



## Personal Protective Equipment 120

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## **Class Outline**

### Objectives

- The Purpose of Personal Protective Equipment
- OSHA PPE Requirements
- Hazard Assessment
- Selecting PPE
- Standards Development
- PPE Training
- Eye and Face Protection
- Types of Eye and Face Protection
- Hearing Protection
- Head Protection
- Types of Hard Hats
- Foot and Leg Protection
- Special-Purpose Safety Shoes
- Hand and Arm Protection
- Types of Protective Gloves
- Protective Clothing
- The Importance of PPE
- Summary

**Lesson: 1/19**

**Objectives**

- Describe the purpose of PPE.
- List OSHA PPE requirements for employers.
- List OSHA PPE requirements for employees.
- List in order the common steps performed during a hazard assessment.
- List criteria for selecting PPE.
- Describe how standards for PPE design are developed.
- Describe OSHA training requirements for employers.
- Identify requirements for eye and face protection.
- Match common types of eye and face protection with their proper uses.
- Identify the three most common types of hearing protection.
- Identify the characteristics of proper head protection equipment.
- Identify the characteristics of different types of hard hats.
- Identify characteristics of common types of foot and leg protection.
- Identify the characteristics of common types of special-purpose safety shoes.
- Identify the characteristics of common forms of hand and arm protection.
- Identify the characteristics of common safety glove materials.
- Identify the characteristics of different protective clothing materials.
- Describe the importance of consistently wearing PPE.



**Figure 1.** Employees must have access to personal protective equipment (PPE) to protect them from hazards in the workplace.



**Figure 2.** Some personal protective equipment, like this protective tape, is disposable.

**Lesson: 2/19**

**The Purpose of Personal Protective Equipment**

The goal of any workplace safety program is to eliminate **hazards**. When hazards cannot be eliminated, they must be controlled at their source. As you can see in Figure 1, a company may enforce engineering changes, such as barriers or wrist restraints, to control hazards. Changes in work practices, such as instituting **lockout/tagout** procedures, can prevent access to hazardous machines or work areas. Figure 2 shows lockout/tagout on a machine. However, when reasonable safety measures are in place and hazards still exist, employers must take further precautions and require employees to wear **personal protective equipment (PPE)**.

Personal protective equipment is any clothing or device worn to minimize exposure to hazards and prevent injury. Some common examples of PPE include safety glasses, gloves, earplugs, and leather aprons. To stay as safe as possible, employees must consistently wear and use whatever equipment is required to keep them safe in their work environments.

This class covers PPE **requirements** from the **Occupational Safety and Health Administration (OSHA)** for employers and employees. You will learn about equipment requirements, hazard assessments, PPE selection, and the standards that govern PPE.



**Figure 1.** To keep employees' hands from getting caught in machinery, employers added wrist restraints.



**Figure 2.** Procedural changes, such as the use of the lockout device above, can also protect workers from injury.

**Lesson:** 3/19

**OSHA PPE Requirements**

Different OSHA **standards** contain specific PPE **requirements** for individual industries. For example, there are many requirements and standards regarding vision protection for the welding industry. Some standards require that employers provide PPE at no cost to the employees. Other standards simply require the employer to provide the equipment. In some cases, this means the employee must pay for it. However, there are several general requirements to which all employers and employees covered by OSHA must conform to make the workplace safe. According to OSHA, employers must:

- Perform a **hazard assessment** of the workplace to identify and control physical and health hazards.
- Identify necessary PPE and provide it to employees.
- Enforce the use of necessary PPE among its employees.
- Train employees in the use and care of PPE.
- Maintain PPE and replace worn or damaged PPE.
- Periodically review, update, and evaluate PPE effectiveness.

OSHA's PPE requirements for employees instruct them to:

- Properly wear and use PPE.
- Attend PPE training.
- Care for, clean, and maintain PPE.
- Inform supervisors when PPE must be repaired or replaced.

Both employers and employees play key roles in the proper use of PPE. Keep in mind that these are general requirements. All the various industries have additional requirements, as determined by the hazard assessment, that are necessary to protect workers.



**Figure 1.** This welder is trained to properly use a welding helmet and other important PPE for this specific industry.



**Figure 2.** Employees must know how to properly maintain PPE.

**Lesson: 4/19**

**Hazard Assessment**

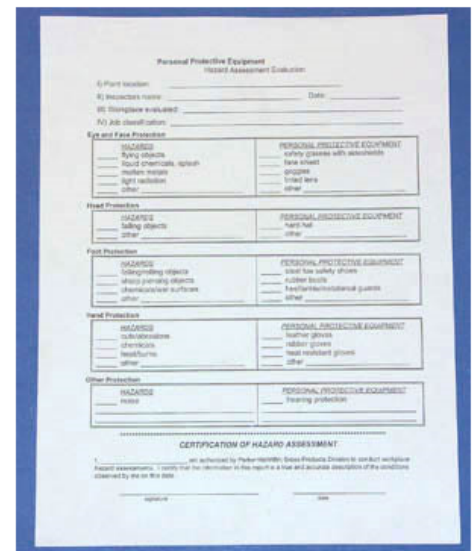
To properly protect workers from injury, illness, and death, employers must first evaluate the workplace with a **hazard assessment** to identify the types of hazards that are present. During a hazard assessment, a company representative or a group trained to assess hazards, such as a safety team, conducts a walk-through and observes and documents the current worksite conditions.

The team divides hazards into two general categories: **physical hazards** and **health hazards**. Physical hazards, such as moving objects or machinery, are those that may result in injuries. Health hazards are those that may result in illness, such as exposure to dust, chemicals, radiation, or repetitive motion.

After hazards are divided into two general categories, the safety team further separates hazards into a set of basic categories identified by OSHA, which are listed in Figure 1. Next, the team looks for possible causes of these hazards, such as machine motion, chemical processes, or dust-filled environments. Additionally, the safety team notes the basic layout of the facility and any history of occupational illnesses or injuries. The safety team can use checklists, spreadsheets, floor plans, and other records to document the hazard assessment.



**Figure 1.** According to OSHA, most hazards fall into these general categories.



**Personal Protective Equipment Hazard Assessment Evaluation**

1. Plant location: \_\_\_\_\_  
 2. Inspector name: \_\_\_\_\_ Date: \_\_\_\_\_  
 3. Workplace evaluated: \_\_\_\_\_  
 4. Job classification: \_\_\_\_\_

Hazard	PERSONAL PROTECTIVE EQUIPMENT
Eye and Face Protection	
FLAMMABLE	Safety glasses with side shields
Flying objects	Face shield
Liquid chemicals, splash	Goggles
Radioactive material	Weld lens
Light radiation	Other
Other	
Head Protection	
HAZARDOUS	PERSONAL PROTECTIVE EQUIPMENT
falling objects	hard hat
other	other
Foot Protection	
HAZARDOUS	PERSONAL PROTECTIVE EQUIPMENT
falling objects	safety toe safety shoes
sharp pointing objects	slip-resistant soles
chemical/acid surfaces	leather/chemical-resistant gloves
other	other
Hand Protection	
HAZARDOUS	PERSONAL PROTECTIVE EQUIPMENT
cut/abrasion	leather gloves
chemicals	rubber gloves
heat/flame	heat resistant gloves
other	other
Other Protection	
HAZARDOUS	PERSONAL PROTECTIVE EQUIPMENT
noise	hearing protection

**CERTIFICATION OF HAZARD ASSESSMENT**

I, \_\_\_\_\_, an authorized safety member, have personally observed and conducted the hazard assessment. I certify that the information in this report is true and accurate description of the conditions observed by me on the date \_\_\_\_\_.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Figure 2.** A checklist like this may be used when performing the hazard assessment.



**Lesson: 5/19**

**Selecting PPE**

Once the hazard assessment is complete, the safety team can clearly determine which forms of PPE are appropriate for the particular hazards within that workplace. For example, a light-duty assembly shop might not require hardhats. However, safety glasses are appropriate in almost any production environment.

OSHA advises that all PPE clothing and equipment must be designed and constructed safely and properly maintained. Also, PPE must be well fitting and comfortable so that employees are more likely to use it and wear it.

The equipment that fits one worker may not properly fit another. PPE must be individually sized to each employee. If multiple items must be worn together, they should be compatible. For example, if an employee must wear a coat with sleeves and a pair of gloves like those in Figure 1, the lengths of both should be ample to protect the worker's arms.



**Figure 1.** This coat and pair of gloves overlap to protect the employee's arms.

Lesson: 6/19

### Standards Development

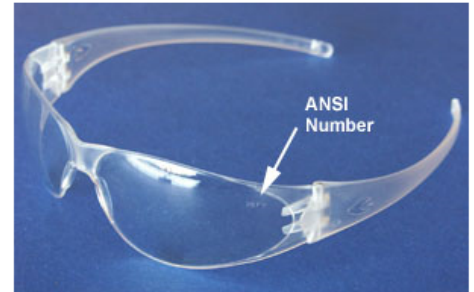
OSHA requirements do not always state which particular type of equipment should be worn. However, when OSHA does mention a specific type of PPE, it may also state that the equipment must meet a certain outside standard. Often these PPE standards are developed by industrial professional groups. These groups are often coordinated by the **American National Standards Institute** (ANSI). ANSI is a private, non-profit organization that administers the U.S. voluntary standards and conformity assessment system. ANSI provides a process for industry to create and publish the specifications for most PPE.

For example, an ANSI standard might list the characteristics of a pair of safety shoes worn under certain conditions. Those specifications are the consensus of the industry involved and are assigned an ANSI standard code number. In another example, eye protection, such as the goggles in Figure 1, must conform or be equivalent to a standard numbered ANSI Z87.1-1989. This means that the material in the glasses meets or is better than what the standard requires. Often, you can find this number, printed, stamped, or molded into the PPE, such as the glasses shown in Figure 2. If you are buying your own PPE, you should find out the standards that apply to your industry and verify that your equipment is in conformance.

Keep in mind that OSHA does not endorse all ANSI standards. In fact, in any accident involving PPE failure, OSHA could issue a citation. However, even if the PPE involved is not ANSI approved, the employer could be cited for the fact that it failed, not that it did not conform to the ANSI standard.



**Figure 1.** Although these glasses do not look alike, all three meet the ANSI standard.



**Figure 2.** The ANSI number often appears somewhere on the item.



**Lesson:** 7/19

**PPE Training**

OSHA requires employers to train each employee in the proper use of their PPE. At a minimum, employees must be trained to know when PPE is necessary and which type of PPE is required. All employees must know how to properly apply, remove, and adjust their PPE. They must also understand the PPE's limitations and life expectancy, as well as proper maintenance and disposal of worn PPE.

Employers must confirm that employees can demonstrate their understanding of PPE training as well as their ability to properly wear and use PPE before they are allowed to perform tasks requiring PPE. Retraining should take place any time there is a change in the type of PPE used or if an employee is not using PPE properly. If you ever have a question about your PPE, you should ask your supervisor for assistance.



**Figure 1.** All employees must know how to apply, remove, and adjust their PPE.

**Lesson:** 8/19

### **Eye and Face Protection**

Flying particles, molten metal, caustic vapors, and harmful light radiation all demand eye and face protection. Eye and face injuries occur when employees are either not wearing PPE or the PPE they are using is poorly fitted.

There are several requirements for eye and face protection. According to OSHA, all workplace eye and face protection should:

- Protect against specific workplace hazards.
- Fit properly and be reasonably comfortable to wear.
- Provide unrestricted vision and movement.
- Be durable and cleanable.
- Allow unrestricted functioning of other required PPE.

In some cases, employers provide eye and face protection to a position or workstation rather than a specific employee. When eye or face protection is shared, employers must make sure that each piece is disinfected after each use. Often, it is the employee's job to clean the PPE for the next wearer. However, prescription eye protection is always provided to individual employees and may not be shared with others.



**Figure 1.** Eye and face protection must provide unrestricted vision and movement.

Lesson: 9/19

### Types of Eye and Face Protection

Eye and face protection is found in almost every type of manufacturing environment and in workplaces ranging from medical laboratories to metalworking shops. Because of the range of hazards in these workplaces, there is a wide variety of eye and face PPE. OSHA identifies these five types as the most common:

- **Safety spectacles** (Figure 1) are protective eyeglasses with metal or plastic frames and impact-resistant lenses that may or may not offer vision correction. Many also have protective side shields.
- **Goggles** (Figure 2) are tight-fitting eye protection that completely cover the eyes, the sockets, and the surrounding facial area. Goggles offer protection from impact, dust, chips, and splashes.
- **Welding shields** (Figure 3) are made from heat-resistant materials and contain a dark, filtered lens. These shields protect the wearer from eye burns due to intense heat and light as well as from flying sparks and metal **spatter**. The filters used in welding helmets have specific shade numbers that correspond to each type of welding.
- **Laser goggles** (Figure 4) protect against the intense light produced by lasers and are chosen based on the equipment and operating conditions in the workplace.
- **Face shields** (Figure 5) are rigid, transparent plastic sheets that cover the worker's entire face. They are used to protect against dust and splashes, but they will not protect against impacts. Goggles are often worn with face shields.

The hazard assessment helps employers determine which type of eye and face protection is appropriate for their individual workspaces. Again, it is up to employers to make sure the PPE they choose satisfies the OSHA standard for their particular industry.



**Figure 1.** Safety spectacles usually have side shields.



**Figure 2.** Goggles usually cover the whole eye area. (Courtesy of NoIR Laser Co., LLC.)



**Figure 3.** This welding hood protects the head, face, and eyes.



**Figure 4.** This pair of LaserShield® goggles protects workers from harmful laser light. (Courtesy of NoIR Laser Co., LLC.)



**Figure 5.** This face shield is often worn with goggles.

**Lesson:** 10/19

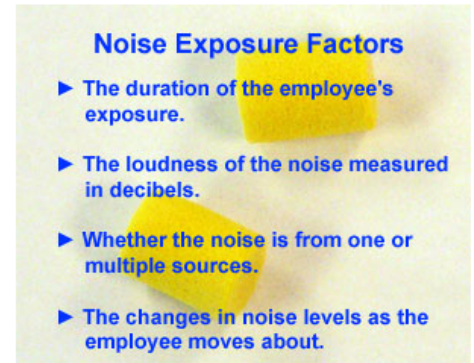
**Hearing Protection**

Noise also presents a safety hazard. Because noise is invisible, it can be difficult for employers to determine the extent of the hazard in their workplaces. Therefore, they should have a noise level study performed by a professional. In general, the amount of acceptable exposure time is dependent on the loudness of the noise. In other words, the louder the noise, the shorter the exposure time before hearing protection is required. OSHA has determined that employee exposure to excessive noise is dependent upon the factors shown in Figure 1.

When excessive noise is present, there are three categories of PPE that are commonly used to protect workers' hearing:

- **Pre-formed earplugs** (Figure 2), also known as molded earplugs, are often professionally fitted devices that are usually made of plastic or **silicone rubber**. They may be disposable or reusable.
- **Single-use earplugs** (Figure 3) are disposable self-forming plugs that work as well as molded earplugs when used properly. They may be made of waxed cotton, foam, or silicone rubber.
- **Earmuffs** (Figure 4) are full-ear coverings connected by a headband that require a perfect seal around the ear. Hair, facial hair, or facial movements may disrupt this seal.

If employees are exposed to occupational noise that reaches or exceeds 85 **decibels** over an eight-hour period, the employer is required to institute a **hearing conservation program**. In addition to hearing protection, employers are required to have employees' hearing regularly tested by a hearing professional.

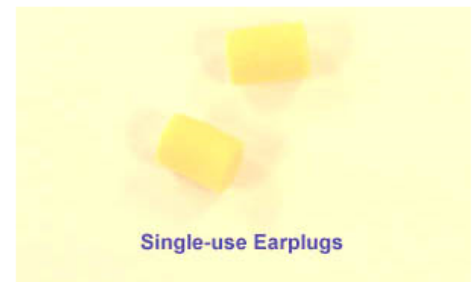


**Figure 1.** When noise is present, the employer should have the levels professionally evaluated.



**Pre-formed Earplugs**

**Figure 2.** Pre-formed earplugs may be used multiple times.



**Figure 3.** Single-use earplugs are disposable.



**Earmuffs**

**Figure 4.** Earmuffs cover the entire ear.

**Lesson:** 11/19

### Head Protection

The proper head protection can prevent injuries from impact, penetration, electrical shock, and burns. Although some head injuries are minor, many others result in brain damage or even death. If the hazard assessment indicates that workers might be hit by falling items, bump their heads on fixed objects like pipes or beams, or come in contact with electrical hazards, they are required to wear head protection.

The most common form of head protection is the **hard hat**. A hard hat is usually a hard-shell, brimmed hat made from plastic or similar material. As you can see in Figure 1, hard hats have a shock-absorbing lining with a headband and straps that suspend the shell away from the skull and provide ventilation. Hard hats are required to contain clear instructions for adjusting and replacing the lining and the headband. Figure 2 lists other requirements for hard hats. Protective headgear must conform or be equivalent to ANSI standard Z89.1-2003.

Hard hats should be cleaned and inspected regularly for cracks or other damage. However, wearers should avoid using solvents and some cleaners, as well as paint, adhesives, or anything else that might harm the helmet's surface. These chemicals, as well as heat and sunlight, can reduce the hat's hardness and/or the ability to resist electric shock.



**Figure 1.** Hard hats contain a headband and straps that suspend the shell away from the wearer's head.



**Figure 2.** Hard hats must conform to these requirements.



**Lesson:** 12/19

**Types of Hard Hats**

Different hard hats are required for different uses. Revised ANSI standards classify hard hats according to impact protection. **Type I hard hats** are designed to protect against top-only impact. **Type II hard hats** protect against impact from the sides, the front, the back, and the top. Both types are designed to prevent penetration of the hat by a falling object. However, Type II hats also protect against chin strap breakage or elongation in hats that have a chin strap.

Within Type I and Type II, hard hats are also classified by electrical insulation rating:

- **Class G hard hats** provide limited **voltage** protection, up to 2,200 volts.
- **Class E hard hats** offer the highest level of protection against voltage and burns, up to 20,000 volts.
- **Class C hard hats** offer no protection from electrical hazards.

Another type of head protector, known as a **bump hat**, is often used in areas with low clearance to protect workers' heads from bumps and cuts. However, these types of head protectors are not ANSI approved. Bump hats may look like regular hard hats, so you should always make sure that the hat you are wearing has a class designation. The letter designation appears inside the shell on a label that also lists the manufacturer and ANSI designation.



**Figure 1.** Different classes of hard hats can protect workers from impacts and electrical shock.



**Figure 2.** The ANSI number must appear on a label inside the hard hat.

Lesson: 13/19

### Foot and Leg Protection

Foot and leg protection shields workers from hazards like objects that fall or roll or from electrical voltage. OSHA describes five types of foot and leg protectors that are common in industry:

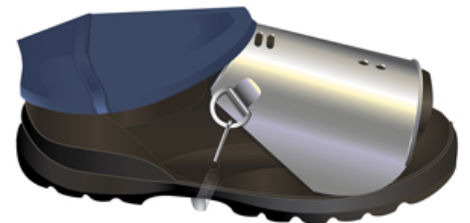
- **Safety shoes** (Figure 1) are the most common type of foot PPE that provide many different ways of protecting workers' feet. For example, they may protect workers from heat, impact, or electrical shock. Because there are so many different hazards, safety shoes come in several designs and materials.
- **Leggings** (Figure 2) protect the lower legs and feet from multiple hazards, especially molten metal and welding sparks. They are often made from leather or fabric and snap off and on for quick removal.
- **Metatarsal guards** (Figure 3) strap over the worker's shoes and cover the upper portion of the foot and protect it from impacts and crushing. They may be made from aluminum, steel, plastic, or fiber.
- **Toe guards** fit over the toes of regular shoes to protect toes from being crushed. Toe guards may be made from aluminum, steel, or plastic.
- **Combination foot and shin guards** cover the shin and most of the foot. Some may require additional toe guards.



**Figure 1.** Safety shoes often have reinforced steel toes.



**Figure 2.** Leggings protect the lower legs and feet.



**Figure 3.** Metatarsal guards protect the upper portion of the foot.

Lesson: 14/19

### Special-Purpose Safety Shoes

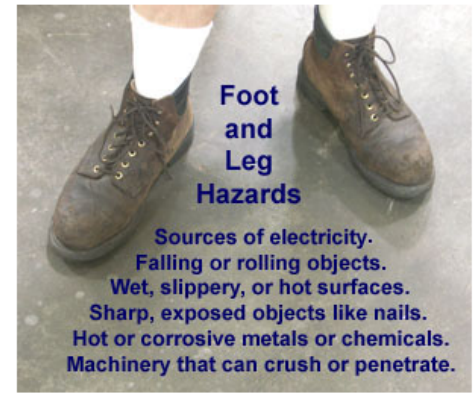
Safety shoes are worn in many types of specialized environments to protect feet and lower legs from a number of hazards. Figure 1 lists foot and leg hazards that require specialty shoes for extra protection. OSHA describes three distinct types of specialty safety shoes: electrically conductive shoes, electrical hazard safety-toe shoes, and foundry shoes.

**Electrically conductive shoes** provide protection against the buildup of **static electricity**. These types of shoes are worn by employees who work in areas where a spark could cause an explosion or fire, such as agricultural grain elevators or other settings that have dry, airborne materials. These shoes should not be worn with silk, wool, or nylon socks because they can produce static electricity.

**Electrical hazard safety-toe shoes** are non-conductive and prevent the wearer from completing an electrical circuit with the ground. These shoes can protect against circuits of up to 600 volts in dry conditions. However, wearers should be careful that these shoes are kept from excessive wear, water, and metal particles so they stay non-conductive.

**Foundry shoes** have built-in safety toes and are constructed to insulate the wearer's feet from heat and molten metal. In addition, these shoes are designed to keep hot metal from lodging in eyelets, tongues, laces, or other shoe crevices.

All ANSI-approved footwear must provide at least some toe protection, but the type and amount varies by need. All safety footwear must meet ANSI minimum compression and impact performance standards.



**Figure 1.** Safety shoes are worn in many types of specialized environments to protect the feet and lower legs from a number of hazards.

**Lesson:** 15/19

**Hand and Arm Protection**

Despite an employer's best efforts to use engineering and process changes to protect workers from injuries, there are many instances when employees' hands can or will come in direct contact with hazards. Different settings can put workers at risk for various injuries, including chemical or thermal burns, cuts, bruises, punctures, and fractures. In the most extreme cases, workers have lost fingers, hands, and arms. Workers in these situations must wear some type of hand and arm PPE.

Hand and arm PPE includes **finger guards**, **arm coverings**, and elbow-length and regular-length **protective gloves**. These items appear in Figures 1-3. Finger guards are used when only one, two, or three fingers are exposed to a hazard, such as when the index finger and thumb of one hand are used to hold a fastener during assembly. Arm coverings and elbow-length protective gloves are used when the worker may be exposed to heat, sparks, or splash from chemicals or molten materials. However, regular-length protective gloves are the most common type of hand protection used. They may be found in many situations, such as when workers must handle chemicals or hot objects or when they need additional gripping ability.

Because there are so many devices used for hand and arm protection to prevent injuries from so many different types of hazards, there is no one standard that defines this category. Instead, employers must select whatever type of PPE will best protect its employees from whatever hazards they may encounter in the workplace. Employers must also determine whether or not wearing hand and arm protection causes a hazard when worn near certain machinery.



**Figure 1.** Finger coverings protect fingers during activities like assembly.



**Figure 2.** Arm coverings usually protect the area from the wrist to the elbow.



**Figure 3.** Some gloves protect part of the arms in addition to the hand.





**Lesson:** 16/19

**Types of Protective Gloves**

Because there are so many types of protective gloves, selecting the right glove for the right hazard requires careful analysis. OSHA categorizes gloves according to their material content. Gloves that appear to be appropriate for a particular hazard may not be designed for that function. For example, some glove materials can chemically react with the substances handled by a worker and cause injury or illness through contamination. OSHA categorizes glove materials into four general groups:

- Leather, canvas, or metal mesh (Figure 1): These gloves protect from sparks, heat, abrasion, cuts, and some chemicals.
- Fabric and coated fabric gloves (Figure 2): These general-purpose gloves are made from cotton or fabric and may be coated with plastic.
- Insulating rubber gloves (Figure 3): These gloves are used to protect against electrical hazards and are specifically described in the standards covering that industry.
- Chemical- and liquid-resistant gloves (Figure 4): These gloves may be made from **butyl**, **latex**, **neoprene**, or **nitrile**. To avoid confusion, they should be checked against a chemical resistance selection chart that rates the various materials.

Keep in mind that chemical- and liquid-resistant gloves are most likely to be confused by the user. However, all of these "rubber" gloves perform differently when exposed to various chemicals and materials. For all glove types, workers should inspect their gloves before each use to ensure they are not damaged. Workers should also be very careful when deciding to re-use gloves and should consider the gloves' **absorption** abilities, as well as the **toxicity** of the substance being handled.



**Figure 1.** These canvas gloves have leather palms.



**Figure 2.** The coating on the palms of these gloves improves gripping ability.



**Figure 3.** Some rubber gloves can protect from electrical shock.





**Figure 4.** These gloves can protect hands from some chemical exposures.

**Lesson:** 17/19

**Protective Clothing**

Employers must ensure that employees wear PPE only for the parts of the worker that are exposed to possible injury. In some cases, large portions of the body are at risk. For example, employees' bodies can be exposed to temperature extremes, hazardous chemicals, and impacts from tools or machinery.

Depending on the hazard, an employee might wear a laboratory coat, coveralls, vest, jacket, apron, surgical gown, or full body suit. A particular style of garment is paired with one of these material types to create the best possible protection:

- **Paper-like fiber** is a disposable material that protects against dust and some splashes.
- **Treated wool** and **treated cotton** are reusable materials that are useful in environments with changing temperatures. They are fire-resistant and protect against dust and abrasion.
- **Duck** is a reusable fabric of closely woven cotton that protects against cuts and bruises.
- **Leather**, shown in Figure 1, is a reusable material that protects against dry heat and flames.
- **Rubber, rubberized fabric, neoprene,** and other plastic materials can protect against liquids, chemicals, and certain physical hazards. Figure 2 shows an example of a liquid-repellant apron. These materials may be discarded or reused, depending on their condition and usage. However, as is the case with protective gloves, not all clothing materials are appropriate for all chemicals.

Again, there is no one standard that covers all protective clothing. Protective clothing characteristics appear in different industry standards. However, employers must be sure that each employee has access to properly fitting clothing that functions for its intended use. At the same time, employees should inspect protective clothing for damage and fit prior to each use.



**Figure 1.** Leather is one of the most common materials used in protective clothing for welding because it is heat resistant.



**Figure 2.** The apron worn by this employee is designed to repel liquids.

**Lesson:** 18/19

**The Importance of PPE**

It is every employer's responsibility to provide the appropriate PPE for workers who require it, and it is every employee's responsibility to properly wear and use that PPE. Compliance is not optional. In addition, company safety policies require employees to follow all safety regulations. Employees who fail to do so can be held accountable and face disciplinary action. In fact, if OSHA conducts an inspection, the **compliance officer** can enforce the company safety policies even if those policies are stricter than OSHA's standards.

In many instances, PPE acts as a barrier to frequent exposure to hazards such as chemicals, dust, and sparks. At other times, PPE is used as a precautionary measure in case of an accident. You might wear safety glasses or a face shield your entire career and be hit in the face just once with a flying object. If you knew what day you were going to be hit, you could leave your equipment off all of the other days. However, since you never know when a machine is going to fail or when someone is going to make a mistake that leads to an accident, you must always wear your safety equipment.



**Figure 1.** Failure to wear the proper PPE can result in accidents, injury, illness, or death.

**Lesson:** 19/19

**Summary**

The purpose of PPE is to minimize exposure to hazards and prevent injury. To properly protect workers from injury, illness, and death, employers must first evaluate the workplace with a hazard assessment. Once the assessment is complete, the employer and the safety team can clearly determine which forms of PPE are appropriate for the hazards present.

OSHA states that all PPE clothing and equipment must be designed and constructed safely, be properly maintained, and be well fitting and comfortable. PPE must also be individually sized to each employee. OSHA requirements infrequently state which types of equipment should be worn. However, when OSHA does mention a specific form of PPE, it often references the ANSI standard. OSHA also requires employers to train each employee in the proper use of PPE. Retraining should take place any time there is a change in the type of PPE used or if an employee is not using PPE properly.

PPE may be categorized by the area of the body that it protects. In general, the most common forms of PPE are:

- eye and face protection.
- hearing protection.
- head protection.
- foot and leg protection.
- hand and arm protection.

There are several different types and designs of PPE available in a variety of materials. It is every employer's responsibility to provide the appropriate PPE for workers who require it, and it is every employee's responsibility to properly wear and use PPE. Compliance is not optional. Mistakes and accidents are unpredictable, so you must always wear your safety equipment.



**Figure 1.** Wearing PPE protects against unexpected hazards like this spill..



**Figure 2.** Even these simple earplugs are a very important piece of PPE.

## Class Vocabulary

<b>Absorption</b>	A material's ability to soak up or become saturated with a liquid.
<b>American National Standards Institute</b>	A private, non-profit organization that administers the U.S. voluntary standards and conformity assessment system. ANSI provides a process for industry groups to create and publish the specifications for some PPE.
<b>Arm Coverings</b>	Fabric or leather sleeves that fit over the arms to protect from various hazards.
<b>Bump Hat</b>	A protective head covering used in areas of low clearance that offers minimal protection from minor impacts and abrasions.
<b>Butyl</b>	A non-porous synthetic rubber that offers better protection from certain chemicals, such as some ketones, than other rubber or rubber-like materials.
<b>Class C Hard Hat</b>	A protective head covering that offers no protection from electrical hazards.
<b>Class E Hard Hat</b>	A protective head covering that offers the highest level of protection against voltage and burns, up to 20,000 volts.
<b>Class G Hard Hat</b>	A protective head covering that provides limited voltage protection, up to 2,200 volts.
<b>Combination Foot And Shin Guards</b>	A device that fits over the shins and most of the foot to protect from multiple hazards, including impacts.
<b>Compliance Officer</b>	The OSHA representative who enforces OSHA standards through inspection and investigation.
<b>Decibel</b>	The unit by which the intensity of sound is measured.
<b>Duck</b>	Closely-woven cotton fabric that resists penetration.
<b>Earmuffs</b>	Full-ear coverings connected by a headband that require a perfect seal around the ear. Hair, facial hair, or facial movements may disrupt this seal.
<b>Electrical Hazard Safety-Toe Shoes</b>	Non-conductive safety shoes made to prevent the wearer from completing an electrical circuit with the ground. These shoes can protect against circuits of up to 600 volts in dry conditions
<b>Electrically Conductive Shoes</b>	Safety shoes that prevent explosions due to buildup of static electricity in certain environments, such as agricultural grain elevators.
<b>Face Shield</b>	A rigid, transparent plastic sheet that covers the worker's entire face to protect against dust or splashes. Because face shields do not protect against impacts, they are often worn with goggles.
<b>Finger Guards</b>	Devices used to protect one, two, or three fingers that may be exposed to a hazard, such as when the index finger, middle finger, and thumb of one hand are used to hold a fastener during assembly.
<b>Foundry Shoes</b>	Safety shoes with built-in safety toes that are constructed to insulate the wearer's feet from heat and molten metal. Foundry shoes are designed to keep hot metal from lodging in eyelets, tongues, laces, or other shoe crevices.
<b>Goggles</b>	Tight-fitting eye protection that completely cover the eyes, the sockets, and the surrounding facial area. Goggles offer protection from impact, dust, chips, and splashes.
<b>Hard Hat</b>	A lightweight, protective head covering, usually made of plastic, used to protect the head from impacts, bumps, and electrical shock.



<b>Hazard</b>	A source of danger or possible injury. Hazards can be physical hazards like falling objects or health hazards like chemical exposures.
<b>Hazard Assessment</b>	A written, formal appraisal of the safety risks that exist within a workplace. A hazard assessment is often performed by the safety team during a walk-through.
<b>Health Hazard</b>	A condition or situation that may result in an illness. Airborne particles, repetitive motions, and some chemicals can be health hazards.
<b>Hearing Conservation Program</b>	An OSHA program designed to protect workers' hearing from noise exposure by requiring employees to monitor noise levels, test affected employees' hearing, and provide hearing protection.
<b>Laser Goggles</b>	Goggles that protect against the intense light produced by lasers. Laser goggles are chosen based on the equipment and operating conditions in the workplace.
<b>Latex</b>	A milky substance found in rubber trees used to make a variety of products.
<b>Leather</b>	Fabric made from cow hide that offers resistance to heat and other hazards.
<b>Leggings</b>	Easily removable lower leg coverings made of leather or fabric that protect the legs from sparks and spatter.
<b>Lockout/Tagout</b>	A specific work safety procedure or practice that safeguards employees from the unexpected powering or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.
<b>Metatarsal Guard</b>	A device that straps onto the shoe to protect the instep from impacts and crushing. Metatarsal guards may be made from aluminum, steel, plastic, or fiber.
<b>Neoprene</b>	A synthetic rubber product that offers better protection from certain chemicals, such as dioxane, than other rubber or rubber-like materials.
<b>Nitrile</b>	A rubber-like material that resists petroleum or oil compounds.
<b>Occupational Safety And Health Administration</b>	A government agency under the U.S. Dept. of Labor that helps employers reduce injuries, illnesses, and deaths in the workplace.
<b>Paper-Like Fiber</b>	A disposable material that has the properties of paper but behaves like fabric.
<b>Personal Protective Equipment</b>	Any example of various safety equipment that workers wear or use to prevent injury in the workplace. Safety glasses are common personal protective equipment (PPE).
<b>Physical Hazard</b>	A condition or situation that may result in an injury. Slippery surfaces, broken or missing walkway railings, and flying debris are physical hazards.
<b>Pre-Formed Earplugs</b>	Professionally fitted ear protection made of silicone or rubber.
<b>Protective Gloves</b>	Gloves made from a variety of materials to protect the hands from hazards such as chemicals, heat, or abrasion.
<b>Requirement</b>	A specific mandate that is contained in a standard. Training is a requirement of OSHA safety standards.
<b>Rubber</b>	An elastic material made from the latex sap of the rubber tree.
<b>Rubberized Fabric</b>	Material that has been coated with rubber to change its behavior, such as to make it resistant to liquids.
<b>Safety Shoes</b>	The most common type of foot PPE that provides many different ways of protecting workers' feet, such as from heat, impact, or electrical shock.
<b>Safety Spectacles</b>	Protective eyeglasses with metal or plastic frames and impact-resistant lenses that may or may not offer vision correction. Many safety spectacles also have protective side shields.
<b>Silicone Rubber</b>	A pliable, formable polymer material.
<b>Single-Use Earplugs</b>	Single-use, disposable, self-forming plugs made of waxed cotton, foam, or silicone rubber.



<b>Spatter</b>	Molten metal spray produced during welding operations.
<b>Standard</b>	An established policy on a particular practice or method. OSHA standards have the same power as law, and non-compliance can result in fines and other penalties.
<b>Static Electricity</b>	An electrical charge that builds up due to friction between two dissimilar materials.
<b>Toe Guard</b>	A device that fits over the toes of regular shoes to protect toes from being crushed. Toe guards may be made from aluminum, steel, or plastic.
<b>Toxicity</b>	The degree to which something is poisonous.
<b>Treated Cotton</b>	Fabric made from cotton plants that has chemical additives that change its behavior, such as making it more fire-retardant or less slippery.
<b>Treated Wool</b>	Fabric made from sheep fur that has chemical additives that change its behavior, such as making it more fire-retardant or less slippery.
<b>Type I Hard Hat</b>	A protective head covering that is designed to protect against top-only impact.
<b>Type II Hard Hat</b>	A protective head covering that is designed to protect against impact from the side, front, back, and top.
<b>Voltage</b>	A unit of measurement of electrical force.
<b>Welding Shield</b>	A heat-resistant face covering that protects from spatter and sparks and contains a darkened lens to protect the eyes from the intense light produced during welding.