

Module 4: Personal Protective Equipment Pages 153 - 173

In many cases, even trenches that are less than 5 feet deep must be secured. Protective systems are used to ensure that trenches do not collapse onto workers.

Guardrails and Suspended Load Clearances

Guardrail requirements can actually create a hazard at the leading edge of installed floor or roof sections by creating the potential for employees to be caught-in-between guardrails and suspended loads. Ensure there is an allowance for a clear workspace or path through which to guide any suspended load into position for placement and welding of members. Operational plans must always allow for adequate work areas in which to move suspended loads.

Stacking Building Materials

Building materials must be stacked in such a way as to prevent their toppling over. Always allow enough space around stacks of materials or wide walkways to allow workers to quickly move out of the way in case materials slide or are accidentally pushed over.

Lesson Summary

Operational plans must always allow for adequate work areas in which to move suspended loads. While guardrails are a critical engineering control used to protect workers from falling, they can pose a caught-in-between hazard under certain circumstances. Guardrail requirements can actually create a hazard at the leading edge of installed floors or roof sections by creating a possibility of employees being caught in between guardrails and suspended loads. Because workers can also be caught in between the sides of a collapsed trench that is not properly braced, or warehoused construction materials which were not correctly stacked to prevent sliding, engineering and workplace controls like shoring, fall protection systems, and properly stacking building materials are essential to keep workers safe.

Module 4: Personal Protective Equipment

Module Description

This module will provide employers and employees alike with knowledge concerning the proper selection, care, and use of Personal Protective Equipment (PPE). They also will be informed of the requirements for compliance with OSHA requirements.

Module Learning Objectives

At the conclusion of this module, students will be able to:



- Describe the role of PPE in controlling exposure to hazards in the workplace
- Identify parts of the body most vulnerable to injury and name hazards associated with each
- Describe the appropriate PPE to be worn for worker safety

Lesson 1: Introduction to Personal Protective Equipment

Lesson Focus

At the end of this lesson, students will be able to:

- Explain what personal protective equipment is and why it is used
- Explain OSHA's personal protective equipment standards
- List the employer's responsibilities
- List the employee's Responsibilities

What Is Personal Protective Equipment?

Personal protective equipment, commonly referred to as "PPE", is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests, and full body suits.

All personal protective equipment should be safely designed and constructed, and should be maintained in a clean and reliable fashion. It should fit comfortably, encouraging worker use. If the personal protective equipment does not fit properly, it can make the difference between being safely covered or dangerously exposed. When engineering, work practice, and administrative controls are not feasible or do not provide sufficient protection, employers must provide personal protective equipment to their workers and ensure its proper use. Employers are also required to train each worker required to use personal protective equipment to know:

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

If PPE is to be used, a PPE program should be implemented. This program should address the hazards present; the selection, maintenance, and use of PPE; the training of employees; and monitoring of the program to ensure its ongoing effectiveness.

Personal Protective Equipment Standards



The Occupational Safety and Health Administration requires that, when necessary, employers establish and administer an effective Personal Protective Equipment (PPE) program for employees in order to reduce the effects of workplace hazard exposure and, as a result, the workplace accident rate.

OSHA Requires: "Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact." [1926.95(a)]

Payment for PPE

When PPE is required to protect employees, it must be provided by the employer at no cost to the employees, except for specific items, including:

- Safety-toe footwear, including steel-toe shoes or steel-toe boots, not limited to the worksite
- Prescription safety eyewear
- Everyday clothing and weather-related gear and
- Logging boots

Employer Responsibilities

Hazard Assessment

The employer must assess the workplace to determine if hazards are present, or likely to be present, that may necessitate the use of personal protective equipment. While an employer's first responsibility upon identification of a workplace hazard is to eliminate it through the use of engineering controls and administrative controls, PPE often is the final solution for remaining hazards.

Physical Hazards

Physical hazards include:

- Repetitive or awkward motion
- High and low temperatures
- Light radiation
- Welding
- Brazing
- Heat treating
- High intensity lighting
- Falling objects
- Sharp objects



- Sources of rolling or pinching objects
- Electric hazards
- Hazardous floor conditions

Health Hazards

Health hazards include:

- Types of chemicals an employee could be exposed to
- Harmful dusts, fumes, and mists
- Radiation
- Noise

Selection of PPE

The selection of personal protective equipment depends on the hazard the worker needs to be protected against, the level of hazard present, and the availability of suitable equipment. Individual components of clothing and equipment should be assembled to both protect the worker from the specific hazard, as well as minimize any hazards (such as tripping) that might arise from the PPE itself. PPE should, wherever possible, be provided for the exclusive use of a single employee.

Periodic reevaluation of the selection is necessary in order to deal with changes in workplace conditions or wearer activities. The type of PPE selected is very important; different brands of PPE should be tried by workers to get the best possible protection. For example, using the wrong types of gloves to work with solvents can lead to ineffective protection.

Training

The employer must provide training to each employee using PPE. This training should include at least the following:

- When and why PPE is necessary
- What PPE is required for certain jobs
- How to properly put on, take off, adjust, and wear PPE
- The limitations of the PPE
- The proper care, maintenance, useful life, and disposal of PPE
- How damaged, worn out, or defective PPE can be replaced

Maintenance

All PPE should be inspected for tears, leaks, punctures, breaks, contamination, or signs of wear before use. Damaged or defective equipment should not be used. PPE should be stored carefully and kept clean to prevent damage. Contaminated PPE that cannot be decontaminated should be disposed of properly.



Recordkeeping

The employer must maintain records of the workplace hazard assessment and employee training.

Employee Responsibilities

Employees are responsible for the following:

- Attending all required training sessions regarding PPE
- Wearing PPE as required and trained
- Cleaning, maintaining, and caring for PPE as required and trained
- Reporting potential hazards they identify to their supervisors
- Informing their supervisors or safety managers of the need to repair or replace PPE
- Following all warnings and precautions.
- Listening to and following directions from supervisors or safety managers

Case Study

This accident occurred in a cellophane-tape manufacturing factory during work to wash a drum that contained an adhesive. The victim, who was on the night shift, was working with a group leader to monitor the machine that applies a coat of adhesive and to conduct sampling inspections. While they were taking turns working in thirty-minute shifts, the victim did not return to work after a break. When the group leader searched for the victim, he found him unconscious, having fallen head-first into an empty drum that previously contained adhesive. Although the victim was immediately taken to the hospital for emergency treatment, he never regained consciousness. It was discovered that a group leader on the day shift had washed the drum with toluene, before the task was transferred to the night shift workers at the time of the shift-change meeting.

What do you think went wrong?

- Ventilation was not used at a site where toluene was used.
- The victim bent forward to wash the inside of the drum that still contained toluene vapor.
- The victim did not use a respirator during the washing work.

Lesson Summary

- Personal protective equipment, commonly known as PPE, is worn to minimize exposure to hazards, such as those resulting from chemical, physical, electrical, mechanical, or other sources.
- Common examples of PPE in construction include gloves, safety glasses, safety shoes, earplugs, earmuffs, hard hats, respirators, coveralls, vests, and body suits.



- All PPE should fit comfortably. If it does not fit properly, it may expose workers to hazards.
- Employers are responsible for the following:
 - Establishing a PPE program
 - Paying for necessary PPE for workers
 - Assessing the worksite for hazards
 - Selecting the most appropriate PPE
 - Training workers and supervisors on how to properly select and use PPE on the worksite
 - Maintaining PPE in good working condition
 - Keeping records of workplace hazard assessments and the necessary control methods, including PPE
- Employees are responsible for the following:
 - Attending all required training sessions regarding PPE
 - Wearing PPE as required and trained
 - Cleaning, maintaining, and caring for PPE as required and trained
 - Reporting potential hazards they identify to their supervisors
 - Informing their supervisors or safety managers of the need to repair or replace PPE
 - Following all warnings and precautions.
 - Listening to and following directions from supervisors or safety managers

Lesson 2: Eye, Face, and Respiratory Protection

Lesson Focus

At the end of this lesson, students will be able to:

- Describe proper eye and face protection as required by OSHA
- Describe proper respiratory protection as required by OSHA

Eye and Face Protection

Every day an estimated 1,000 eye injuries occur in American workplaces. The financial cost of these injuries is enormous—more than \$300 million per year is lost in production time, medical expenses, and workers compensation. However, no dollar figure can adequately reflect the personal toll these accidents take on injured workers and their families. Providing adequate, proper eye and face protection is crucial to a safe worksite.

What contributes to eye injuries at work?

- **Not wearing eye protection:** The BLS reports that nearly three out of every five workers injured were not wearing eye protection at the time of their accidents.



- **Wearing the wrong kind of eye protection for the job:** About 40% of the injured workers were wearing some form of eye protection when the accident occurred, but often, it was not the correct eye protection for the job being done.

What causes eye injuries at work?

- **Flying Particles:** The BLS found that almost 70% of the accidents studied resulted from flying or falling objects or sparks striking the eye. Injured workers estimated that nearly three-fifths of the objects were smaller than pin heads. Most of the particles were said to be traveling faster than hand-thrown objects when accidents occurred.
- **Contact with Chemicals:** Chemicals caused one-fifth of the injuries.
- **Other accidents:** Miscellaneous accidents were caused by objects swinging from a fixed or attached position—like tree limbs, ropes, chains, or tools pulled into an eye while a worker was using them.

Where do accidents occur most often?

Potential eye hazards can be found in nearly every industry, but BLS reported that more than 40% of injuries occurred among craft workers, like mechanics, repairers, carpenters, and plumbers.

Over a third of the 40% injured operated machinery, such as assemblers, sanders, and grinding machine operators. Laborers suffered about one-fifth of the eye injuries. Almost half the injured workers were employed in manufacturing; slightly more than 20% were in construction.

How can eye injuries be prevented?

- **Always wear effective eye protection:** To be effective, eyewear must be appropriate for the hazard and also must be properly fitted. All eye-protective equipment provided by an employer must meet ANSI Z-87.1 standards (American National Standards Institute).
- **Better training and education:** The BLS reported that most workers were hurt while doing their regular jobs. Workers injured while not wearing protective eyewear most often said they believed it was not required by the situation. Even though the vast majority of employers furnished eye protection at no cost to employees, about 40% of the workers received no information on when and what kind of eyewear should be used.
- **Maintenance:** Eye protection devices must be properly maintained. Scratched and dirty devices reduce vision, cause glare, and may contribute to accidents.



Eyewash Stations

Any time workers may be exposed to corrosive materials, employers must provide facilities for drenching or flushing the eyes and body. These facilities should be within the work area itself so that they can be accessed immediately in case of an emergency. To that end, eyewash stations should be located no more than 10 seconds away from the hazard area, meaning that workers should be able to reach one within 10 seconds of an accident. They should be located on the same level as the source of the hazard and the path of travel should be free of obstructions. The emergency equipment location should be well lit and identified with a highly visible sign.

If employees accidentally get something into their eyes, they must go directly to the eyewash station and flush their eyes with water for at least 15 minutes. They should hold the eyelids open and "look" directly into the water streams. They should NOT rub their eyes. Rubbing the eyes may scratch or embed particles. Employees should seek medical attention immediately.

Eye and Face Protectors

Common forms of eye and face protection include:

- **Safety glasses [spectacles]** are protective eyewear with safety frames and impact-resistant lenses, as well as built-in side shields or in some cases removable side shields. Safety glasses provide impact protection and do not typically provide protection against liquid splashes, mists, or vapors. If they do provide protection against those hazards, they will be marked as a splash protector. Always check safety glasses for marks reading "ANSI/ISEA Z87" which indicate they provide appropriate impact protection.
- **Goggles** are fitted eye protection that completely encloses the eyes and facial area immediately surrounding the eyes. Goggles of soft, pliable body design provide adequate eye protection from many hazards including impact, dust, mists, vapors, and splashes. These goggles are available with clear or tinted lenses and perforated, port vented, or non-vented frames. Goggles with direct ventilation typically are used for impact hazards and dusts, not for protection against chemical splashes or vapors. Goggles with indirect ventilation can be used for protection from dusts and splash hazards. Those with no ventilation can provide protection from impact, dusts, splashes, mists and vapors. Single lens goggles provide similar protection to spectacles and may be worn in combination with spectacles or corrective lenses to ensure protection along with proper vision. Check the goggle lens and body for specific "ANSI/ISEA Z87" marks indicating they provide appropriate impact protection.
- **Face shields** may be used in operations when the entire face needs protection and should be worn to protect the eyes and face against flying particles and metal sparks. Specifically designed shields also provide protection from chemical and biological splashes. Wearing a



face shield does not necessarily protect from impact hazards. Face shields may be lifted away from the face, so the wearer should put on safety glasses under the face shield to protect the eyes when the face shield is in the raised position.

- **Welding shields** with eye shields are designed to protect users from the visible and invisible (ultraviolet and infrared) rays a welding arc emits. Tinted shields should be provided to protect workers' eyes and face from infrared or radiant light burns, flying sparks, metal spatter, and slag chips encountered during welding, brazing, soldering, resistance welding, bare or shielded electric arc welding and oxyacetylene welding and cutting operations. Workers should protect their eyes from welding light by wearing a welder's helmet fitted with a filter shade that is suitable for the type of welding work they are doing. Tinted lenses are available in varying shades or degrees of tinting, and it's the employer's responsibility to provide the appropriate lenses for the hazard to be encountered.

Training

Employers must provide adequate training for all supervisors and workers who require eye and face protection to protect from any hazards or other conditions identified in the PPE Hazard Assessment. Training should include:

- Proper selection, fit, and use of eye and face protection
- Inspection and maintenance of eye and face protection
- How and where to obtain protective eyewear and replacements if necessary
- The manufacturer's instructions, warnings, cautions, and equipment limitations

Safe Work Practices

To ensure safe work practices are followed, employees must:

- Read and follow all warnings and precautions that may be found on equipment and hazardous materials
- Avoid throwing tools or participating in horseplay
- Keep sharp or pointed objects away from his or her eyes
- Follow the supervisor's or safety manager's suggestions and recommendations for working safely

Respiratory Protection

Inhalation is one of the most common ways dangerous particles often found on a construction site can enter the human body. To avoid the hazards associated with inhaling such particles, workers and employers should use four basic methods:



- **Substitution** involves replacing the hazardous material or process with a non-hazardous or less hazardous one.
- **Engineering controls** include enclosing the process so that contaminants do not get into the workspace, improving the ventilation, and changing the equipment or processes.
- **Administrative controls** include restricting access to contaminated areas, limiting the total time workers are exposed, and establishing housekeeping procedures to control exposure.
- **Personal protective equipment** includes respirators. PPE should always be the last resort for protecting workers. In some cases, however, respirators are the only effective means of protection available.

OSHA requires employers to use engineering control measures and/or substitution of less toxic materials to control inhalation hazards where feasible. When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators should be used. In any workplace where respirators are necessary to protect the health of employees, or whenever respirators are required by the employer, the employer should establish and implement a written respiratory protection program with worksite-specific procedures.

What is a Respirator and When is it Needed?

A respirator is a protective device that covers the worker's nose and mouth or the entire face and head to keep airborne contaminants out of the worker's respiratory system and to provide a safe air supply. There are two major categories of respirators:

- **Air Purifying Respirators** use a filter to purify the air as the worker breathes it in. Examples include:
 - Disposable Particulate Masks
 - Half Mask Respirators
 - Full Face Mask Respirators
 - Gas Masks
 - Powered Air Purifying Respirators
- **Supplied Air Respirators** use a supply line of fresh air or oxygen from a tank. Examples include:
 - Airline Respirators
 - Emergency Escape Breathing Apparatus
 - Self-Contained Breathing Apparatus (SCBA)

Selecting the Correct Respirator

The first step in selecting the correct respirator is to determine the level of hazard that is posed by the environment in which work will be done. There are five questions that are used to determine that level:

- What type of contaminant is present?
- What is the form of the contaminant?



- How toxic is the contaminant?
- What is the concentration of the contaminant?
- What will be the length and duration of the exposure?

Employees should always work with their supervisor or safety professional to determine the correct answers to these questions, which help select the appropriate NIOSH-certified respirator for the conditions present. Without the technical knowledge to make correct decisions, it's best to consult with an industrial hygienist or safety professional who is trained to provide professional guidance on proper respirator selection and use.

Before an employer provides any employee with a respirator to use in a workplace, the employer must create a formal written respiratory protection program and have every employee who will wear a respirator medically evaluated by a licensed healthcare professional. The program must contain the requirements for program administration, worksite-specific procedures, respirator selection, employee training, fit testing, medical evaluation, and respirator use, cleaning, maintenance, and repair.

Medical Evaluation

Workers assigned to tasks that require respirator use must be physically able to perform the work while using the respirator. A medical evaluation must be performed by a physician or other licensed health care practitioner (PLHCP) by using a medical questionnaire [Appendix C of the OSHA standard] or by a medical examination that provides the same information as the questionnaire. This evaluation must be done before the employee is fit tested and uses the respirator in the workplace.

Fit Testing

Not all respirators fit everyone. Different types of respirators and even different brands of the same type of respirator have different fits. Employers must provide a sufficient number of respirator models and sizes to ensure that every employee can select an acceptable respirator that fits properly.

Additionally, tight-fitting respirators cannot provide proper protection without a tight seal between the facepiece and the wearer's face. Therefore, fit testing is required for tight-fitting facepiece respirators before a worker uses one for protection.

A respirator fit test checks whether a respirator properly seals and fits the face of someone who wears it. The fit can be tested in two ways: qualitatively and quantitatively.

Qualitative fit testing involves using a harmless odoriferous or irritating substance in the breathing zone while the respirator is being worn. If no odor or irritation is detected by the wearer, this indicates a proper fit.

Quantitative fit testing uses a machine to measure respirator fit. The fit testing instrument numerically measures the amount of leakage into the respirator while the



wearer performs exercises that could cause facepiece leakage. If no leakage is detected, this indicates a proper fit.

Inspection before Use

Every time an employee uses a respirator, he or she must first inspect it. The facepiece, headband, valves, connecting tube, fittings, and any cartridges, canisters or filters must be in good condition to provide proper protection. To properly inspect a respirator before using it, one should look for:

- Chips or cracks in the faceplate
- Cracks or holes in the breathing tube or airlines
- Worn or frayed straps
- Worn or damaged fittings
- Bent or corroded buckles
- Dirty or improperly seated valves

Give special attention to rubber or plastic parts that can deteriorate or lose pliability. If you find anything wrong with your respirator, do not use it! Have it repaired or replaced immediately.

Training

Training is essential for correct respirator use. Employees must know how to properly select, use, and maintain respirators. Training must include an explanation of the following:

- Why respirator use is necessary
- Nature of the respiratory hazard and consequences of not fitting, using, and maintaining the respirator properly
- Reason(s) for selecting a particular type of respirator
- Capabilities and limitations of the selected respirator
- How to inspect, put on and remove, and check the seals of the respirator
- Respirator maintenance and storage requirements

Donning (putting on) a Respirator

When donning a respirator, workers should read the manufacturer's instructions carefully. They must be able to demonstrate proper donning of the respirator to their supervisor or to a safety professional. When using a tight-fitting respirator, the wearer must perform a user seal check to ensure that an adequate seal is created each time the respirator is put on. This involves conducting positive and negative pressure checks based on the manufacturer's recommendation.

- To conduct a positive pressure check, close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal.



- To conduct a negative pressure check, close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for ten seconds. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

IMPORTANT: User seal checks are not substitutes for qualitative or quantitative fit tests!

Case Study

This accident occurred during work to lift a drain pump through a manhole in a sewerage construction worksite.

The work was to replace the pipes for rainwater. As another drain pump became necessary, it was decided to use the drain pump from another manhole in which work was almost completed. Accordingly, two workers opened the cover of the manhole and entered, using a ladder.

After a short while, a colleague who was going to the material shed spotted the two workers lying at the bottom when he looked into the manhole. He raised an alarm with other workers, one of whom ran to the spot, entered the manhole, and called out to them but received no answer. Immediately afterwards, this worker also collapsed.

Although the three were taken to a hospital by a rescue team, the first two workers died, and the would-be rescuer was hospitalized with brain damage caused by hypoxia (a lack of oxygen).

The two fatalities were attributed to anoxia (meaning, without oxygen) inside the manholes.

What do you think were some of the causes?

- Although survey results had been provided by the client, neither the general contractor nor the subcontractor assessed the worksite as presenting the hazard of anoxia.
- The employer and supervisor failed to measure the oxygen content of the hole and to carry out ventilation measures before allowing any employee to enter.
- The project should have been declared a Permit Required, Confined Space, and all elements of OSHA's standard for PRCS should have been implemented.
- Neither special education nor rescue training concerning work at sites with the danger of anoxia was provided to workers.



Lesson Summary

- To be effective, eyewear must be appropriate for the encountered hazard and also be fitted properly. All eye-protective equipment provided by an employer must meet ANSI standards.
- Not wearing eye protection and wearing the wrong kind of eye protection for the job are common factors in eye injuries on the job. Causes of eye injuries include flying particles, contact with chemicals, and objects swinging from a fixed or attached position.
- Eye injuries be prevented with:
 - Effective eye protection
 - Better training and education
 - Maintenance
 - Face and eye protection includes:
 - Goggles
 - Face shields
 - Welding shields
- Because many substances that are health hazards can become airborne, knowing how to protect workers is very important. A respirator is a protective device that covers the worker's nose and mouth or the entire face and head to keep airborne contaminants out of the worker's respiratory system and to provide a safe air supply. There are two major categories of respirators: air purifying respirators and supplied air respirators.
 - Every time an employee uses a respirator, he or she must first inspect it.
 - When necessary, workers must be able to demonstrate proper donning and doffing of respirators. If you find anything wrong with a respirator, do not use it; instead, have it repaired or replaced immediately.

Lesson 3: Head, Hand, Face, and Foot Protection

Lesson Focus

At the end of this lesson, students will be able to:

- Explain why head protection is important
- Identify potential hazards
- Explain why occupational noise is dangerous and identify its sources
- Explain why hand protection is important
- Explain why foot protection is important



Why Head Protection is Important

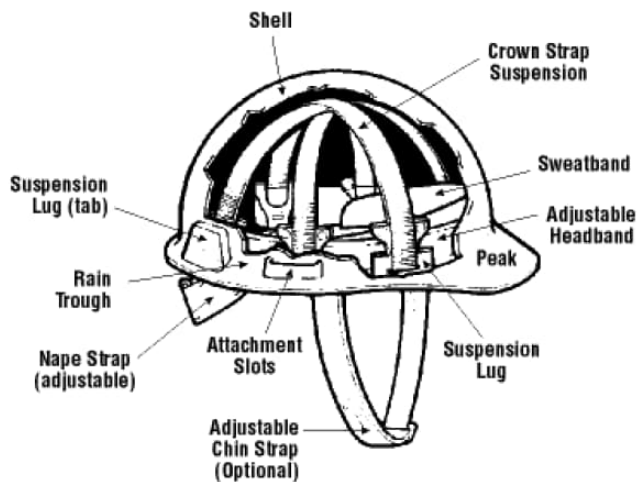
Injuries to the head can be very serious. Even a relatively minor cut on the head can bleed a great deal. Impact forces on the head can lead to concussions and brain damage. Additionally, other areas of potentially severe injury, such as the eyes and ears, are located on the head. This means that damage to the head has the potential to create a variety of different injuries simultaneously.

Construction sites in particular are full of opportunities for head injuries. Impact to the head from a falling object or passing vehicle, for example, could cause neck sprains, concussions, or skull fractures. Electric shock could cause burns or other injuries. Confined spaces and exposed supports offer opportunities for workers to bang their heads.

How Hard Hats Protect an Employee's Head

Employees working in areas where there is a possible danger of head injury from impact, falling or flying objects, or electrical shocks and burns, must be protected by hard hats. Employers must provide hard hats that meet the appropriate ANSI standards. They must protect an employee's head with a rigid shell that resists and deflects blows to the head and a suspension system inside the hat that acts as a shock absorber. Some hats serve as insulators against electrical shocks. Hard hats may also shield the scalp, face, neck, and shoulders against splashes, spills, and drips. Some hard hats are constructed so that face shields, goggles, hoods, or hearing protection can be added.

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. Consult the helmet manufacturer for information on inspecting and using a hard hat.



<https://www.ccohs.ca/oshanswers/prevention/ppe/headwear.html>



Note: OSHA does not specify when an employer must provide hard hats. It's up to each employer to make that determination based on the hazards of the workplace and through the required completion of a proper hazard assessment.

Why Noise Protection is Important

Noise is a common problem in many workplaces. Research has shown that high levels of noise will damage your hearing. Losing your hearing is typically a gradual process and is less noticeable than other types of workplace injuries. It is, however, a permanent handicap for those who are affected.

Remember the four "P"s of hearing loss: it is painless, permanent, progressive, and usually preventable.

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

OSHA's hearing conservation program requires employers to monitor noise exposure levels in a way that accurately identifies employees exposed to noise at or above 85 decibels (dB) averaged over 8 working hours, or an 8-hour time-weighted average (TWA). When an employer determines the "Action Level" of 85 dBs has been reached, they must create a formal written hearing conservation program.

Hearing Protection Devices

Many types of hearing protection devices are available. Popular types of hearing protection devices, along with their proper care instructions, are the following:

- **Foam Earplugs:** When not using your foam earplugs, store them in a clean, cool, dry place. If your foam earplugs become soiled, torn, or stiff, discard them and ask your supervisor or safety manager for a new pair.
- **PVC Earplugs:** When not using your PVC earplugs, store them in a clean, cool, dry place. If your PVC earplugs become soiled, you can clean them according to the manufacturer's guidelines. If your PVC earplugs become torn or brittle, discard them and ask your supervisor or safety manager for a new pair.
- **Earmuffs:** When not using your earmuffs, store them in a clean, cool, dry place. Always inspect your earmuffs for cracks around the foam cups. If your earmuffs are damaged, have them repaired immediately or ask your supervisor or safety manager for a new pair.



Why Hand Protection is Important

A number of disabling accidents on the job involve the hands. Without your fingers or hands, your ability to work would be greatly reduced. Human hands are unique. No other creature in the world has hands that can grasp, hold, move, and manipulate objects quite like ours. They are one of your greatest assets and, as such, must be protected and cared for.

Potential Hazards to the Hand

- **Traumatic Injuries:** An employee can suffer a traumatic injury to his or her hands in many ways:
 - Tools and machines with sharp edges can cut hands.
 - Staples, screwdrivers, nails, chisels and stiff wire can puncture hands.
 - Getting your hands caught in machinery can sprain, crush or remove your hands and fingers.
- **Contact Injuries:** Coming into contact with caustic or toxic chemicals, biological substances, electrical sources or extremely cold or hot objects can irritate or burn one's hands.
- **Repetitive Motion Injuries:** Whenever you repeat the same hand movement over a long period of time, you run the risk of repetitive motion problems. Repetitive motion problems can appear as a numb or tingling sensation, chronic or acute pain, loss of gripping power in your hands, or in many other ways.

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. However, the variety of potential occupational hand injuries can make selecting the right pair of gloves challenging. The following factors 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

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.



Instructions for the Safe Removal of Contaminated Gloves

When removing contaminated gloves, remember to:

- Pull one glove near your wrist towards your fingertips until the glove folds over
- Carefully grab the fold and pull towards your fingertips. As you pull you are turning the glove inside-out
- Pull the fold until the glove is almost off
- To avoid contamination of your environment, continue to hold the removed glove, then completely remove your hand from the glove
- Slide your finger from your glove-free hand under the remaining glove, then continue to slide your finger towards your fingertips until almost half of your finger is under the glove
- Turn your finger 180 degrees and pull the glove outwards and towards your fingertips; as you do this, the first glove will be encased in the second glove and the inside of the second glove will also be turned outwards
- Grab the gloves firmly, by the uncontaminated surface (the side that was originally touching your hand), release your grasp of the first glove you removed, and pull your second hand free from its glove
- Dispose of the gloves properly

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. In some cases, a more thorough inspection by filling the gloves with water and tightly rolling the cuff towards the fingers will help reveal any pinhole leaks that may be needed. 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.

Why Foot Protection is Important

Scientists and engineers have marveled for centuries at the design and structure of the human foot. It is rigid enough to support the weight of your entire body, and yet flexible enough to allow you to run, dance, play sports, and take you anywhere you want to go. They also absorb a great deal of stress on a construction site and, as a result, are a common spot for injuries, which can include debilitating injuries that would prevent you from working in the future. Employees who face possible foot or leg injuries from falling or rolling objects or from crushing or penetrating materials should wear protective footwear.

Potential Hazards to the Foot

The following are some of the hazards that are commonly associated with foot injuries:

- **Impact Injuries:** If you have ever stubbed your toe, you know that impact injuries can hurt. At work, heavy objects can fall on your feet. If



you work around sharp objects, you might also step on something sharp and puncture your foot.

- **Injuries from Spills and Splashes:** Liquids such as acids, caustics, and molten metals can spill onto your shoes and boots. These hazardous materials can cause chemical and heat burns.
- **Compression Injuries:** Heavy machinery, equipment, and other objects can roll over your feet. The result of these types of accidents is often broken or crushed bones.
- **Electrical Shocks:** Accidents involving electricity can cause severe shocks and burns.
- **Extremes in Cold, Heat, and Moisture:** If not protected, your feet can suffer from frostbite if you must work in an extremely cold environment. Extreme heat, on the other hand, can blister and burn your feet. Finally, extreme moisture in your shoes or boots can lead to fungal infections.
- **Slipping:** Oil, water, soaps, wax, and other chemicals can cause you to slip and fall.

Housekeeping

Poorly maintained machinery and tools, sloppy work areas, and cluttered aisles all contribute to foot injuries. It is important that employers institute proper housekeeping measures to reduce the likelihood of a foot injury occurring. Keep walkways or other high-traffic areas clear of debris or tools that a worker might accidentally kick or run into. Ensure heavy materials or equipment are secured so that they cannot fall or be dropped onto workers' feet. Ensure all tools that could cause a foot injury are inspected and maintained properly so that they do not malfunction.

Wearing and Using Safety Footwear

Select and use the right kind of footwear for the job you are going to be performing. Prior to 2005, footwear was required to meet or exceed the standards set by ANSI (ANSI Z41-1991). Since high-quality footwear can sometimes last for decades, shoes with this designation may still be in use. Following 2005, footwear has been required to conform to the newer ASTM F 2413 Specifications for Performance Requirements for Protective Footwear.

The specifications in ASTM F2413 contain the following standards:

- Footwear should be impact and compression resistant at the toe.
- The metatarsal bones at the top of the foot should be protected.
- The shoes should reduce electrical conductivity to avoid static that could cause ignition of flammable gasses or other substances, as well as to avoid the potential hazards arising from stepping on a live electrical wire.
- The shoes should be puncture resistant.



Care of Protective Footwear

As with all protective equipment, safety footwear should be inspected prior to each use. Shoes should be checked for wear and tear at reasonable intervals. This includes looking for cracks or holes, separation of materials, and 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. Remember to do the following:

- Select footwear that fits properly.
- Inspect your footwear before you use it. Look for holes and cracks that might leak.
- Replace footwear that is worn or torn.
- After working with chemicals, cleanse your footwear appropriately to rinse away any chemicals or dirt before removing footwear.
- Avoid borrowing footwear; footwear is personal protective equipment.
- Store footwear in a clean, cool, dry, ventilated area.

Lesson Summary

- Head injuries can be very serious and are common on construction sites. Causes include falling objects, passing vehicles, or electric shocks.
- Hard hats should be provided to workers if they are exposed to head hazards. Hard hats should have a rigid outer shell, a suspension system that acts as a shock absorber, and, if necessary, they should be shock resistant. Hard hats should be inspected daily.
- High noise levels are also common on worksites and can present hazards for workers. Noise is measured in decibels, and when the noise action level of 85 decibels is reached, employers must create a written hearing conservation plan. Hearing protection devices include foam and PVC earplugs, as well as earmuffs.
- There are many potential hazards to the hands on a worksite. Common injuries include traumatic injuries (a single, traumatic event causes the injury), contact injuries (the hands come into contact with dangerous or caustic substances), and repetitive motion injuries (resulting from repeating the same motion over and over again).
- Gloves are the most common form of hand protection. The type of gloves used depends on a variety of factors, including the type of chemical being handled, the duration of the contact, and the grip requirements.
- Contaminated gloves must be removed carefully to avoid getting any caustic substances on your hands in the process.
- Foot hazards on a worksite include impact injuries, compression injuries, electrical shocks, extreme temperatures, and slipping on oil or lubricant.



- Foot injuries can be avoided by implementing proper housekeeping techniques to keep walkways clear of debris or tools. Depending on the working conditions, special footwear may also be required, such as shoes with steel toes.

Module 5: Health Hazards in Construction

Module Description

The Hazard Communication Standard (HCS) provides information to workers and employers about various chemical hazards that exist in the workplace, and what protective measures they can take to prevent the adverse effects of such hazards.

This module will give you a basic understanding of how to deal with hazardous chemicals and how workers can prevent and protect themselves from chemical hazards at a construction worksite.

Module Learning Objectives

At the conclusion of this module, students will be able to:

- Describe the purpose of The Hazard Communication Standard (HCS)
- Discuss labels and Safety Data Sheets
- Differentiate between physical and health hazards associated with hazardous chemicals
- Distinguish between symbols used to identify hazards
- State how to prepare and implement a written hazard communication program
- Explain the importance of proper training

Lesson 1: Introduction to Hazard Communication Standard

Lesson Focus

At the end of this lesson, students will be able to:

- Describe the Hazard Communication Standard (HCS or HazCom)
- Identify common hazardous materials
- Provide important definitions associated with the HCS

