

A Guide to Personal Protective Equipment

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Acknowledgments

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This guide is intended to be consistent with all existing OSHA standards; therefore, if an area is considered by the reader to be inconsistent with a standard, then the OSHA standard should be followed.

To obtain additional copies of this book, or if you have questions about North Carolina occupational safety and health standards or rules, please contact:

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Additional sources of information are listed on the inside back cover of this book.

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Foreword

We all know that the best way to avoid dangerous working conditions is to engineer them out of the workplace or to establish rules that keep employees from committing risky job practices. But sometimes, there is simply no way for a worker to avoid spending time in a dangerous atmosphere, doing a job in a loud environment, or being exposed to other conditions that could cause an occupational injury or illness.

Those are the times when a worker must depend on personal protective equipment to protect his or her health. This guide explains how to determine what “PPE” is needed in a typical workplace and then looks at many different types of equipment.

In North Carolina, N.C. Department of Labor inspectors enforce the federal Occupational Safety and Health Act through a state plan approved by the U.S. Department of Labor. The N.C. Department of Labor’s Division of Occupational Safety and Health offers many educational programs to the public and produces publications, including this guide, to help inform people about their rights and responsibilities regarding occupational safety and health.

As you look through this guide, please remember that OSHA’s mission is greater than just enforcement. An equally important goal is to help citizens find ways to create safe and healthy workplaces. Everyone profits from working together for safety. Reading and using the information in *A Guide to Personal Protective Equipment* will help you form sound occupational safety and health practices in your workplace.

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Note

The goal of this booklet is to assist in providing a safe and healthful workplace. Words used in this publication such as “must,” “shall,” “required” and “necessary” indicate requirements under OSHA standards. Procedures indicated by “should,” “may,” “suggested” and “recommended” constitute generally accepted good occupational safety and health practices.

Much of the PPE information in this guide is framed in general terms and is intended to complement relevant regulations and manufacturers’ requirements. For more specific information, refer to the OSHA standards in Title 29, Code of Federal Regulations, Parts 1900–1999. In some instances, the standards referenced in this guide refer to specifications by the American National Standards Institute and the American Society for Testing and Materials.

This guide does not attempt to cover every PPE issue and topic. For example, respiratory protection is not covered in this book. Other guides in this series cover specific PPE-related topics in a more detailed manner, for example, *A Guide to Developing and Maintaining an Effective Hearing Conservation Program*. (Consult back inside cover for a listing.) Finally, this guide is intended to be consistent with federal and state OSHA standards; however, if an area is considered by the reader to be inconsistent with a standard, then the standard should be followed.

Introduction

General Information

Devising an employee safety program that eliminates injuries and illnesses is as important in the workplace as creating a quality product or service. Most employers know that improved morale and lower workers' compensation costs are just two of the many benefits of having good safety programs. Such programs should include procedures for the elimination of injuries and illnesses through the use of personal protective equipment. This guide provides information that will help employers implement or enhance their companies' safety plans regarding PPE.

Remember, it is the employer's responsibility to see that employees have, and use, personal protective equipment. If there's an accident, the employer is typically held responsible for any injuries that should have been avoided by the use of personal protective equipment by an employee. It is also important to keep all PPE in sanitary and reliable condition. If a protective device fails due to being in poor condition, the employer is usually cited under OSHA regulations. Employers should make sure that their employees know how to properly use the PPE they are expected to wear.

General industry and construction standards require that personal protective equipment be provided to and used by employees whenever workplace hazards are encountered that could injure or impair any part of the body. Some requirements provide for the head, face, eyes and feet. Others explain when fall protection devices are required. When purchasing PPE, consult the OSHA standards to be sure that the equipment being bought satisfies the requirements in the standards. Particular standards also require that employees be allowed a choice of PPE devices. Personal protective equipment should not be used as a substitute for engineering, work practice and/or administrative controls. PPE should be used in conjunction with these controls to provide for employee safety and health in the workplace. PPE includes all clothing and other work accessories designed to create a barrier against workplace hazards. The basic element of any management program for personal protective equipment should be an in-depth evaluation of the equipment needed to protect against the hazards at the workplace. Management dedicated to employee safety and health should use that evaluation to set a standard operating procedure for personnel, then train employees on the protective limitations of the selected PPE, as well as its use and maintenance.

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

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

This booklet discusses those types of equipment most commonly used for protection of the head, including eyes and ears, and torso, arms, hands and feet. The use of equipment to protect against life-threatening hazards is also discussed.

Hazard Assessment and Training

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

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

Before doing work which requires the use of PPE, employees must be trained to know when PPE is necessary; what type is necessary; how it is to be worn; and what its limitations are, as well as know its proper care, maintenance, useful life and disposal.

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

Workplace Hazard Control Program

An effective PPE program is an important part of an overall workplace hazard control program. An effective program is a product of a partnership between the employer and employees. It is a joint venture. Employees must know that it is part of their duty to look for and report workplace hazards on a daily basis.

The workplace hazard control program focuses not only on hazards addressed by OSHA standards but also on hazards not specifically covered by these standards. The program can be thought of as a plan for:

- Recognizing hazards
- Evaluating hazards
- Controlling hazards

Recognizing Hazards

Recognizing hazards does not result from happenstance. It results from a formal, systematic plan founded upon employee training. Some hazards, like unguarded machinery in a metal stamping shop, are peculiar to the workplace. Others, such as fire hazards, are of a general nature. But hazards of any nature can go undetected unless employees are trained to recognize them.

Insurance companies, private safety consultants and government agencies can help employers learn about hazards that may result from the nature of the work being conducted and about hazards common to all workplaces. From that beginning, employees can be trained to recognize hazards.

Evaluating Hazards

The ability to recognize hazards must be applied to the workplace in the form of periodic inspections and monitoring. The total plant facility should be inspected at least annually. Many workplace areas require monthly, weekly or even daily inspections. A written record of these inspections needs to be kept. There should be a standard procedure to follow up the inspections to ensure deficiencies are corrected.

Special testing equipment may be required for particular hazards. The equipment should be maintained and properly calibrated. Employees who operate testing equipment must be trained to use it and to interpret the findings.

Work practices must also be evaluated for hazards. Approved work practices should always be reviewed when new machinery, a new operator or a different procedure is introduced to the operation. Particular standards require ongoing hazard evaluation. The standard regarding the control of hazardous energy (lockout/tagout) during machine repair or maintenance is one example.

Controlling Hazards

There may not be a single best way to eliminate (control) hazards. Three approaches to the control of workplace hazards are through:

- Engineering controls
- Administrative controls
- Personal protective equipment

Engineering controls should be used first. Administrative controls should be used second. Personal protective equipment may be used in conjunction with engineering and administrative controls. For example, a machine could have excellent guarding at the point of operation (engineering controls), yet eye protection (PPE) may be required while the machine is being operated.

Examples of Engineering Controls

A classic example of eliminating hazards through engineering controls is machine guarding. Eliminating possible ignition sources near operations where potential explosive vapors could be present is an engineering control. Enclosures for electrical hazards and ventilation equipment for respiratory hazards are engineering controls.

Examples of Administrative Controls

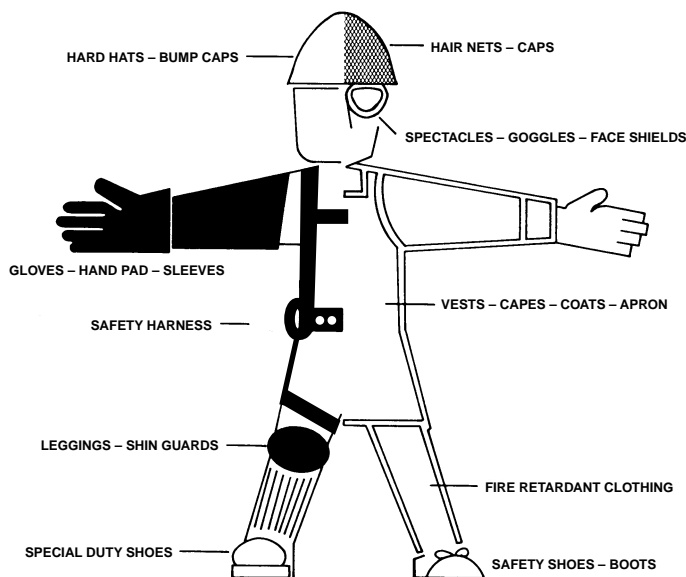
Administrative controls are used if engineering controls will not work or if they only partially work. This method involves limiting employee exposure to hazards by administratively controlling work schedules. Exposure to excessive heat, where cooling is not feasible or equipment has failed, could be controlled by limiting the time an employee spends working in that area. Administrative controls may also be necessary during emergencies or unusual situations. Since they are not as effective as engineering controls, administrative controls should be avoided in most situations.

Examples of Personal Protective Equipment

Figure 1 illustrates PPE to protect the body, head, eyes, face, hands and feet. It is safety equipment designed to be worn or attached to the body. Fall protection devices and equipment to protect employees against drowning are also considered PPE. PPE offers protection that engineering and administrative controls cannot offer. In some operations PPE may be the only available protection for the employee. It is only proper to consider PPE as an adjunct to other means of controlling hazards. Remember, use engineering controls first and PPE as an additional workplace hazard control method.

Figure 1

Personal Protective Equipment



Personal Protective Equipment—Selection, Use, and Maintenance

Selection

The workplace hazard control program should identify areas and operations that require PPE. OSHA and North Carolina occupational safety and health standards require PPE (and its use) in specific instances. The employer is responsible for knowing which standards apply to its workplace. Management's consultation with employees will identify even more instances where PPE would enhance workplace safety. A management-employee team approach creates a positive atmosphere regarding the PPE and its use.

Funds should be budgeted for the procurement, maintenance and replacement of PPE. When the employer orders PPE, specific standard requirements should be included in the purchase order (see 29 CFR 1910.133(b)(1)). To illustrate this necessity, eye and face protection devices are required by OSHA standards to be designed, constructed and tested in accordance with American National Standards Institute Z87.1-1989. Hard hat protection (29 CFR 1910.135) must meet the requirements and specifications of ANSI Z89.1-1986. Be sure to consult the OSHA standards for applicable requirements before ordering PPE. Never purchase inferior PPE just because it is less expensive.

For specific sources of PPE, manufacturers' catalogs, safety equipment supply catalogs and trade literature can be referenced. Another very good information source is the annual March safety equipment issue of *Safety and Health* magazine published by the National Safety Council (Chicago, Ill.).

Use and Maintenance

There should be a written company policy regarding the use and maintenance of PPE. This policy demonstrates management's concern for the safety of its employees. Employees also have a responsibility to use the PPE and to keep the equipment clean and in reliable condition. Whenever the PPE is damaged or is not safe to be used, employees should be encouraged to turn in the old PPE item for a new one. When use of the PPE is required by company policy, employees must be made aware of the price for failing to adhere to the policy. The policy should be enforced with consistency and fairness.

The ongoing PPE program should have a written inventory of the PPE on hand. It may be necessary to include on the inventory PPE for emergency situations. Each employee should be issued his or her own PPE. Personal protective equipment should not be thought of as "community property." PPE such as safety shoes, eye protection and hard hats should also be fitted to the individual. When PPE is properly fitted, it is more comfortable and is more likely to be used.

It is vitally important that the employee be trained in the proper use and care of the PPE. Both initial and refresher training is essential. Refresher training should be conducted at least annually.

2

Body Protection

General Information

This part addresses body protection against operational, environmental and mechanical (but not chemical) hazards. Personal protective vests, aprons, coats, pants, coveralls and suits are available in a wide range of materials and for numerous purposes. The type of PPE for body protection and the selection of proper material should result from the workplace hazard control program. Accident investigations and analyses of injuries may also suggest the need for types of body PPE.

Requirements

OSHA standards require that protective clothing be provided, used and maintained in a sanitary and reliable condition wherever it is necessary due to hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact (see 29 CFR 1910.132(a) and 29 CFR 1926.28(a)). Purchasers of body protection PPE should reference appropriate standards on purchase requests.

Once the PPE is in use it must be maintained in reliable condition. If employees are permitted to use their own PPE, the employer must nonetheless make certain that the PPE is adequate and properly maintained. Body protection PPE should be part of the overall inspection program and included in inspection checklists.

Cooling Vests and Suits

Personal cooling vests and suits are available for wear in operations involving extreme heat conditions. One design requires the use of a supplied air system. The air enters the vest or coverall through a tube in which it is cooled by as much as 40 degrees. The cooled air is channeled out over the upper torso and around the neck area when only the vest is being used. When the coverall or full body cooling type of PPE is used, the cooling air is also channeled to the leg and arm areas.

There is also a type of body cooling system that does not require an electrical, air or water supply. This vest is made of durable flame-resistant cotton shell fabric. Sewn underneath the outer shell are layers of light metallic insulation that reflect radiant heat outward and cooling inward toward the body. Pouch-like areas are accessible for quick and easy installation of segmented, semi-frozen gel cooling packets. These gel packs, often referred to as plastic ice, provide approximately twice the cooling effect of the same volume of water ice. The gel packs will not leak, even if punctured. They can be refrozen overnight in an ordinary freezer.

Other systems use supplied cooling air and a manifold system of tubes to channel the cool air to the body extremities. Outer surfaces are frequently made of aluminum or other heat-reflective material, depending on the type and source of the heat conditions.

Foul Weather Gear

Rain gear is available in coats or combination bib overall and jackets. Different types of materials are available to match the needs of the user. Common rain gear materials include PVC coatings on polyester or nylon fabric. For lightweight gear single-ply, 20-mil PVC is available. For heavy duty, a heavy-weight nylon netted material coated on both sides with a premium grade of 35-mil flame resistant PVC (or equivalent) may be used. Another combination is rubber on cotton material. This provides a material that resists aging and abrasion and remains flexible in cold weather.

Cold weather gear is available from many sources including sporting goods, catalog and clothing stores. The most common material used for cold outdoor work is the ten- and twelve-ounce cotton duck shell with a variety of lining insulation material. One of the more common lining insulations is polyester fiberfill. It is lightweight and moisture-resistant and has superior insulation qualities. Outer shell material is also available in water- and wind-repellant nylon twill. This material is lightweight but not as rugged as the cotton duck. Water-repellant cotton duck material is also available, but generally it must be retreated after washing. For extremely cold environments one fabricator uses wind-tight nylon duck material with polyester fiber insulation and a tight weave nylon lining. For durability in cold weather gear, look for construction with triple-stitched main seams and riveted stress points (e.g., at the pockets).

Knife Cutting Protection

Workers in the meat, fish, poultry and other food processing industries may be required to perform operations involving the use of sharp knives. Stainless steel mesh material may be used to protect these employees. In many cutting and trimming operations, mechanical guarding is not feasible and body exposure to cuts is a concern. Metal mesh aprons are available for such tasks. Hand, wrist and arm protection garments are also available. These products are comfortable to wear and provide the user freedom of movement. Sizes are available for all body types. Adjustable shoulder and waist straps assure the user a snug fit. Whereas these types of garments are cut resistant, they are not puncture proof. They should not be used with high speed or serrated blades.

High Visibility Vests

High visibility vests are available for workers involved in traffic control. These vests may also be required in operations where key personnel location is crucial. These vests are generally a high visibility orange. Vests can be procured with reflective trim, which offers greater day and night visibility. The vests may be made of solid vinyl, PVC coated polyester or nylon. The garment may be knit or flat mesh, solid or perforated, or nylon mesh. Other features can include hook and loop or snap front closure, webbing or elastic side closures, and reflective and/or luminescent vertical or horizontal stripes.

Flotation Vests

OSHA standard 29 CFR 1926.106(a) requires that employees working over or near water, where the danger of drowning exists, be provided U.S. Coast Guard approved life jackets or buoyant work vests. These vests are available as flotation pads inside high visibility international orange nylon shells or as vinyl coated flotation pads of international orange. The flotation vests must be U.S. Coast Guard approved.

Welding and High Heat

Coveralls, jackets, pants and aprons are available for operations involving high heat or molten metal splashes. Leather is the traditional protective material for many welding operations. Where there is exposure to radiant heat as well as molten metal splashes, aluminized garments may be used. They reflect up to 95 percent of the radiant heat. Flame-resistant cotton coveralls designed for comfort as well as protection are sometimes preferred. Whatever the type of clothing used for welding operations, it should not have external pockets or cuffs.

Fabrics of silica, ceramic and fiberglass eliminate the need for asbestos and are now available for welding operations. These fabrics are available in many combinations of color and weight. The fabrics are functional over a temperature range of 700 F to 2,000 F.

3

Head Protection

General Information

Preventing head injuries is an important goal of every safety program. A survey by the U.S. Bureau of Labor Statistics of on-the-job accidents and injuries noted that most workers who suffered impact injuries to the head were not wearing head protection when the accident occurred. The majority of workers were injured while performing their normal jobs at their regular work stations.

The survey showed that in most instances where head injuries occurred, employers had not required their employees to wear head protection. According to the report, in almost half of the accidents involving head injuries, employees did not know of any measures taken by the employers to prevent such injuries from occurring. Of the workers wearing hard hats, 95 percent indicated that they were required by their employers to wear them.

The BLS survey noted that more than one-half of the workers struck on the head were looking down when the accident occurred. Almost 30 percent of them were looking straight ahead. The study showed a dramatic difference in the injury rate for workers who bumped into stationary objects based on the use of hard hats. Unprotected workers suffered about three times the number of injuries as hard hat wearing workers did when striking a stationary object.

Eliminating or controlling hazards should be given first consideration, but many accidents involving head injuries are difficult to anticipate and control. Where dangers exist, head protection must be provided to avoid injury.

Depending upon the construction, hard hats protect employees from head injuries that can be caused by falling or flying objects, bump hazards in close or confined spaces, and electrical shock or burns. Whatever the construction, the hard hat should be easily adjustable so that employees will wear the hat properly. The hats should be acceptable in terms of comfort and appearance so that employees will want to wear them.

A good hard hat program will stress that the hard hat is part of the work uniform. In fact, the hard hat is an excellent place to print the employer's name, identifying the employee as part of the organization.

Particular hard hats can:

- Resist a reasonable impact force without breaking or collapsing the shell or damaging the internal suspension
- Dissipate and/or absorb as much impact force as possible to avoid transmitting the force to the head, spinal column or other parts of the body
- Resist impact penetration
- Provide electrical protection

Those responsible for determining the use of hard hats should be aware of the protection the hats are intended to provide, their limitations, and the maintenance and care required to keep the hats in safe and reliable condition. Employees who are required to wear the hats should be informed of the same information.

OSHA Requirements

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

Selection

Each type and class of head protectors is intended to provide protection against specific hazardous conditions. An understanding of these conditions will help in selecting the right hat for the particular situation.

Protective hats are made in the following types and classes:

Type 1—helmets with full brim, not less than 1¼ inches wide

Type 2—brimless helmets with a peak extending forward from the crown

For industrial purposes, three classes are recognized:

Class A—general service, limited voltage protection

Class B—utility service, high-voltage protection

Class C—Special service, no voltage protection

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

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

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

The safety hat or cap in Class C is designed specifically for lightweight comfort and impact protection. This class is usually manufactured from aluminum and offers no dielectric protection. Class C helmets are used in certain construction and manufacturing occupations, oil fields, refineries, and chemical plants where there is no danger from electrical hazards or corrosion. They are also used on occasions where there is a possibility of bumping the head against a fixed object.

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

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

Manufacturer's Name

ANSI Z89.1-1969 (or later year)

Class A

Fit

Headbands are adjustable in ½-size increments. When the headband is adjusted to the right size, it provides sufficient clearance between the shell and the headband. The removable or replaceable type sweatband should cover at least the forehead portion of the headband. The shell should be of one-piece seamless construction and designed to resist the impact of a blow from falling material. The internal cradle of the headband and sweatband forms the suspension. Any part that comes into contact with the wearer's head must not be irritating to normal skin.

Inspection and Maintenance

Hard hat manufacturers should be consulted with regard to paint or cleaning materials for their helmets because some paints and solvents may damage the shell and reduce protection by physically weakening it or negating electrical resistance. **Employees should understand that they must not drill holes or cut their initials into hard hats.**

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

All components, shells, suspensions, headbands, sweatbands and any accessories should be visually inspected daily for signs of dents, cracks, penetration or any other damage that might reduce the degree of safety originally provided.

Users are cautioned that if unusual conditions occur (such as higher or lower extreme temperatures than described in the standards), or if there are signs of abuse or mutilation of the helmet or any component, the margin of safety may be reduced. If damage is suspected, helmets should be replaced or representative samples tested in accordance with procedures contained in ANSI Z89.1-1986.

Helmets should not be stored or carried on the rear-window shelf of an automobile, since sunlight and extreme heat may adversely affect the degree of protection.

Accessories

Faceshield Protection

Faceshield devices can be attached to the helmet without changing the helmet strength and electrical protection. A metal faceshield bracket system can be used on a Class A helmet; however, if a Class B helmet is to be used in an area where Class B protection is required, a type of bracket and shield system which will not conduct electricity (has a dielectric rating) should be used.

Ear Muffs

The required degree of hearing protection should be considered prior to selecting ear muff attachments. If ear muffs are to be attached to helmets, metal attachments are acceptable for Class A helmets. Attachments with a dielectric rating must be used for Class B helmets.

Sweat Bands

If sweat bands are necessary, they must not interfere with the effectiveness of the helmet headband system. Some sweatband devices are made to fit on the headband. For electrical work, metal components must not be used to attach sweatbands to helmets.

Winter Liners

There are many varieties of winter liners. One type fits over the hard hat assembly. It is flame retardant and elasticized to give the user a snug, warm fit. Other styles fit under the helmet. If the liner is to be used with a Class B helmet, it must have a dielectric rating. Regardless of the warmth characteristics, the liner and helmet combination should be compatible. The liner and helmet must fit properly to give the employee proper impact and penetration protection.

Chin Straps

When wind or other conditions present the possibility of the hard hat being accidentally removed from the head, chin straps can be used. If chin straps are used, they should be the type that fastens to the shell of the hard hat. If the chin straps fasten to the headband and suspension system, the shell may blow off and strike another employee.

4

Eye and Face Protection

General Information

Your eyes are two of your most valuable possessions. Almost everything you learn enters your brain through your eyes. Flying objects can also enter the brain through the eyes. Since the eye is one of the most vulnerable parts of the body, it is very important that you give your eyes the protection they deserve.

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

Most eye injury accident evaluations reveal that nine out of ten eye injuries could have been avoided if safety procedures had been followed and eye and/or face protection had been worn. Eye injuries are caused by flying particles, cuts, chemical burns, injurious light, heat rays and blows to the face and eyes. To prevent such injuries, many types of eye and face protection devices are available. Sometimes it is wise to use both eye and face protection. The face shield can serve as the first line of defense to protect against flying particles. The face shield can also protect other parts of the face and the throat.

The workplace hazard control program should include the evaluation of operations, procedures and equipment that might threaten the eyes and face and requirements for eye and face protection. The eye and face protection program should ensure that employees:

- Are aware of potential eye and face hazards in their job
- Have and use eye and face protection appropriate for the potential hazards involved
- Know that their PPE meets OSHA standards
- Have PPE that fits and does not in and of itself create a hazard
- Make certain their PPE is kept in a clean and reliable condition and replaced if damaged
- Understand when lighting is or is not adequate and compatible with the PPE being used
- Know the emergency procedures to follow in case of an accident to the eye or face

OSHA Requirements

OSHA standards 29 CFR 1910.133(a)(1) and 29 CFR 1926.102(a)(1) require eye and face protection devices to be provided and worn where there is a reasonable probability of injury which can be prevented by using such equipment. The standards require that employers make appropriate protective devices available and ensure that employees use such devices.

OSHA Standards 29 CFR 1910.133(b) and 29 CFR 1926.102(b)(2) state criteria and guidelines for eye and face protection. The design, construction, testing and use of eye and face protection required by these sections shall meet the requirements specified in ANSI Z87.1-1968 and ANSI Z87.1-1989 (Practice for Occupational and Educational Eye and Face Protection), as appropriate to the standard and device. Eye and face protection devices should protect against the intended hazard and be:

- Marked to identify the manufacturer
- Reasonably comfortable
- Of proper fit
- Durable
- Capable of being disinfected
- Easy to clean
- In good repair

Eye Protection

In OSHA construction standard 29 CFR 1926.102(a)(5) a table is provided to guide the selection of eye and face protection. Figure 2 illustrates and lists protective devices based on types of workplace hazards. An industrial hygienist can help select eye protection for radiation, chemical hazards and some types of heat hazards. Fitting protective goggles and spectacles to an individual worker should be done by someone skilled in the procedure.

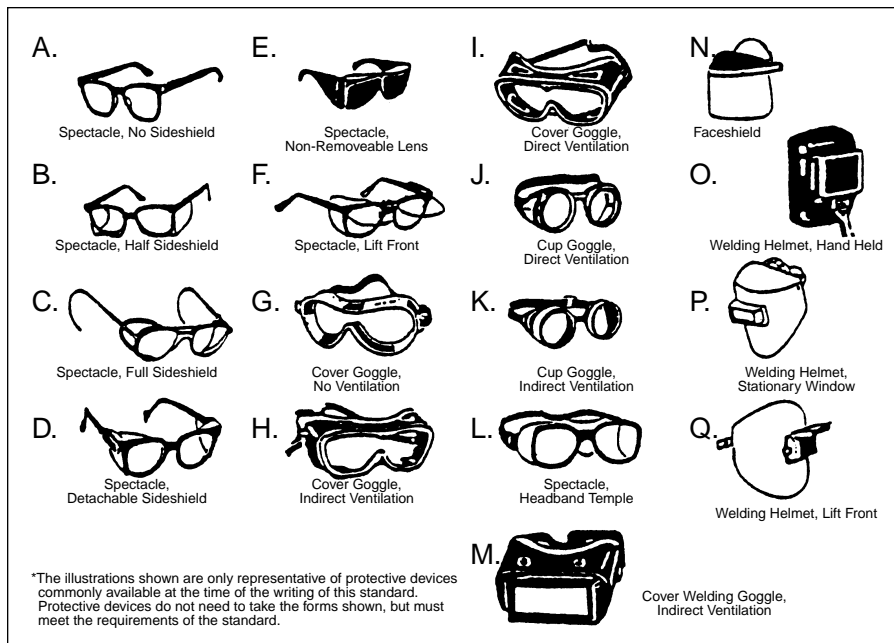
Spectacles

Spectacles are available in a wide variety of styles and colors. They can be equipped with or without side shields, depending on the potential hazards involved. Figure 2 (item A) depicts an example of a spectacle with no sideshield, for use where only frontal protection only is required. Spectacles with full or half sideshields are for use where side protection is desired. *Always use the protection needed for the highest level of hazard that could occur.* For example, it is wise policy to use sideshields throughout a machining or grinding work area.

Lenses can be made of polycarbonate (plastic) or heat treated or chemically treated glass. The most common lens is the polycarbonate type. It is lightweight and has superior projectile impact resistance. Either type of lens material can be prescription ground. Persons wearing contact lenses are additionally required to wear eye and face protection if the impact hazard exposure is located in a hazardous environment.

Frames are also made of a variety of materials. Metal frames should not be used in an electrical hazard area. The manufacturer should warrant that lenses and frames meet the ANSI Z87.1 standard requirements.

Figure 2
Eye and Face Protection Devices



Goggles

People who wear prescription glasses and are exposed to eye impact hazards must either wear safety glasses with prescription lenses or wear goggles designed to be worn over their regular prescription eye wear. Goggle frames are molded of oil resistant synthetic rubber, natural rubber and vinyl. Figure 2 (items G through K) illustrates different goggle configurations. Goggles that offer ventilation are important where fogging is a problem. In work areas with smoke, dust, chemical splashes or fumes that could irritate the eyes, goggles with no ventilation capacity may be safer. *Always select goggle protection against the highest level of hazard that could occur in the workplace environment.*

Figure 3
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 inch to 6 inches.....	4 or 5
Heavy cutting, over 6 inches.....	5 or 6
Gas welding (light), up to 1/8-inch.....	4 or 5
Gas welding (medium), 1/8-inch to 1/2-inch.....	5 or 6
Gas welding (heavy), over 1/2-inch.....	6 or 8

Note: In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation.

Goggle lens materials include polycarbonate, acetate and glass. For environments where high humidity or fogging is a problem, anti-fogging lenses are available. Welding goggles with filter lenses require filter lens shade numbers for protection against the particular welding operation radiant energy hazard. Use the table in figure 3 (from 29 CFR 1910.252) to select the proper shade number. Laser beam protective lenses are also available.

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

Inspection and Maintenance

It is essential that the lenses of eye protectors be kept clean. Continuous vision through dirty lenses can cause eye strain—a commonly used excuse for not wearing the eye protectors. Daily inspection and cleaning of the eye protector with soap and hot water, or with a cleaning solution and tissue, is recommended.

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

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

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

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

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

Face Protection

Faceshields provide extra protection. ANSI Z87.1-1989 states that “faceshields shall only be worn over primary eye protection.”

Faceshields provide additional protection for the nose, mouth and throat. Faceshields do not protect employees from impact hazards. Use faceshields in combination with goggles or safety spectacles when you must protect employees from impact hazards, even in the absence of dust or potential splashes. There must be a program to maintain faceshields in a clean and reliable condition. Faceshields are frequently used by more than one person. When not in use, faceshields should be properly stored and not left lying on a workbench or hanging on a wall where they could collect dust and grime.

Plastic faceshields are available in acetate, polycarbonate and Lexan. The shield thickness is generally 0.04 or 0.06 inches; however, thicker shields are available. For severe exposure hazards it is generally recommended that 0.06 inch polycarbonate or Lexan be used. These thickness and material combinations offer a superior projectile impact resistance safety factor. Reflecting metal screen face shields are available for workplaces where radiant heat is a potential hazard. Headgear and hard hat brackets can be obtained to attach the faceshield to a hard hat or directly to the head. Dielectric headgear or hard hat brackets are available for use in work areas where potential electrical hazards exist.

Another form of face protection is the welding helmet. Such helmets are equipped to hold shaded filter lenses to protect against optical radiation (see figure 2). The helmets also protect against molten metal splatter. Extended crowns on helmets can protect the top of head.

5

Gloves—Hand and Arm Protection

General Information

Approximately 25 percent of workplace injuries are to employees' hands, fingers and arms. These injuries account for approximately 30 percent of workers' compensation costs. The hands and fingers are used to accomplish many hazardous workplace activities. They must be protected from injury.

Hand, arm and finger protective equipment is available in a great variety of types and materials. Gloves help protect against chemicals, surface heat, radiant heat, extreme cold, splinters, abrasion, cuts and electrical shock. The workplace hazard control program should carefully assess all work areas for hand and arm protection needs. The proper use of gloves can reduce accidents and associated losses and also help increase production.

The length of gloves should be determined for splash protection, arm immersion in any solution or any exposure to other types of hazards. The proper size and fit of gloves are also important considerations. If gloves are too large they may be uncomfortable and accidentally come off at the wrong time. If they are too small they can bind the hand and cause hand fatigue. The correct glove size is double the width (inches) of the palm at its widest point.

Before purchasing gloves, the employer should request documentation from the manufacturer that the gloves meet the appropriate test standard(s) for the hazard(s) anticipated. For example, for protection against chemical hazards, the toxic properties of the chemical(s) must be determined—particularly, the ability of the chemical(s) to pass through the skin and cause systemic effects.

OSHA Requirements

OSHA standards 29 CFR 1910.132(a) and 29 CFR 1926.28(a) require that PPE be provided to protect employees' extremities whenever it is necessary by reason of hazards of processes or the environment. The PPE must also be maintained in a sanitary and reliable condition.

There are specific requirements for hand protection for electrical workers. Rubber is considered the best material for insulating gloves and sleeves from the shock and burn hazards encountered in electrical work. Rubber insulating gloves for general industry electrical workers must meet the requirements in 29 CFR 1910.137 and for construction industry workers, the requirements in 29 CFR 1926.951(a) (ANSI J6.6-1971).

Hand and Arm Protection

Cut-Resistant

When engineering and work practice controls fail to eliminate the risk of injury to employee hands or arms, protective gloves are the primary means of protecting their hands. When the risk of injury includes the arm, protective sleeves, often attached to the gloves, may be appropriate. Nature of the hazards(s) and the operation to be performed will determine your selection of gloves.

The meat packing and poultry processing industries typically use metal mesh hand, wrist, arm and finger protective wear to protect against knife cuts. This type of glove can be used in other industries where protection against cuts is required. Plastic dots can be adhered to the metal mesh to facilitate gripping. Another type of cut-resistant glove combines stainless steel with cut-resistant fiber wrapped with nylon fibers for enhanced flexibility and surface softness. These materials resist knives, glass, sheet metal, sharp edges and other cutting surfaces. They are cut resistant but not cut proof or puncture proof. These materials must not be subjected to high-speed knives or serrated blades.

High and Low Temperatures

Gloves, mittens, and arm and sleeve protectors are available in a wide variety of materials. Leather is a common welder's glove material. Heavy duty terrycloth gloves can provide heat protection of up to 350 F. For extreme high and low temperature protection, specially processed silica fiber cloth (nonasbestos) can withstand temperatures from -100 F to 1,100 F. *Do not use asbestos gloves.*

Splinters, Cuts, Abrasions and General Use

Lightweight pigskin, goatskin or calfskin leather gloves enable dexterity and grip while offering some resistance to cuts and abrasions. Other materials that offer similar protection include laminated nitrile coating on stretch fabric; vinyl impregnated stretch fabric; vinyl, rubber or nitrile coated cotton; and other combinations of PVC, neoprene, vinyl, rubber coated or impregnated fabrics.

Electrical Protection

Employers must make certain that rubber devices to protect against electrical shock meet the ANSI J6 series standards. Rubber insulating gloves must meet ANSI J6.6. These gloves are available to meet different voltage exposures. Lightweight low voltage gloves are for use on voltages of under 1,000. Gloves for use on high voltage are of thicker material for the dielectric strength. As the use voltage rating increases so does the glove weight. Leather glove protectors are available to protect electrical linemen's rubber gloves against punctures and abrasion. Employees who use this type of equipment must be *qualified* (see 29 CFR 1910.331(a)). Rubber gloves must be visually inspected and an "air" test must be performed before they are used.

Repetitive Motion and Vibration

New forms of technology have brought about injuries known collectively as cumulative trauma disorders. Protective gear is now available to help minimize repetitive hand and wrist motions. Gloves are also being marketed to provide protection against vibration. One such glove has openings for the fingers but offers palm protection. These anti-vibration gloves may be worn under regular work gloves.

Chemicals

Glove materials used to protect against chemicals include natural rubber, neoprene, polyvinyl chloride, polyvinyl alcohol and nitrile. Chemical degradation guides are available to help you determine the general suitability of various glove materials to exposures of specific chemicals.

There are many operational variables that may affect the performance of chemical protection gloves, including chemical combinations and concentrations, temperature, and exposure time. The employer is responsible for determining the suitability of the glove material for the job. Upon request, most glove manufacturers will furnish samples of materials to help you determine the best material for the specific chemical.

6

Foot and Leg Protection

General Information

In an average lifetime our feet will carry us 65,000 miles. That figures out to be approximately 11 round trips, coast to coast, across the United States. For our feet to accomplish that considerable feat, their 52 bones, 60 joints, 38 muscles and 114 ligaments must work very hard. Obviously we do not want these valuable body parts to become injured. They provide mobility we need to work and enjoy life.

The typical foot injury, according to the BLS study cited earlier, was caused by objects falling less than 4 feet and having a median weight of about 65 pounds. As with most of the injuries studied, most workers were conducting normal job activities when they suffered a foot injury.

Good footwear provides comfort, supports the body and reduces fatigue. Proper shoe size helps employees avoid foot maladies such as ingrown toe nails. Properly designed shoe soles can provide secure footing for a variety of different workplace environmental conditions. Safety shoes can prevent foot bruises, resist punctures and minimize injuries. There are many safety shoe manufacturers that will gladly help you set up a safety shoe program.

Most safety shoes use metal toe caps built into the toe of the shoe. Nonmetal toe guards are available for employees who must pass through metal detecting devices for security purposes. There are other workplace environments, such as electrical work, where nonmetal safety shoes must be used.

Other footwear protective devices are available. Foot and toe guards can fit over shoes. Employees who require special shoes can wear these devices over their shoes. For leg and ankle protection, the employer can obtain separate shin, knee or ankle guards. Some guards combine all or part of these features into one integrated guard.

Protective spats and leggings can be used to protect all or part of the leg from the ankle to the knee. These guards are generally used to protect employees against molten metal or hot sparks. They can be equipped with Velcro-type closures that can allow quick removal in case of emergency.

OSHA Requirements

Safety footwear is classified according to its ability to meet minimum requirements for both compression and impact tests. These requirements and testing procedures may be found in American National Standards Institute standards. Protective footwear purchased prior to July 5, 1994, must comply with ANSI Z41.1-1967, *USA Standard for Men's Safety-Toe Footwear*. Protective footwear purchased after July 5, 1994, must comply with ANSI Z41-1991, *American National Standard for Personal Protection-Protective Footwear*. These requirements apply to both the construction and general industries in the OSHA standards (see 29 CFR 1926.28(a) and 29 CFR 1910.136). Safety shoes must be kept in reliable condition. Safety shoes must protect against the specific workplace hazard(s) involved.

Foot and Leg Protection

Safety Shoes

There are many styles of shoes available as well as different materials and construction. Dress shoes with safety toes are difficult to distinguish from ordinary dress shoes. A safety shoe program can provide acceptable safety footwear for management, supervisors and operations personnel.

Special safety shoes without laces or eyelets can be obtained for protection where molten metal and/or welding sparks are a hazard. For those types of exposures, leather or heat- and flame-resistant shoe material construction should be used. Where there is a hazard of protruding nails or sharp objects on the walking surface, safety shoes should be equipped with metal inner soles. For electrical workers and those who

have to work in classified or security areas, nonmetal toe guards, eyelets, and other shoe construction components are available. For special foot protection needs you should contact a safety shoe manufacturer or distributor.

Safety Shoe Accessories

Storm rubbers that slip on over the safety shoe provide a nonskid tread for fall protection on slippery walking surfaces. One such shoe has a storm rubber sole with safety bars of aluminum oxide molded into the tread. Not only are storm rubbers good for fall protection, they also provide excellent protection for inside or outside work where water, oil, or chemicals could damage the safety shoe outer shell.

Lightweight metal or plastic toe and/or instep shoe caps offer protection where marginal foot hazards exist. These devices can be quickly slipped on over safety or street shoes. They are not intended to replace safety shoes.

Leg Protection

Over the sock or over the safety shoe boots are available. Boot outer shell materials include PVC, rubber, butyl and neoprene. Temperature, abrasion and chemical exposures in the workplace must be considered in the selection of the material.

Protective spats and leggings offer protection against chain saws, high heat, flame, molten metal splashes and hot sparks. Material construction includes leather, flame-retardant duck, aluminized rayon and other aluminized fabrics. Quick release legging Velcro closures should be used when any emergency would require the legging to be quickly removed.

Other PPE

Ear Protection

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

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

Some earplugs are disposable, to be used one time and then thrown away. The nondisposable type should be cleaned after each use for proper protection. Plain cotton is ineffective as protection against hazardous noise.

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

The N.C. Department of Labor publishes a separate guide on occupational hearing protection (e.g., Industry Guide #15, *Developing and Maintaining an Effective Hearing Conservation Program*). Please see inside back cover of this publication for more information. For additional, specific information on a hearing conservation program, see OSHA standard 29 CFR 1910.95, *Occupational Noise Exposure*.

Respiratory Protection

Regulations concerning the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, vapors, or in oxygen-deficient environments can be found in OSHA standard 29 CFR 1910.134.

Torso Protection

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

Selection

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

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

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

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

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

8

Fall Protection

General Information

The focus of this part is to provide general information and address protection devices and systems that pertain to requirements of standard for fall protection. The fall protection standard deals with both the human and equipment-related issues in protecting workers from fall hazards. According to data as provided OSHA through the U.S. Department of Labor, between 150 and 200 workers are killed and more than 100,000 are injured as a result of falls at construction sites. Slips, trips and falls constitute the majority of general industry accidents.

OSHNC requires fall protection in construction when working from unguarded surfaces above six feet (or 10 feet on scaffolds) or at any height when above dangerous machinery or equipment. For general industry, the standard requires every open-sided floor, walkway, platform or runway 4 feet or more above adjacent floor or ground level be guarded by a standard railing or equivalent. Also as applicable to general industry, the standard states regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, and similar hazards must be guarded with a standard railing and toeboard.

Under guidelines of the standard, employers are able to select fall protection measures compatible with the type of work being performed. Fall protection generally can be provided through the use of guardrail systems, safety net systems, personal fall arrest systems, positioning device systems and warning line systems, among others.

When workers are exposed to falls during building or bridge construction, safety nets may be used. Safety nets are generally viewed as backup safety devices rather than primary life-saving devices. Safety belts, harnesses and lanyards attached to a structure or lifeline are primary life-saving devices for employees who work at high elevations. For work at low elevations, such as in confined spaces, the safety harness or belt and lanyard system can be used to retrieve an injured or incapacitated person.

Before a fall arrest system is used and after any fall arrest component or system is changed, employees must be trained to use the system safely. Fall arrest systems must be inspected prior to each use for mildew, wear, damage and other deterioration. Defective components must be removed from service. Any fall arrest systems or components subjected to impact loading (such as an accidental fall) must be immediately removed from service. It must not be used again for employee protection unless a competent person inspects the system or component, determines it to be undamaged, and authorizes its reuse.

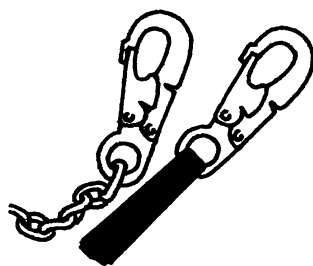
Ladder safety climb systems combine the safety harness or belt and lanyard with a rope or rail type grab device. Ladder safety climb devices can be used on water towers, radio and television antenna towers, and other high structures to provide the user safety as well as a system that reduces the effort required to climb very high ladders.

Should an employee pass out while on the ladder and while at a high elevation, another employee with his or her own ladder climb device can safely ascend the ladder and retrieve the disabled employee. Ladder safety devices can be used in lieu of cage protection on ladders over 20 feet in height in unbroken lengths.

Notice

In North Carolina, employers must make sure that employees now use locking type snaphooks to attach personal fall arrest equipment to the fall protection system in use. This rule is in effect throughout this state and being enforced by the N.C. Division of Occupational Safety and Health.

Effective January 1, 1998, body belts are no longer acceptable as part of an employee personal fall arrest system in either North Carolina or the rest of the United States. In general, this will mean using full body harnesses in their place.



Locking Type Snaphooks



Full Body Safety Harness

Safety Harnesses and Belts

The employee fall arrest system should be selected after considering such factors as the presence of sand, extreme heat or cold, solvents, acids, lubricants, and other factors that could have an adverse effect on the equipment. Free-fall distance should be kept to six feet or less. Wire rope fall arrest systems should not be used where an electrical hazard is present. If lanyards, connectors and lifelines are subject to damage by work operations such as welding or sandblasting, exposed fall arrest system components must be protected. Design, system performance criteria, care and use, and inspection requirements for fall arrest systems for powered platforms are contained in 29 CFR 1910.66, appendix C. These same considerations should be observed for fall arrest systems for any operation. ANSI A10.114-1975 should be consulted to resolve questions regarding the type of safety harness or belt and lanyard to use for a particular job.

Ladder safety devices may be used in lieu of cage protection on tower, water tank and chimney ladders over 20 feet in unbroken length. No landing platform is required in these cases. (See 29 CFR 1910.27(d)(5).)

The waist safety belt can be used is used with some ladder climb safety systems. Although a fall may be arrested with a waist belt and lanyard, serious injury can result if the free-fall distance is not restricted to six inches or less. A waist belt can cause severe internal injuries if it arrests an employee's free-fall from as little as three feet.

If there is a possibility of a free-fall between two and six feet, the full body harness must be used. An employee fall arrest system must be rigged so that an employee can neither free-fall more than six feet nor contact any lower level. The full body harness allows a portion of the shock load to be transmitted to the buttocks and thighs, thereby preventing serious injury. From a fall arrest comfort standpoint (to minimize thigh strap pull-up in the crotch) thigh straps should be attached to the shoulders and waist on the back only.

ANSI standard class 4 suspension belts are for independent work support to suspend a worker. Examples are boatswain's chairs, tree trimmer belts, and raising and lowering harnesses. A tree trimmer belt is designed to be used as a positioning and sole support belt, similar to a boatswain's chair. The D-rings are located in the front so in the event of a free-fall the arresting force is from the chest to the back. Since this would cause the body to be bent backwards, causing severe injury, a class 4 belt must not be used as part of a personal fall arrest system.

Lanyards, Deceleration Devices and Lifelines

A lanyard is a flexible line of rope, wire rope or strap used to secure the body belt or body harness to a deceleration device, lifeline or anchorage. If deceleration devices are used, they either have lanyards to attach to the belt D-ring or the manufacturer will specify the type of lanyard to use. Lanyards and vertical lifelines to tie off one person must have a minimum breaking strength of 5,000 pounds. Nylon rope has the greatest shock absorbing characteristics. Straps (webbing) can be used where abrasion resistance is required. Other synthetic fiber ropes such as polyester and polypropylene are available. Select the type of material on the basis of the workplace environment. The D-rings and locking snaphooks must be capable of sustaining a minimum tensile load of 5,000 pounds. Locking snaphooks must be sized to be compatible with the member to which they are to be connected so as to prevent unintentional disengagement.

Ropes and straps (webbing) used for lanyards, lifelines, and strength components of body belts and body harnesses must be made of synthetic fiber or wire rope. Leather body belts must not be used. A 2 inch wide by ¼ inch thick steer hide strap will break at around 1,500 pounds. A 1½ inch wide by ¼ inch thick cotton webbing nylon filled strap will break at 5,000 pounds.

Several types of fall arrest and restraint devices are available to meet specific industrial or construction industry needs. Mobile and static type rope grab devices for both fiber rope and steel wire cable can move up or down the lifeline so that they can be kept adjusted at or above the shoulder to limit free-fall.

Self-retracting lifelines and lanyards can limit a freefall to less than two feet. These devices allow the worker to move about while working. The spring tensioned cable retracts into the block as the worker moves toward the unit and pulls out as the worker moves away from the block. If a fall does occur, the device locks and suspends the worker until rescue is accomplished.

A vertical lifeline used to tie off one employee must have a minimum breaking strength of 5,000 pounds. The manufacturer or distributor should supply test data verifying that the design, performance and testing requirements of the standards have been met.

The following industry guides are available from the N.C. Department of Labor's Division of Occupational Safety and Health:

- #1. A Guide to Safety in Confined Spaces*
- #2. A Guide to Procedures of the Safety and Health Review Board of North Carolina*
- #3. A Guide to Machine Safeguarding*
- #4. A Guide to OSHA in North Carolina*
- #5. A Guide for Persons Employed in Cotton Dust Environments*
- #6. A Guide to Lead Exposure in the Construction Industry*
- #7. A Guide to Bloodborne Pathogens in the Workplace*
- #8. A Guide to Voluntary Training and Training Requirements in OSHA Standards*
- #9. A Guide to Ergonomics*
- #10. A Guide to Farm Safety and Health*
- #11. A Guide to Radio Frequency Hazards With Electric Detonators*
- #12. A Guide to Forklift Operator Training*
- #13. A Guide to the Safe Storage of Explosive Materials*
- #14. A Guide to the OSHA Excavations Standard*
- #15. A Guide to Developing and Maintaining an Effective Hearing Conservation Program*
- #17. A Guide to Asbestos for Industry*
- #18. A Guide to Electrical Safety*
- #19. A Guide to Occupational Exposure to Wood and Wood Dust*
- #20. A Guide to Crane Safety*
- #21. A Guide to School Safety and Health*
- #23. A Guide to Working With Electricity*
- #25. A Guide to Personal Protective Equipment*
- #26. A Guide to Manual Materials Handling and Back Safety*
- #27. A Guide to the Control of Hazardous Energy (Lockout/Tagout)*
- #28. A Guide to Eye Wash and Safety Shower Facilities*
- #29. A Guide to Safety and Health in Feed and Grain Mills*
- #30. A Guide to Working With Corrosive Substances*
- #31. A Guide to Formaldehyde*
- #32. A Guide to Fall Prevention in Industry*
- #33. A Guide to Office Safety and Health*
- #34. A Guide to Safety and Health in the Poultry Industry*
- #35. A Guide to Preventing Heat Stress*
- #36. A Guide to the Safe Use of Escalators and Elevators*
- #37. A Guide to Boilers and Pressure Vessels*
- #38. A Guide to Safe Scaffolding*
- #39. A Guide to Safety in the Textile Industry*
- #40. A Guide to Emergency Action Planning*
- #41. A Guide to OSHA for Small Businesses in North Carolina*

Occupational Safety and Health (OSH) Sources of Information

You may call 1-800-NC-LABOR (1-800-625-2267) to reach any division of the N.C. Department of Labor; or visit the NCDOL home page on the World Wide Web, Internet Web site address: <http://www.nclabor.com>.

N.C. Division of Occupational Safety and Health

Mailing Address:
1101 Mail Service Center
Raleigh, NC 27699-1101
Local Telephone: (919) 807-2900 Fax: (919) 807-2856

Physical Location:
111 Hillsborough St.
(Old Revenue Building, 3rd Floor)

For information concerning education, training and interpretations of occupational safety and health standards contact:

Bureau of Education, Training and Technical Assistance

Mailing Address:
1101 Mail Service Center
Raleigh, NC 27699-1101
Telephone: (919) 807-2875 Fax: (919) 807-2876

Physical Location:
111 Hillsborough St.
(Old Revenue Building, 4th Floor)

For information concerning occupational safety and health consultative services and safety awards programs contact:

Bureau of Consultative Services

Mailing Address:
1101 Mail Service Center
Raleigh, NC 27699-1101
Telephone: (919) 807-2899 Fax: (919) 807-2902

Physical Location:
111 Hillsborough St.
(Old Revenue Building, 3rd Floor)

For information concerning migrant housing inspections and other related activities contact:

Agricultural Safety and Health Bureau

Mailing Address:
1101 Mail Service Center
Raleigh, NC 27699-1101
Telephone: (919) 807-2923 Fax: (919) 807-2924

Physical Location:
111 Hillsborough St.
(Old Revenue Building, 2nd Floor)

For information concerning occupational safety and health compliance contact:

Safety and Health Compliance District Offices

Raleigh District Office (313 Chapanoke Road, Raleigh, NC 27603)
Telephone: Safety (919) 662-4597 Fax: (919) 662-4709
Health (919) 662-4711

Asheville District Office (204 Charlotte Highway, Suite B, Asheville, NC 28803-8681)
Telephone: (828) 299-8232 Fax: (828) 299-8266

Charlotte District Office (901 Blairhill Road, Suite 200, Charlotte, NC 28217-1578)
Telephone: Safety (704) 342-6163 Fax: (704) 342-5919

Winston-Salem District Office (901 Peters Creek Parkway, Winston-Salem, NC 27103-4551)
Telephone: Safety (336) 761-2700 Fax: (336) 761-2326
Health (336) 761-2700 Fax: (336) 761-2130

Wilmington District Office (1200 N. 23rd St., Suite 205, Wilmington, NC 28405-1824)
Telephone: (910) 251-2678 Fax: (910) 251-2654

To make an OSHA Complaint, **OSH Complaint Desk:** (919) 807-2796

For statistical information concerning program activities contact:

Planning, Statistics and Information Management

Mailing Address:
1101 Mail Service Center
Raleigh, NC 27699-1101
Telephone: (919) 807-2950 Fax: (919) 807-2951

Physical Location:
111 Hillsborough St.
(Old Revenue Building, 2nd Floor)

For information about books, periodicals, vertical files, videos, films, audio/slide sets and computer databases contact:

N.C. Department of Labor Library

Mailing Address:
1101 Mail Service Center
Raleigh, NC 27699-1101
Telephone: (919) 807-2848 Fax: (919) 807-2849

Physical Location:
111 Hillsborough St.
(Old Revenue Building, 5th Floor)

N.C. Department of Labor (Other than OSH)

1101 Mail Service Center
Raleigh, NC 27699-1101
Telephone: (919) 733-7166 Fax: (919) 733-6197