NORTH CAROLINA
Department of Transportation





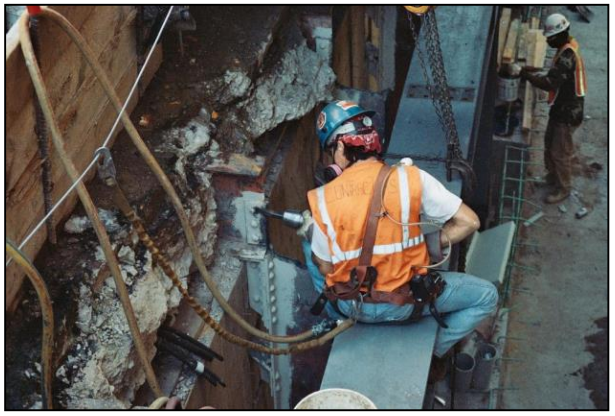


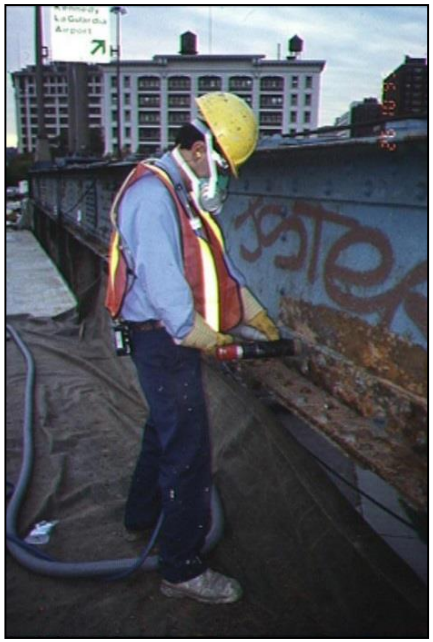


Personal Protective Equipment

Wade Baily

Personal Protective Equipment





Personal Protective Equipment

Lesson Overview

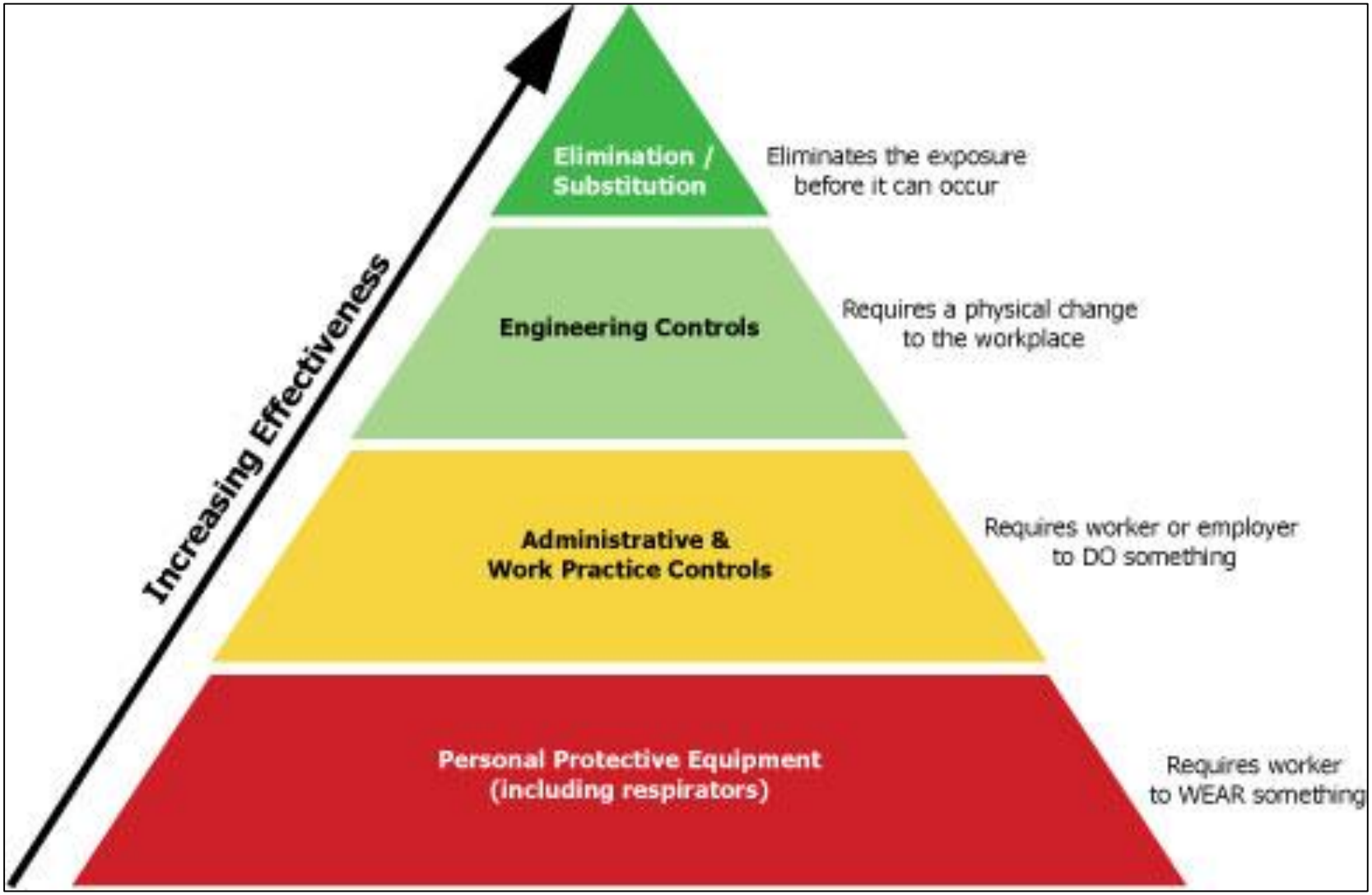
- Hierarchy of controls
- Types of PPE
- PPE Training Requirements
- Employer and Employee Responsibilities
- Hazard Recognition Activity

Protecting Employees

Employers must protect employees:

- **Assess** workplace
- **Eliminate** and **reduce** hazards using engineering and administrative controls
- Then **use** appropriate personal protective equipment (PPE)
- Remember, PPE is the last level of control!

Protecting Employees



Engineering Controls

Physical changes to workplace

- Isolation
- Ventilation
- Equipment modification
- Others

Administrative Controls

Requires worker to do something

- Proper procedures
- Inspection and maintenance
- Housekeeping
- Supervision
- Regulated areas
- Limit exposure by time or distance

Administrative Controls

- Example: Noise Exposure
  - Operate noisy machines during shifts when fewer people are exposed
  - Limit the amount of time a person spends at a noise source
  - Provide quiet areas where workers can gain relief from hazardous noise sources
  - Control noise exposure through distance

Types of PPE

Source of photos: OSHA

Head Protection

- Frequent Causes of Head Injuries:
  - Object striking head
  - Head striking object
  - Contact with exposed, energized electrical conductors

Classes of Hard Hats

- Class G (General)
  - General service (e.g., building construction, shipbuilding, lumbering, and manufacturing)
  - Good impact protection
  - Limited voltage protection (proof-tested at 2,200 volts)

Classes of Hard Hats

- Class E (Electrical)
  - Electrical work
  - Protect against falling objects
  - Protect against high-voltage shock/burns (proof-tested at 20,000 volts)

Classes of Hard Hats

- 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

Hard Hat Types

- ANSI Z89.1
  - Type I offers protection to the top of the head and is commonly used in the United States
  - Type II offers protection to the top and sides of the head and is commonly used in Europe

Eye and Face Protection

- Common Causes of Eye Injuries
  - Dust
  - Flying particles
  - Harmful chemicals
  - Intense light
    - Welding
    - Lasers

Safety Glasses

- Selecting eye and face protection:
  - Meet requirements of **ANSI Z87**
  - Elements to consider
    - Ability to protect
    - Fit and comfort
    - Vision and movement not restricted
    - Durable and cleanable
    - Other PPE not restricted

Safety Glasses

- Protect against:
  - Flying particles from wood, metal, cement, plastics, or other materials
  - Airborne particulates such as ashes, dust, embers, sand blast, grit, paint, or other materials

vs.

Goggles

- Protect eyes, eye sockets and facial area around eyes from impact, dust, & splashes
- Goggles or other eye protection
  - may fit over corrective lenses
  - may not interfere with the function of the glasses

Welding Shields

- Protect eyes from burns
  - Infrared light
  - intense radiant light

- Protect face and eyes from
  - flying sparks
  - metal spatter slag

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 under the face shield.

Warning: Employees Who Wear Corrective Lenses

Workers who wear prescription glasses must also wear required eye protection.

Respiratory Protection

OSHA QUICK CARD™

Protect Yourself
Respirators

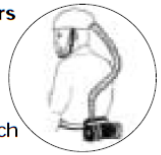
Respiratory protection must be worn whenever you are working in a hazardous atmosphere. The appropriate respirator will depend on the contaminant(s) to which you are exposed and the protection factor (PF) required. Required respirators must be NIOSH-approved and medical evaluation and training must be provided before use.

Single-strap dust masks are usually not NIOSH-approved. They must not be used to protect from hazardous atmospheres. However, they may be useful in providing comfort from pollen or other allergens.

Approved filtering facepieces (dust masks) can be used for dust, mists, welding fumes, etc. They do not provide protection from gases or vapors. DO NOT USE FOR ASBESTOS OR LEAD; instead, select from the respirators below.

Half-face respirators can be used for protection against most vapors, acid gases, dust or welding fumes. Cartridges/filters must match contaminant(s) and be changed periodically.

Full-face respirators are more protective than half-face respirators. They can also be used for protection against most vapors, acid gases, dust or welding fumes. The face-shield protects face and eyes from irritants and contaminants. Cartridges/filters must match contaminant(s) and be changed periodically.



Loose-fitting powered-air-purifying respirators (PAPR) offer breathing comfort from a battery-powered fan which pulls air through filters and circulates air throughout helmet/hood. They can be worn by most workers who have beards. Cartridges/filters must match contaminant(s) and be changed periodically.

A Self-Contained Breathing Apparatus (SCBA) is used for entry and escape from atmospheres that are considered immediately dangerous to life and health (IDLH) or oxygen deficient. They use their own air tank.

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

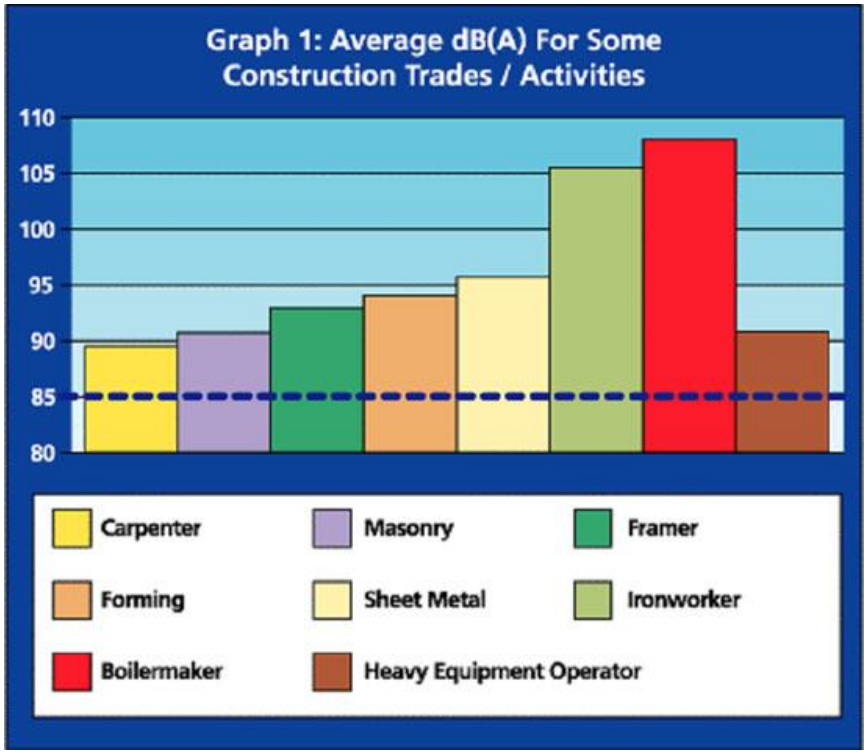
Storing Respirators

Protect against dust, sunlight, heat, extreme cold, excessive moisture, and damaging chemicals.

Store in position to retain natural configuration.

Hearing Protection

- Exposure to over 85 dB can cause hearing loss
- Hearing protection required at 90 dB
- Effective Hearing Conservation Program

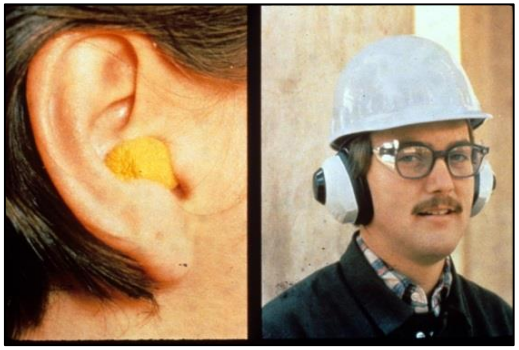


Source: Construction Safety Association of Ontario

Hearing Protection

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

NIOSH/John Rekus/elcosh.org



NIOSH/John Rekus/elcosh.org

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.

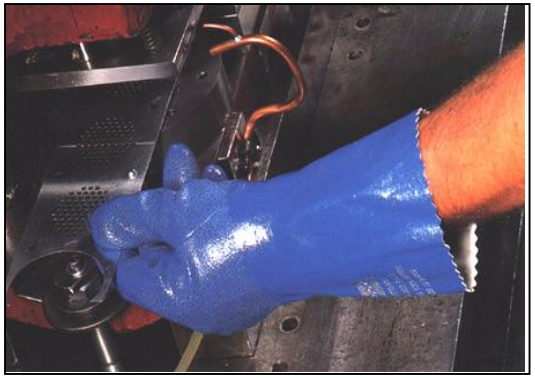
Hand and Arm Protection

- Employers must provide hand protection when employees are exposed to hazards
  - Skin absorption of harmful substances
  - Severe cuts or lacerations
  - Severe abrasions
  - Punctures
  - Chemical and thermal burns
  - Harmful temperature extremes

Types of Gloves

Anti-vibration

Leather Palm



Permeation Resistant

Heat Resistant

Cut Resistant

Source of photos: OSHA

500 - 999 grams to cut

Light/medium cut hazards: material handling, small parts assembly with sharp edges, packaging, warehouse, general purpose, forestry, construction, pulp & paper, automotive assembly

1000 - 1499 grams to cut

Light/medium cut hazards: material handling, small parts assembly with sharp edges, packaging, warehouse, general purpose, forestry, construction, pulp & paper, automotive assembly

1500 - 2199 grams to cut

Medium cut hazards: appliance manufacturing, bottle and light glass handling, canning, dry walling, electrical, carpet installation, HVAC, pulp and paper, automotive assembly, metal fabrication, metal handling, packaging, warehouse, aerospace industry, food prep/processing

3000 - 3999 grams to cut

High cut hazards: metal stamping, metal recycling, pulp and paper (changing slitter blades), automotive assembly, metal fabrication, sharp metal stampings, glass manufacturing, window manufacturing, recycling plant/sorting, HVAC, food prep/processing, meat processing, aerospace industry

4000 - 4999 grams to cut

High cut hazards: metal stamping, metal recycling, pulp and paper (changing slitter blades), automotive assembly, metal fabrication, sharp metal stampings, glass manufacturing, window manufacturing, recycling plant/sorting, HVAC, food prep/processing, meat processing, aerospace industry

5000 - 5999 grams to cut

High cut hazards: metal stamping, metal recycling, pulp and paper (changing slitter blades), automotive assembly, metal fabrication, sharp metal stampings, glass manufacturing, window manufacturing, recycling plant/sorting, HVAC, food prep/processing, meat processing, aerospace industry

Foot and Leg Protection

- Causes of Foot Injuries
  - Heavy objects
  - Sharp objects
  - Molten metal
  - Hot surfaces
  - Slippery or wet surfaces
  - Electrical hazards

Foot and Leg Protection

- Examples
  - 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: OSHA

Steve Clark/Laborers/elcosh.org

Foot and Leg Protection

- 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"

Body Protection

- Causes of bodily injuries
  - Intense heat
  - Splashes of hot metals or hot liquids
  - Impacts from tools, machinery, or materials
  - Sharp objects
  - Hazardous chemicals
  - Contact with potentially infectious materials
  - Radiation

Body Protection

- 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

Body Protection

- 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
  - Leather – dry heat, flames
  - Rubber, rubberized fabrics, neoprene, and plastics – certain chemicals and physical hazards

HAZWOPER

Training

- Why PPE is necessary
- How PPE will protect the employee
- What PPE can and cannot do
- When and how to wear PPE
- How to identify signs of wear and tear
- How to clean and disinfect PPE
- When PPE is worn out and how to properly dispose of PPE

Responsibilities

- Employers must:
  - Assess hazards
  - Select appropriate PPE and determine when to use
  - Provide some PPE at no cost to employee
  - Make sure that employee-owned PPE is adequate, properly maintained and sanitary
  - Train employees and enforce use of PPE

Responsibilities

- Employees must:
  - Actively participate in training
  - Consistently use PPE as prescribed
  - Properly maintain, inspect, clean, and store PPE
  - Immediately replace damaged PPE

Hazard Recognition

Hazard Recognition

Hazard Recognition

Questions?