

Personal Protective Equipment

10-hour General Industry Outreach Training

Introduction



Source of photos: OSHA

Introduction

Lesson objectives:

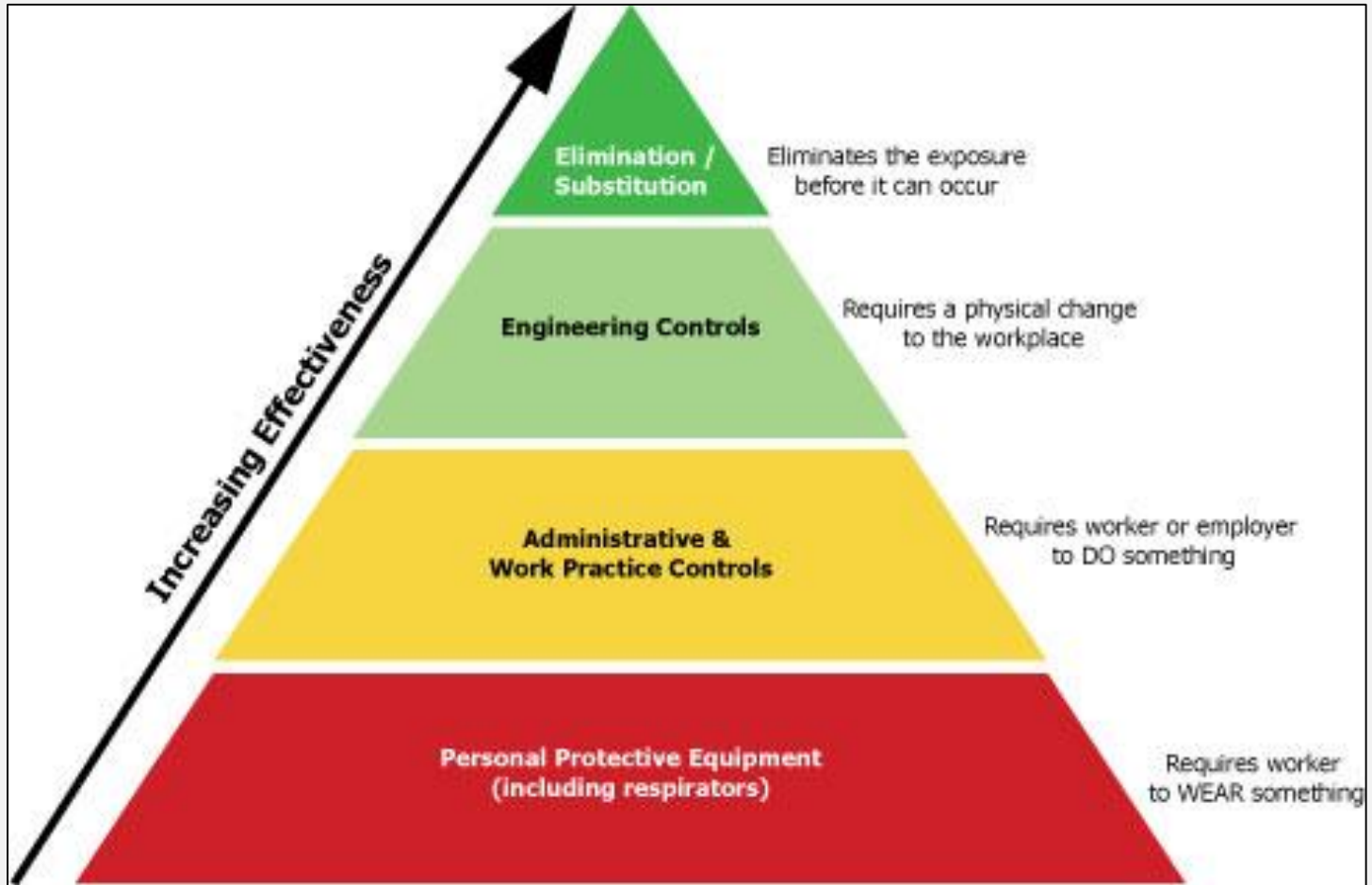
1. Describe the hierarchy of controls as it relates to personal protective equipment.
2. Identify types of personal protective equipment utilized in general industry.
3. Explain personal protective equipment training requirements.
4. Explain the employer responsibilities regarding personal protective equipment.
5. Explain the employee responsibilities regarding personal protective equipment.

Introduction

Employers must protect employees:

- **Assess** the workplace
- **Eliminate and reduce** the hazards found using engineering and administrative controls
- Then **use** appropriate personal protective equipment
- **Remember, Personal Protective Equipment is the last level of control.**

Hierarchy of Controls

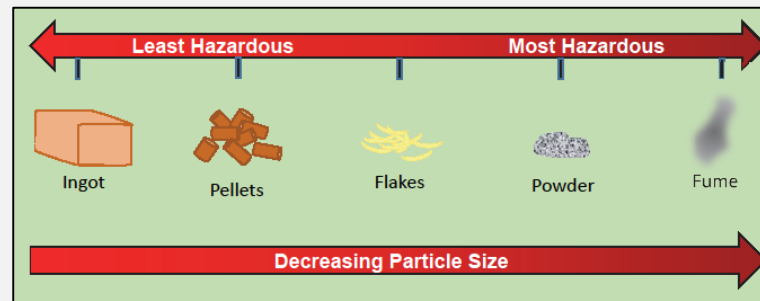


Source: OSHA

Hierarchy of Controls

Elimination/substitution:

- Highest level of protection
- Eliminate hazard from the workplace
- Substitute
 - Use safer item/substance
 - Use same chemical but in a different form; as particle size of a substance decreases, hazard level increases

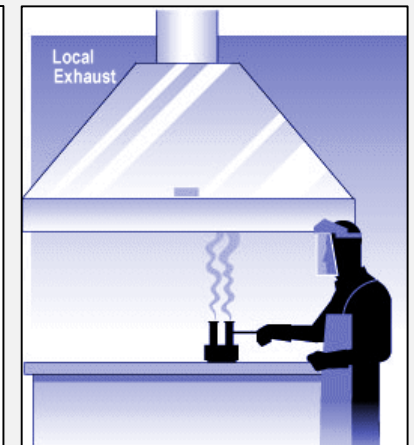
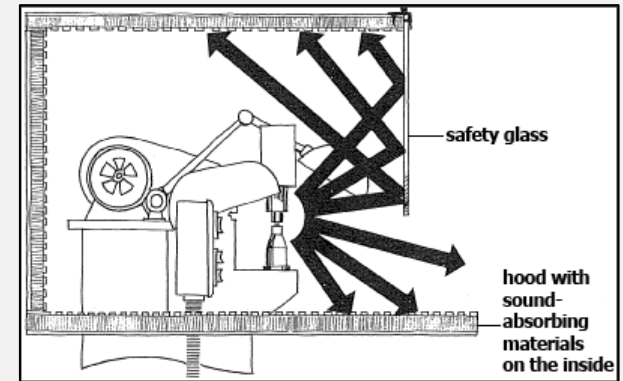


Source: OTIEC Workgroup

Hierarchy of Controls

Engineering controls:

- Physical changes to workplace
- Examples
 - Isolation
 - Ventilation
 - Equipment modification
 - Others



Hierarchy of Controls

Administrative controls/work practice control:

- Requires worker or employer to do something
- Examples
 - Written proper operating procedures, work permits and safe work practices
 - Inspection and maintenance
 - Housekeeping
 - Monitoring the use of highly hazardous materials
 - Supervision
 - Training
 - Alarms, signs and warnings
 - Regulated areas
 - Limit exposure by time or distance

Hierarchy of Controls

PPE controls:

- Requires worker to wear something
- Examples



Source of Photos: OSHA

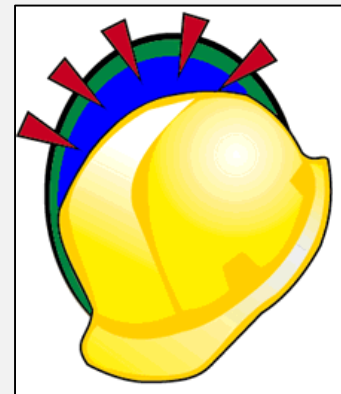
Types of PPE

Head protection:

- Frequent causes of head injuries
 - Falling objects from above striking on the head;
 - Bump head against fixed objects, such as exposed pipes or beams; or
 - Accidental head contact with electrical hazards.

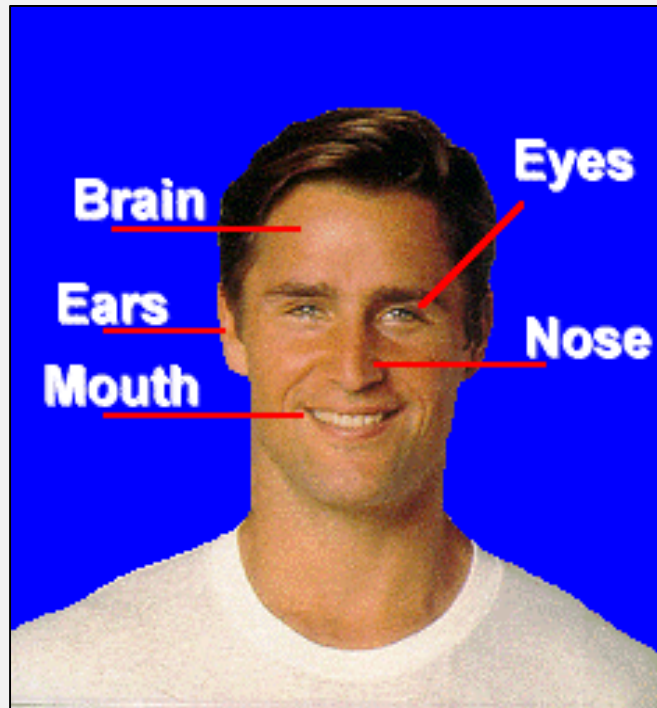


Source: OSHA



Types of PPE

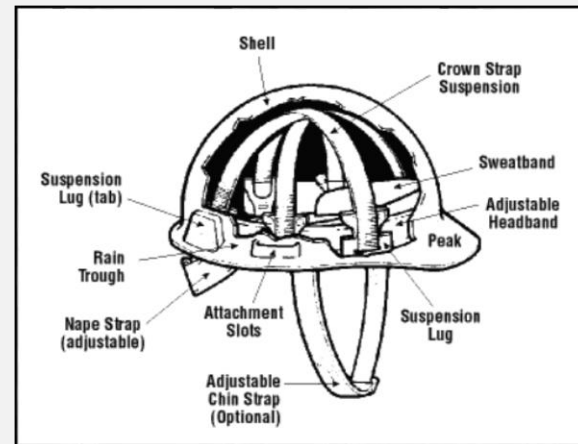
Why head protection is important...



Source: OSHA

Types of PPE

- Classes of hard hats:
 - CLASS G (General)
 - Protect against impact, penetration
 - Low-voltage electrical protection (proof-tested to 2,200 volts)



Source of graphics: OSHA

Types of PPE

– CLASS E (Electrical)

- Designed for electrical/utility work
- Protect against falling objects, impact
- Electrical protection against high-voltage (proof-tested to 20,000 volts)



Source: OSHA

Types of PPE

– CLASS C (Conductive)

- Designed for comfort; offers limited protection
- Protects heads that may bump against fixed objects
- Does not protect against falling objects or electrical hazards

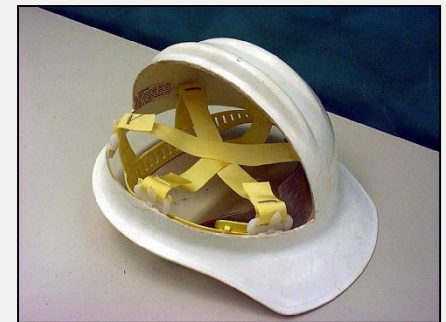


Source: OSHA

Types of PPE

- **ANSI Z89.1, 1997**

- **Type I:** provides protection from objects fall directly on top of the helmet, but not from objects that strike the side, front, or back of the head.
- **Type II:** provides protection from strikes to the top of the head and also provides protection from blows to the sides, front, and back of the head. More suitable for workers who are not always in a standing position



Source of photos: OSHA

Types of PPE

Eye and face protection:



Safety glasses



Safety goggles



Face shield



Welding face shield

Source of images: OSHA

Types of PPE

- Common causes of eye injuries
 - Chemical splashes
 - Blood or OPIM splashes or sprays
 - Intense light
 - Dust and other flying particles
 - Molten metal splashes



Source: OSHA

Types of PPE

- Eye and face protection – must comply with
 - ANSI Z87.1-2003, or
 - ANSI Z87.1-1989 (R-1998)



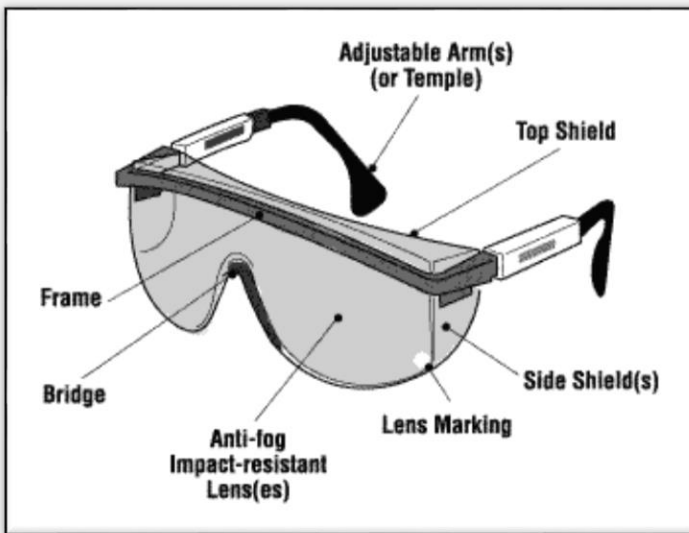
Source: OSHA

Types of PPE

- Selecting eye and face protection – elements to consider:
 - Ability to protect against workplace hazards
 - Should fit properly
 - Should provide unrestricted vision and movement
 - Durable and cleanable
 - Allow unrestricted functioning of other PPE

Types of PPE

- Safety glasses
 - Used to protect against moderate impacts from particles



Source of graphics: OSHA

Types of PPE

- Prescription glasses
 - Employees who use prescription glasses while performing operations with potential eye hazards must use eye protection that:
 - Incorporates the prescription in its design, **or**
 - Can be used over your prescription glasses without interfering with the proper positioning of the prescription glasses or goggles



Source: OSHA

Types of PPE

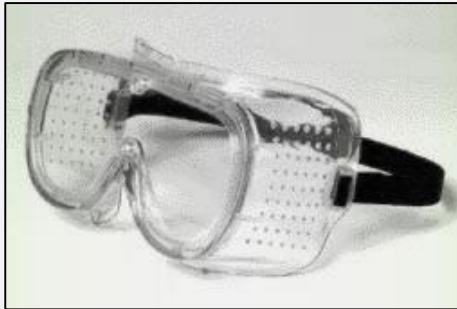
- Goggles
 - Protect eyes, and the facial area immediately surrounding the eyes from impact, dust, splashes.
 - Some can be used over corrective lenses, if they fit them.



Source: OSHA

Types of PPE

– Goggle types



Direct-ventilated

- Resist direct passage of large particles into the goggle
- Prevents fogging by allowing air circulation



Indirect-ventilated

- Prevents fogging by allowing air circulation
- Protects against liquid or chemical splash entry



Non-ventilated

- Does not allow the passage of air into the goggle
- Prevents splash entry
- May fog and require frequent lens cleaning

Source: OSHA.gov

Types of PPE

- Face shields

- Protect face from nuisance dusts and potential splashes or sprays of hazardous liquids
- Shields do not protect from impact hazards unless so rated
- Shields are for face protection, not eye protection. To protect the eyes, wear safety glasses with side shields, or goggles under the face shield.



Source: OSHA

Types of PPE

- Welding shields
 - Protect eyes from burns caused by:
 - Infrared light
 - Intense radiant light
 - Protect eyes and face from flying sparks, metal spatter, and slag chips



Source of photos: OSHA

Types of PPE

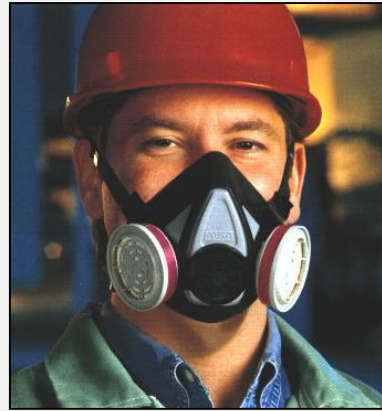
- Laser safety goggles
 - Provide protection from hazards:
 - physical contact such as flying particles
 - ultraviolet light, laser, and welding



Source: OSHA

Types of PPE

Respiratory protection:



Source of photos: OSHA



Types of PPE

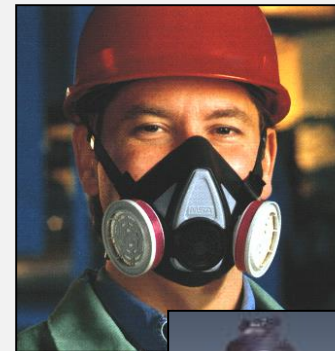
- Elimination/substitution or Engineering controls
 - Eliminate toxic material or substitute a less toxic material
 - Enclose or confine operation
 - General or local exhaust ventilation
- **Only** when engineering controls are not feasible, will respirators be used



Source: OSHA

Types of PPE

- Types of respirators
 - **Air-Purifying (APR)** – remove contaminants from air
 - Particulate respirators
 - Chemical cartridge/ gas mask respirator
 - Powered Air-Purifying Respirator (PAPR)



Source of photos: OSHA

Types of PPE

– **Atmosphere-Supplying** – provide clean, breathable air

- Self-Contained Breathing Apparatus (SCBA)
- Supplied-Air Respirator (SAR)



Source of photos: OSHA

Types of PPE

- Medical evaluation
 - Before fit tests are conducted and employee is authorized the use of a respirator, a medical evaluation must be provide to determine the ability of the employee to use a respirator.
 - Identify a physician or other license health care professional (PLHCP) to perform medical evaluations using a medical questionnaire or an initial medical evaluation with which the same information is obtained.

Types of PPE

- Inspecting and cleaning respirators
 - Inspect all respirators for wear and tear before and after each use
 - Wash in a detergent solution; then, disinfect by immersing in a sanitizing solution



Source of photos: Carmen Vazquez

Types of PPE

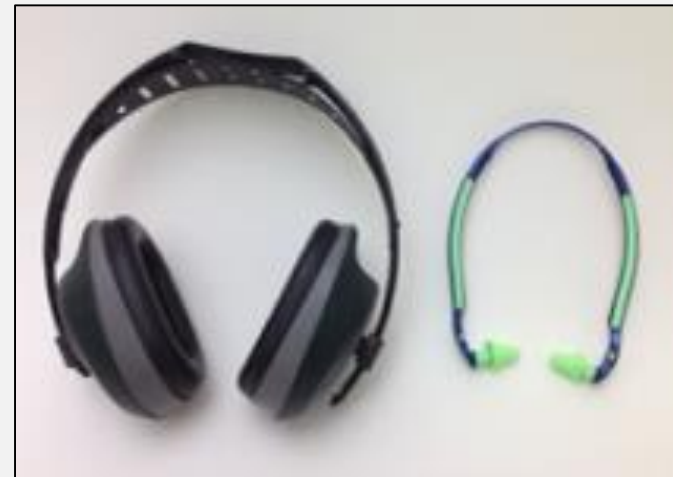
- Storing respirators
 - Protect against dust, sunlight, heat, extreme cold, excessive moisture, and damaging chemicals
 - Store in position to retain natural configuration



Source of photos: Carmen Vazquez

Types of PPE

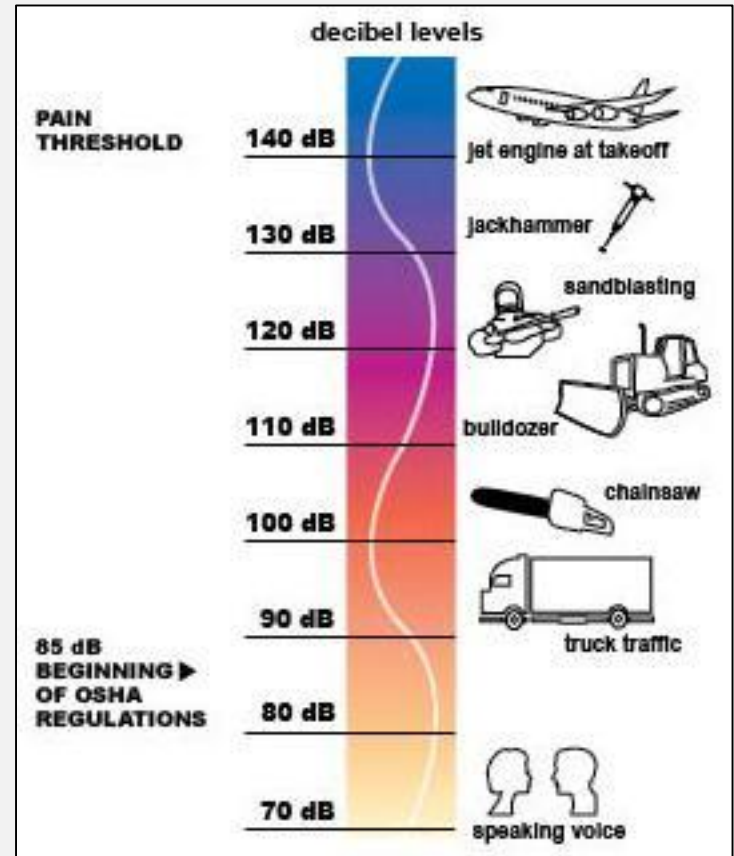
Hearing protection:



Source of photos: OSHA

Types of PPE

- Exposure to noise levels over 85 dB can cause hearing loss
- Hearing protection required at 90 dB
- Implement effective Hearing Conservation Program



Source: OSHA

Types of PPE

- The employer must provide ear protection when the noise level in the work area is greater than indicated in this table.



Source: NIOSH

Permissible Noise Exposure 29 CFR 1910.95(b)(1)	
Duration per Day (hours)	Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
1	105
1/2	110
1/4	115

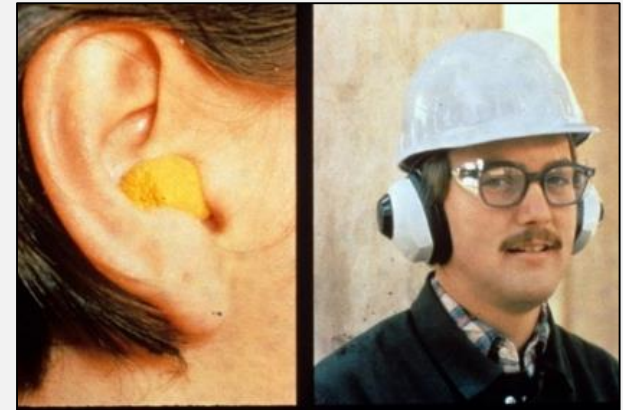
Impact noise should not exceed 140 dB

Types of PPE

- Examples of hearing protection:
 - Disposable foam plugs
 - Molded ear plugs
 - Noise-cancelling ear plugs
 - Ear muffs
- Consider Noise Reduction Rating (NRR) of devices



Source of photos: OSHA



NIOSH/John Rekus/elcosh.org

Types of PPE

- How to insert ear plugs properly

How To Wear Soft Foam Earplugs

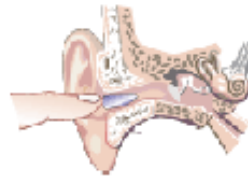
To get the best protection from your soft foam earplugs, remember to **roll**, **pull**, and **hold** when putting them in. Use clean hands to keep from getting dirt and germs into your ears!



- 1. Roll** the earplug up into a small, thin "snake" with your fingers. You can use one or both hands.



- 2. Pull** the top of your ear up and back with your opposite hand to straighten out your ear canal. The rolled-up earplug should slide right in.



- 3. Hold** the earplug in with your finger. Count to 20 or 30 out loud while waiting for the plug to expand and fill the ear canal. Your voice will sound muffled when the plug has made a good seal.

Check the fit when you're all done. Most of the foam body of the earplug should be within the ear canal. Try cupping your hands tightly over your ears. If sounds are much more muffled with your hands in place, the earplug may not be sealing properly. Take the earplug out and try again.

Source: NIOSH

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon.

There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Types of PPE

Hand protection:

- Potential hazards for hands
 - Skin absorption of hazardous substances
 - Lacerations or severe cuts
 - Punctures
 - Chemical burns
 - Thermal burns
 - Extreme temperatures



Source of photos: OSHA

Types of PPE

- Types of gloves



Anti-vibration



Chemical-resistant



Leather Palm



Permeation-resistant



Heat-resistant



Cut-resistant

Source of photos: OSHA

Types of PPE

Foot and leg protection:

- Causes of foot injuries:
 - Falling or rolling of heavy objects
 - Crushing or penetrating materials
 - Sharp objects that can penetrate the sole
 - Exposure to molten metal
 - Working on, or around, hot, wet, or slippery surfaces
 - Working when electrical hazards are present.



Source: OSHA

Types of PPE

- Conditions requiring foot protection
 - Impacts
 - Compressions
 - Cuts/punctures
 - Chemicals
 - Temperatures



Source: OSHA

Types of PPE

- Examples of foot and leg protection
 - Impact-resistant toe and/or instep
 - Steel
 - Composite
 - Heat-resistant soles
 - Metal shanks
 - Specialty footwear may be needed
 - Metatarsal guards
 - Liquid- or chemical-resistant
 - Conductive or nonconductive



Source of photos: OSHA

Types of PPE

- Protective footwear must comply with any of the following consensus standards:
 - ANSI Z41.1 – 1991 - "American National Standard for Personal Protection -- Protective Footwear,"
 - ASTM F-2412 – 2005 – "Standard Test Methods for Foot Protection"
 - ASTM F-2413 – 2005 – "Standard Specification for Performance Requirements for Protective Footwear"



Source: OSHA

Types of PPE

- Protection from hazards
 - Shoes with metal toe-cap protects against knocks, falling objects
 - Rubber shoes protect against chemical materials, as directed by the SDS



Source of photos: OSHA

Types of PPE

Body protection –
protective clothing:



Source of photos: OSHA

Types of PPE

- Provide protective clothing for those parts of the body exposed to possible injuries
- Types of body protection
 - Laboratory coats
 - Coveralls
 - Vests
 - Jackets
 - Aprons
 - Surgical gowns
 - Full-body suits



Source of photos: OSHA

Types of PPE

- Selection of body protection – variety of materials effective against particular hazard
 - Paper-like fiber – dust and splashes
 - Treated wool and cotton – fire-resistant; dust, abrasions, rough/irritating surfaces
 - Duck – cuts, bruises
 - Leather – dry heat, flames
 - Rubber, rubberized fabrics, neoprene, and plastics – certain chemicals and physical hazards



Source of photos: OSHA

Types of PPE

- Protective clothing is required for HAZWOPER activities
- EPA's levels of PPE
 - **Level A**
 - Provides highest level of protection
 - Required when greatest potential for exposure exists and greatest level of skin, respiratory, and eye protection is required
 - Examples
 - Positive pressure, full facepiece SCBA, or positive pressure supplied air respirator with escape SCBA
 - Totally encapsulated chemical- and vapor-protective suit
 - Inner and outer chemical-resistant gloves
 - Disposable protective suit, gloves, and boots

Types of PPE

– Level B

- Required for highest level of respiratory protection and lesser level of skin protection
- Examples
 - Positive pressure, full facepiece SCBA, or positive pressure supplied air respirator with escape SCBA
 - Inner and outer chemical-resistant gloves
 - Face shield
 - Hooded chemical-resistant clothing
 - Coveralls
 - Outer chemical-resistant boots

Types of PPE

– Level C

- Required when concentration and type of airborne substances are known and criteria for using APR is met
- Examples
 - Full-face air-purifying respirators
 - Inner and outer chemical-resistant gloves
 - Hard hat
 - Escape mask
 - Disposable chemical-resistant outer boots

Types of PPE

– Level D

- Required when minimum protection is needed
- Sufficient when no contaminants are present or work operations preclude splashes, immersion, or potential for unexpected inhalation or contact
- Examples
 - Gloves
 - Coveralls
 - Safety glasses
 - Face shield
 - Chemical-resistant, steel-toe boots or shoes

Training

Training requirements:

- Each employee who is required to use PPE must be trained to know:
 - When PPE is necessary
 - What PPE is necessary
 - How to properly put on, take off, adjust, and wear the PPE
 - The limitation of the PPE
 - Proper care, maintenance, useful life, and disposal of PPE

Responsibilities

- The **employer** is required to:
 - Perform hazard assessment
 - Provide appropriate PPE
 - Train employees
 - Maintain/replace PPE
 - Review/update/evaluate PPE Program

Responsibilities



- The **employer** is required to **pay for PPE** used to comply with OSHA standards
 - Examples
 - Metatarsal foot protection
 - Rubber boots with steel toes
 - Non-prescription eye protection
 - Prescription eyewear inserts/lenses for full face respirators
 - Goggles and face shields
 - Fire fighting PPE
 - Hard hats
 - Hearing protection
 - Welding PPE

Responsibilities



- Employer payment **exemptions**
 - Non-specialty safety-toe protective footwear and non-specialty prescription safety eyewear
 - Everyday clothing
 - Ordinary clothing, skin creams, or other items, used solely for protection from weather
 - Consumer safety items worn by food workers
 - Lifting belts
 - When employee lost or intentionally damaged PPE

Responsibilities

- The **employee** is required to:
 - Properly wear PPE
 - Attend PPE training
 - Care for, clean, and maintain PPE
 - Inform supervisor of needs for repair/replacement



Source: OSHA

Knowledge Check

1. Common causes of foot injuries include: crushing, penetration, molten metal, chemicals, slippery surfaces, and sharp objects.
 - a. True
 - b. False

Answer: a. True

Knowledge Check

2. Who is responsible for providing PPE needed to comply with OSHA standards?
- a. The employee
 - b. OSHA
 - c. The Employer
 - d. Workers' Compensation

Answer: c. The Employer

Knowledge Check

3. Hazard controls must be addressed in which order of priority?
- a. Substitution, PPE, workaround, and administrative
 - b. Workaround, stop work, PPE, and engineering
 - c. Stop work, PPE, engineering, and substitution
 - d. Substitution, engineering, administrative, and PPE

Answer: d. Substitution, engineering, administrative, and PPE

Knowledge Check

4. Which type of hard hat would provide the most protection from electrical hazards?
- a. Class A
 - b. Class C
 - c. Class E
 - d. Class G

Answer: c. Class E

Knowledge Check

5. Hearing protection is required when noise levels exceed OSHA's PEL of ___ dBA as a TWA.
- a. 80
 - b. 90
 - c. 100
 - d. 110

Answer: b. 90 dBAs

Knowledge Check

6. Who is responsible for providing specialized work footwear?
- a. Insurance companies
 - b. The employee
 - c. OSHA
 - d. The employer

Answer: d. The employer

Knowledge Check

7. Which of the following is considered approved eye protection?
- a. Sun glasses
 - b. Prescription glasses
 - c. Reading glasses
 - d. Glasses meeting ANSI standard Z87

**Answer: d. Glasses meeting
ANSI standard Z87**

Knowledge Check

8. Which of the following is **NOT** considered PPE?
- a. Rubber gloves
 - b. Glasses meeting ANSI standard Z87
 - c. Sports shoes
 - d. Hearing muffs

Answer: c. Sports shoes