 297-4810 or see "Outreach" on OSHA's website at www.osha.gov. For further information on any OSHA program, contact your nearest OSHA area or regional office listed at the end of this publication.

Information Available Electronically

OSHA has a variety of materials and tools available on its website at www.osha.gov. These include e-Tools such as Expert Advisors, Electronic Compliance Assistance Tools (e-cats), Technical Links; regulations, directives and publications, videos and other information for employers and employees. OSHA's software programs and compliance assistance tools walk you through challenging safety and health issues and common problems to find the best solutions for your workplace.

OSHA's CD-ROM includes standards, interpretations, directives and more, and can be purchased on CD-ROM from the U.S. Government Printing Office. To order, write to the Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 or phone (202) 512-1800, or order online at http://bookstore.gpo.gov.

OSHA Publications

OSHA has an extensive publications program. For a listing of free or sales items, visit OSHA's website at www.osha.gov or contact the OSHA Publications Office, U.S. Department of Labor, 200 Constitution Avenue, NW, N-3101, Washington, DC 20210. Telephone (202) 693-1888 or fax to (202) 693-2498.

Contacting OSHA

To report an emergency, file a complaint or seek OSHA advice, assistance or products, call (800) 321-OSHA or contact your nearest OSHA regional or area office listed at the end of this publication. The teletypewriter (TTY) number is (877) 889-5627.

You can also file a complaint online and obtain more information on OSHA federal and state programs by visiting OSHA's website at www.osha.gov.

OSHA
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OSHA Regional Offices

Region I
(CT,* ME, MA, NH, RI, VT*)
JFK Federal Building, Room E340
Boston, MA 02203
(617) 565-9860

Region II
(NJ,* NY,* PR,* VI*)
201 Varick Street, Room 670
New York, NY 10014
(212) 337-2378

Region III
(DE, DC, MD,* PA,* VA,* WV)
The Curtis Center
170 S. Independence Mall West
Suite 740 West
Philadelphia, PA 19106-3309
(215) 861-4900

Region IV
(AL, FL, GA, KY,* MS, NC,* SC,* TN*)
61 Forsyth Street, SW
Atlanta, GA 30303
(404) 562-2300

Region V
(IL, IN,* MI,* MN,* OH, WI)
230 South Dearborn Street, Room 3244
Chicago, IL 60604
(312) 353-2220

Region VI
(AR, LA, NM,* OK, TX)
525 Griffin Street, Room 602
Dallas, TX 75202
(214) 767-4731 or 4736 x224

Region VII
(IA,* KS, MO, NE)
City Center Square
1100 Main Street, Suite 800
Kansas City, MO 64105
(816) 426-5861

Region VIII
(CO, MT, ND, SD, UT,* WY*)
1999 Broadway, Suite 1690
PO Box 46550
Denver, CO 80201-6550
(303) 844-1600

Region IX
(American Samoa, AZ,* CA,* HI, NV,* Northern Mariana Islands)
71 Stevenson Street, Room 420
San Francisco, CA 94105
(415) 975-4310

Region X
(AK,* ID, OR,* WA*)
1111 Third Avenue, Suite 715
Seattle, WA 98101-3212
(206) 553-5930

*These states and territories operate their own OSHA-approved job safety and health programs (Connecticut, New Jersey and New York plans cover public employees only). States with approved programs must have a standard that is identical to, or at least as effective as, the federal standard.

Note: To get contact information for OSHA Area Offices, OSHA-approved State Plans and OSHA Consultation Projects, please visit us online at www.osha.gov or call us at 1-800-321-OSHA.

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Appendix A
OSHA Standards that Require PPE

29 CFR 1910, General Industry

Standards that Require the Employer to Provide PPE:

1910.28	Safety requirements for scaffolds
1910.66	Powered platforms for building maintenance
1910.67	Vehicle-mounted elevating and rotating work platforms
1910.94	Ventilation
1910.119	Process safety management of highly hazardous chemicals
1910.120	Hazardous waste operations and emergency response
1910.132	General requirements (personal protective equipment)
1910.133	Eye and face protection
1910.135	Occupational foot protection
1910.136	Occupational foot protection
1910.137	Electrical protective devices
1910.138	Hand protection
1910.139	Respiratory protection for M. tuberculosis
1910.157	Portable fire extinguishers
1910.160	Fixed extinguishing systems, general
1910.183	Helicopters
1910.218	Forging machines
1910.242	Hand and portable powered tools and equipment, general
1910.243	Guarding of portable power tools
1910.252	General requirements (welding, cutting and brazing)
1910.261	Pulp, paper, and paperboard mills
1910.262	Textiles
1910.268	Telecommunications
1910.269	Electric power generation, transmission and distribution
1910.333	Selection and use of work practices
1910.335	Safeguards for personnel protection
1910.1000	Air contaminants
1910.1003	13 carcinogens, etc.
1910.1017	Vinyl chloride
1910.1029	Coke oven emissions
1910.1043	Cotton dust
1910.1096	Ionizing radiation

Standards that Require the Employer to Provide PPE at No Cost to the Employee:

1910.95	Occupational noise exposure
1910.134	Respiratory protection
1910.146	Permit-required confined spaces
1910.156	Fire brigades
1910.266	Logging operations
1910.1001	Asbestos
1910.1018	Inorganic Arsenic
1910.1025	Lead
1910.1027	Cadmium
1910.1028	Benzene
1910.1030	Bloodborne pathogens
1910.1044	1,2-dibromo-3-chloropropane
1910.1045	Acrylonitrile
1910.1047	Ethylene oxide
1910.1048	Formaldehyde
1910.1050	Methylenedianiline
1910.1051	1,3-Butadiene
1910.1052	Methylene chloride
1910.1450	Occupational exposure to chemicals in laboratories

29 CFR 1915, Shipyard Employment

Standards that Require the Employer to Provide PPE:

1915.12	Precautions and the order of testing before entering confined and enclosed spaces and other dangerous atmospheres
1915.13	Cleaning and other cold work
1915.32	Toxic cleaning solvents
1915.34	Mechanical paint removers
1915.35	Painting
1915.51	Ventilation and protection in welding, cutting and heating
1915.73	Guarding of deck openings and edges
1915.77	Working surfaces
1915.135	Powder actuated fastening tools
1915.156	Foot protection
1915.157	Hand and body protection
1915.158	Lifesaving equipment
1915.159	Personal fall arrest systems (PFAS)

Standards that Require the Employer to Provide PPE at No Cost to the Employee:

1915.154 Respiratory Protection
1915.1001 Asbestos

29 CFR 1917, Marine Terminals

Standards that Require the Employer to Provide PPE:

1917.22 Hazardous cargo
1917.25 Fumigants, pesticides, insecticides and hazardous waste
1917.26 First aid and lifesaving facilities
1917.91 Eye and face protection
1917.93 Head protection
1917.95 Other protective measures
1917.126 River banks
1917.152 Welding, cutting and heating (hot work)
1917.154 Compressed air

Standards that Require the Employer to Provide PPE at No Cost to the Employee:

1917.92 Respiratory protection

29 CFR 1918, Longshoring

Standards that Require the Employer to Provide PPE:

1918.85 Containerized cargo operations
1918.88 Log operations
1918.93 Hazardous atmospheres and substances
1918.94 Ventilation and atmospheric conditions
1918.104 Foot protection
1918.105 Other protective measures

Standards that Require the Employer to Provide PPE at No Cost to the Employee:

1918.102 Respiratory protection

29 CFR 1926, Construction

Standards that Require the Employer to Provide PPE:

1926.28 Personal protective equipment
1926.52 Occupational noise exposure

1926.57	Ventilation
1926.64	Process safety management of highly hazardous chemicals
1926.65	Hazardous waste operations and emergency response
1926.95	Criteria for personal protective equipment
1926.96	Occupational foot protection
1926.100	Head protection
1926.101	Hearing protection
1926.102	Eye and face protection
1926.104	Safety belts, lifelines and lanyards
1926.105	Safety nets
1926.106	Working over or near water
1926.250	General requirements for storage
1926.300	General requirements (Hand and power tools)
1926.302	Power-operated hand tools
1926.304	Woodworking tools
1926.353	Ventilation and protection in welding, cutting and heating
1926.354	Welding, cutting and heating in way of preservative coatings
1926.416	General requirements (Electrical)
1926.451	General requirements (Scaffolds)
1926.453	Aerial lifts
1926.501	Duty to have fall protection
1926.502	Fall protection systems criteria and practices
1926.550	Cranes and derricks
1926.551	Helicopters
1926.701	General requirements (Concrete and masonry construction)
1926.760	Fall protection (Steel erection)
1926.800	Underground construction
1926.951	Tools and protective equipment
1926.955	Overhead lines
1926.1101	Asbestos

Standards that Require the Employer to Provide PPE at No Cost to the Employee:

1926.60	Methylenedianiline
1926.62	Lead
1926.103	Respiratory protection
1926.1127	Cadmium

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