



Personal Protective Equipment and High Visibility Clothing

Module Purpose

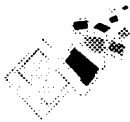
This module provides an emphasis on the requirements for use of personal protective equipment (PPE), including head, hearing, eye and face, hand, foot and respiratory protection. Emphasis will be placed on the appropriate selection and use of high visibility apparel.

Time

60 minutes (11:25 - 12:25 am)
(A 10-minute break follows this module)

Objectives

Show slides 3.1 – 3.2.



Upon completion of this module, participants will be able to:

- Recognize the requirements for use of relevant PPE, including head, torso, arm, leg, hearing, eye and face, hand, foot and respiratory protection
- Identify OSHA standards relevant to roadway construction workers
- Recognize the main components of the respiratory standard, 29 CFR 1910.134
- Recognize the method for selecting appropriate respiratory protection
- Recognize the importance of wearing proper high visibility apparel (e.g. retro-reflective vests)
- Determine which class of high visibility garments is most appropriate for roadway construction workers during both day- and night-time operations.

**Materials and
Resources**

PowerPoint Slides: Module 3
Activities: Appendix 3-A

Module 3: Personal Protective Equipment and High Visibility Clothing

Instructional Strategy and Course Content

Facilitator Notes

Lecture



1. What is Personal Protective Equipment?
Show Slide 3.3.



2. What's my responsibility regarding PPE? *Show Slide 3.4.*



3. How can I "make" someone wear PPE?
Show Slide 3.5.



Lesson

1. What is "Personal Protective Equipment"?

Hard hats, safety glasses, face shields, earplugs, steel-toed shoes, and respirators are all types of *personal protective equipment* or "PPE." PPE is designed to provide workers an increased level of protection or enhanced safety from injury and illnesses that may be caused by hazardous conditions in their work area.

PPE is an important part of worker protection. According to federal data:

- Of all the workers who suffer head injuries, only 16% wear hard hats
- Only 1% of those suffering face injuries wore face protection
- Only 23% of those workers with foot injuries wear safety shoes or boots, and
- About 40% of those suffering eye injuries wear eye protective equipment

OSHA standards require employers to furnish—and require employees to use—suitable PPE where there is "reasonable probability" that injury can be prevented by such equipment. OSHA standards and industry consensus standards, such as "ANSI" (the American National Standards Institute) set provisions for specific types of equipment.

2. What's my responsibility regarding PPE?

Personal protective equipment includes all the clothing and accessories designed to create a barrier against workplace hazards. The basic element of any personal-protective-equipment management program should be an in-depth evaluation of the equipment needed to protect against the hazards at the workplace. Management dedicated to the safety and health of employees should use that evaluation to set standard operating procedures for personnel, and then train those employees to use, maintain, and clean the PPE to protect themselves against those hazards.

3. How can I "make" someone wear PPE?

Many methods of reinforcing the use of PPE have been employed. Regardless of the method, the employee should understand at the outset that his or her life may well depend upon the use of the equipment.

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

4. When should I use PPE? Show Slide 3.6.



5. Who pays for PPE? Show Slide 3.7.



6. What PPE is covered by OSHA standards? Show slides 3.8- 3.21.



Selection of the proper piece of personal protective equipment for the job is important. Employers and employees must understand the equipment's purpose and its limitations. The equipment must not be altered or removed even though it may be uncomfortable. (Sometimes equipment may be uncomfortable simply because it does not fit properly.)

4. When should I use PPE?

PPE is generally considered SECONDARY or SUPPLEMENTARY protection for hazards that cannot be primarily controlled through safe work procedures, processes and/or better-engineered work areas.

If the employer determines that PPE is appropriate to reduce employee exposure to hazards, a PPE program should be created and maintained. This program should contain:

- Identification and evaluation of hazards in the workplace and if use of PPE is an appropriate control measure
- How the PPE is selected, maintained and its use evaluated
- Training of employees using the PPE; and

Continuous review of the program to determine its effectiveness in preventing employee injury or illness.

5. Who pays for PPE?

In most situations, it is the employer's responsibility to provide needed PPE for their workers. Some PPE of a personal nature, such as shoes that which can be worn away from the workplace, may be the responsibility of the employee to provide. Where employees provide their own protective equipment, the employer has the duty to assure its adequacy, including proper maintenance and sanitation of that equipment.

6. What PPE is covered by OSHA standards?

The following OSHA PPE standards are relevant to roadway construction workers:

Hand	1926.95
Foot	1926.96
Head	1926.100
Hearing	1926.101
Eye and Face	1926.102
Respiratory	1926.103, 1910.134
Safety Belts, Lifelines, and Lanyards	1926.104
Working Over or Near Water	1926.106

Head Protection—Protective hats for head protection against impact blows must be able to withstand penetration and absorb the shock of a blow. In some cases hats should also protect against electric shock. Recognized standards for hats have been established by the American National Standards Institute, Z89.1-1969, Safety Requirements for Industrial Head Protection. Also, hard hats for employees exposed to high voltage electrical shock and burns shall meet the specifications contained in American National Standards Institute, Z89.2-1971.

Foot and Leg Protection—For protection against falling or rolling objects, sharp objects, molten metal, hot surfaces and wet, slippery surfaces, workers should use appropriate foot guards, safety shoes or boots and leggings. Safety shoes should be sturdy and have an impact-resistant toe. Safety-toe footwear for employees shall meet the requirements and specifications in American National Standard for Safety-Toe Footwear, Z41.1-1967.

Eye and Face Protection—Protection should be based on kind and degree of hazard present and should: 1) be reasonably comfortable, 2) fit properly, 3) be durable, 4) be cleanable, 5) be sanitary, and 6) be in good condition. Typical applications requiring eye and face protection include welding, cutting, burning, grinding, jack hammering, and use of laser equipment (surveying). Roadway workers should also seriously consider the use of sunglasses to protect against long-term exposures to sunlight and harmful UV light.

Ear Protection—Exposure to high noise levels can cause irreversible hearing loss or impairment. It can also create physical and psychological stress. Preformed or molded earplugs should be individually fitted by a professional. Waxed cotton, foam or fiberglass wool earplugs are generally self-forming. Disposable earplugs should be used once and thrown away; non-disposable ones should be cleaned after each use for proper maintenance. When considering use of PPE, always consider the ability to reduce the noise source before utilizing ear protective devices.

Arm and Hand Protection—Burns, cuts, electrical shock, amputation, contact dermatitis and absorption of chemicals are examples of hazards associated with arm and hand injuries. A wide assortment of gloves, hand pads, sleeves and wristlets for protection from these hazards is available. The devices should be selected to fit the specific task. Insulating gloves and sleeves must conform to ANSI standards. (Copies available from ANSI, 1430 Broadway, New York, NY 10018).

Torso Protection—Many hazards can threaten the torso: heat, splashes from hot asphalt and liquids, impacts, cuts, acids, and radiation. A variety of protective clothing is available: vests, jackets, aprons, coveralls, and full body suits. Fire retardant wool and specially treated cotton clothing items are comfortable, and they adapt well to a

variety of workplace temperatures. Other types of protection include leather, rubberized fabrics, and disposable suits. Most recently, new garments are being created and improved that provide cooling protection in hot environments, coupled with chemical protection, high visibility coatings, etc.

Respiratory Protection— To control those occupational diseases caused by breathing air contaminated with harmful dust, fogs, fumes, mites, gases, sprays, or vapors, the best way to prevent exposure is to prevent air contamination. Where feasible, this should be accomplished through engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators must be used.

Responsibility

The safety coordinator will be responsible for:

- Determining the need for respirators through air sampling
- Determining the type of respirator required and the frequency of change for cartridges or canisters
- Obtaining the necessary training materials
- Reviewing the respirator program annually
- Insuring required fit tests are performed

Managers will be responsible for:

- Ensuring respirators and supplies such as canisters, cartridges, filters, and straps are available and issued as needed
- Ensure employees wear respirators and change filter media as required
- Inspecting respirators monthly
- Prohibiting workers from work who are not adequately trained or that cannot obtain proper respiratory fit when respirators are required

Employees will be responsible for:

- Using respirator equipment in accordance with training
- Cleaning, disinfecting, inspecting, and storing assigned respirator
- Reporting respirator malfunctions to supervisor
- Refraining from modifying respirators or working in areas or jobs requiring respiratory protection when proper fit cannot be achieved

Inspection

The user must inspect all respirators routinely before and after each use, and after cleaning to check condition of face piece, head bands, valves, and hoses, as well as canister, filter, or cartridge fit. The foreman or supervisor should inspect all respirators at least once per

month. Respirators maintained for emergency use should be tagged, noting the date of inspection and the initials of the person doing the inspection. A log indicating these inspections shall be maintained in the office.

Maintenance

Respirators that do not pass inspection must be replaced or repaired immediately. Repair of the respirator by the user should be limited to changing canisters, cartridges, filters, and head straps. An experienced person should perform all other replacements or repairs, with parts designed for the respirator. No one should attempt to replace components or make adjustments, modifications, or repairs beyond the manufacture's recommendations.

Cleaning

Filters, cartridges, or canisters should be removed before washing the respirator and should be discarded as necessary. Respirators must be washed in a disinfecting and detergent solution, rinsed with clean water, and allowed to dry in a clean area. A brush should be used to scrub the respirator to remove adhering dirt. Do not use disinfectants, such as alcohol, as they can dry out the facemask material causing cracking, which affects the seal.

Storage

After inspection, cleaning, and necessary repairs, respirators should be protectively bagged or sealed and stored to protect against dust, sunlight, extreme heat, extreme cold, excessive moisture, or damaging chemicals.

Training

Every employee required to wear a respirator will be trained in the proper use of the respirator. Both the employee and his/her manager are to receive this training which includes:

- Description of the respirator
- Intended use and limitations of the respirator
- Consequences and signs of respirator failure
- Hazards of symptoms caused by the substances that cause the respirator to be used
- Reasons why the company has not or cannot control the hazardous substance by other means
- What to do if the respirator fails (emergency actions)
- Instructions on proper wearing, adjustment, and testing for fit
- Cleaning and storage methods
- Inspection and maintenance procedures

This training must be repeated as necessary, at least annually, to ensure that the employees remain familiar with the proper use of respiratory protection. The training program should be evaluated at

least annually by the program coordinator to determine its continued effectiveness.

Records

The following records should be maintained:

- The number and types of respirators in use
- A record of employee training reports
- Medical certification that the employee is capable of wearing a respirator under his or her given work conditions

Medical Requirements

Employees must not be assigned to tasks requiring use of respirators without a physical examination by a physician familiar with subjects' work conditions. A doctor shall determine what health and physical conditions are pertinent. A doctor will indicate if any limitation on respirator use exists.

Respirator Fit

Every employee who wears a respirator must receive fitting instructions, including demonstration and practice in how the respirator should be worn, how to adjust it, and how to determine if it seals properly.

Respirators relying on face to face-piece seals must not be worn when conditions prevent good face seal such as:

- Facial hair
- Glasses
- Deep scars
- Face size or shape that prevents a good seal


To assure proper protection, the face-piece fit must be checked by the employee each time he/she puts on the respirator. A negative pressure test and a positive pressure test must be conducted. Respirators must not be worn with contact lenses.

OSHA provides detailed information on the requirements for respirators to control of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, and vapors. The standard is available in 29 CFR 1910.134. Proper selection of respirators should be made according to the guidance of ANSI Practices for Respiratory Protection. Roadway construction workers may be required to use respiratory protection in operations such as lead paint removal and sandblasting and/or cutting of concrete or other aggregates that may cause exposure to crystalline silica.

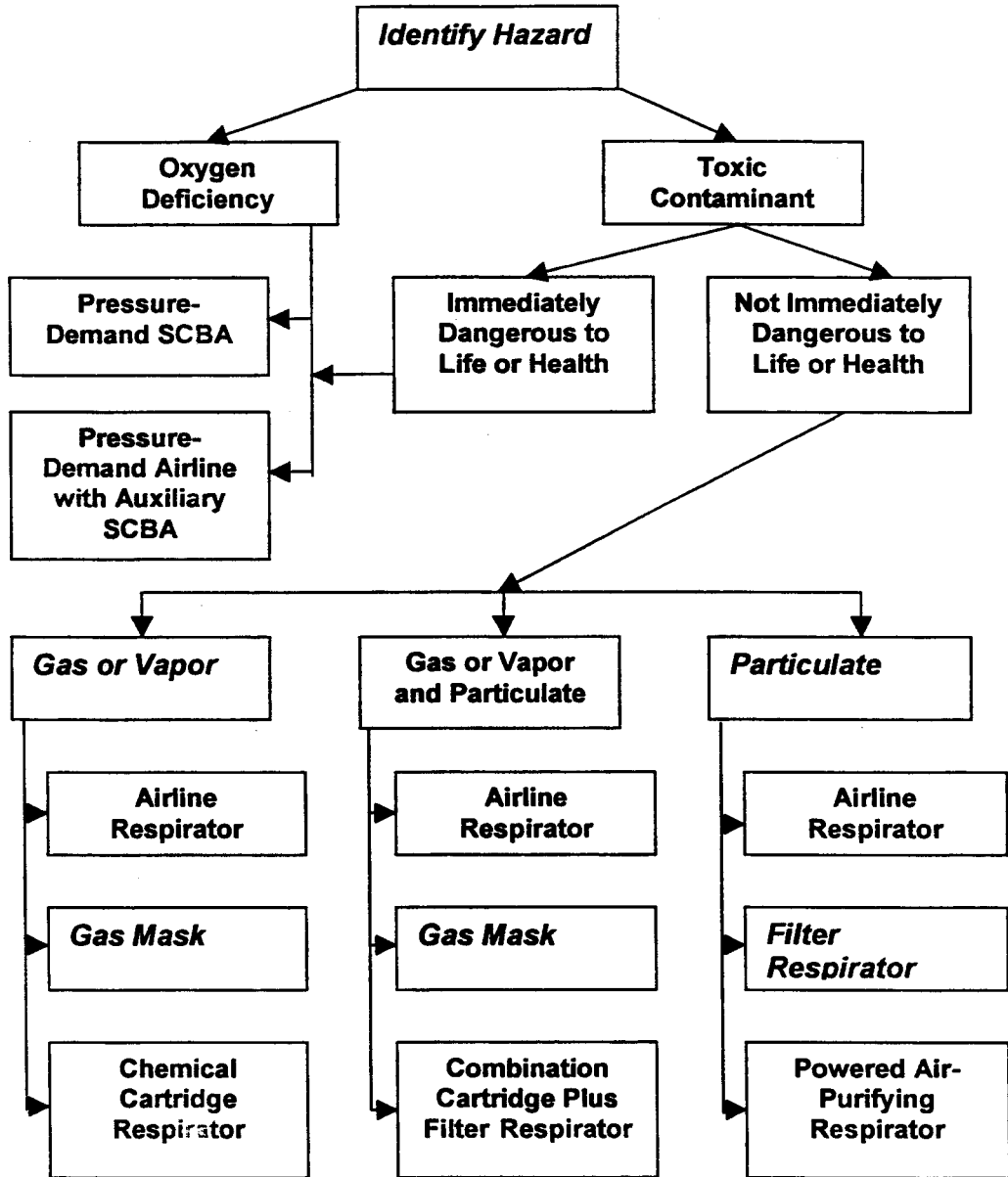
The table on the following page may be useful in selecting appropriate respiratory protection:

Figure 3-1

Group Activity



Instructor should assemble and demonstrate proper use of various types of masks and respirators. Slide 3.22; see Appendix 3-A



Show slides 3.23 –
3.25.



Safety Belts, Lifelines and Lanyards—Under new OSHA standards, safety belts are to be used only as *positioning devices*. Lifelines, harnesses, anchorage systems and lanyards are designed for use as fall arrest and should not be loaded with weight during normal use. If an arrest system is loaded with weight during work—other than static load testing—it must be immediately removed from service and not be used again.

When securing lifelines, make sure they are attached to an anchorage point above the worker and are capable of supporting a minimum dead weight of 5,400 pounds. When deployed, the arrest system must prevent the worker from falling more than six feet

Safety Nets—Safety nets are required when workplaces are more than 25 feet above the ground or water surface, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical. In roadway construction, safety nets are most often used in bridge construction. Where safety net protection is appropriate or required by OSHA standards, work must not begin until the net is in place and has been tested.

Nets must extend 8 feet beyond the edge of the work surface where employees are exposed to a fall and should be installed as close under the work surface as possible. The net may not be installed more than 25 feet below the work surface. Nets shall be hung with sufficient clearance to prevent user's contact with the surfaces or structures below. The clearance between the net and user must be determined by impact load testing.

OSHA standards intended that only one level of nets be required for bridge construction.

A more complete discussion of fall arrest, fall restraint and fall protection is covered in Module 10.

Working Over Water—Employees working over or near water, where the danger of drowning exists, must be provided with U.S. Coast Guard-approved life jacket or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy.

Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys cannot exceed 200 feet. OSHA standards require at least one lifesaving skiff be immediately available at locations where employees are working over or adjacent to water.

7. What is "high visibility clothing and when do I need it? Show slides 3.26 – 3.30.



7. What is "high visibility" clothing and when do I need it?

High visibility clothing refers to reflective garments that workers should wear whenever their work place contains hazards related to low visibility or when they work near vehicles or moving equipment. In 1999, a new industry standard was developed—ANSI/ISEA 107-1999—to provide a national standard for such clothing. This standard contemplates greater use of florescent colors and retroreflective materials to increase worker visibility in both day- and night-time activities. It also contains provisions for garment durability in high-use activities.

The new standard established three classes of high-visibility safety apparel. Class 1, 2 or 3 garments are selected for each level of visibility, depending upon traffic speed and volume, visual complexity of the work areas, and worker activity. The new standard provides increased visibility protection for roadway workers during both day and nighttime operations. This standard specifies minimum amounts of background fabrics and retroreflective materials for high visibility garments. Background materials must be fluorescent yellow-green, fluorescent orange-red, or fluorescent red.

- Class 1 garments are for settings where there is ample separation of workers on foot from vehicular traffic. The garments are designed for work conditions where traffic does not exceed 25 mph and where background settings are not complex. This class is used for workers in traffic settings where their attention will not be diverted from approaching vehicles.
- Class 2 garments, containing more reflective material, are intended for workers who need greater visibility due to situations where inclement weather, presence of complex backgrounds, and work activities are close to moving traffic. This class is used for workers in traffic settings where their attention will likely be diverted from approaching vehicles. It is intended for work sites where vehicle speeds range from 25-50 mph. These garments would likely be use in urban work zones where traffic speeds are relatively low.
- Class 3 garments, with the greatest amount of reflective material, are for use when traffic is greater than 50 mph and the wearer must be conspicuous—and identifiable as a person—through the full range of body motions at a minimum of 1,280 feet. These garments are required when working on interstates and other high traffic – speed highways.

According to ISEA, "garments that meet (the ANSI/ISEA 107-1999) standard can be used 24-hours a day to provide users with a high level of conspicuity through the combined use of fluorescent and retroreflective materials."

The following table may be useful in determining which class of material is most appropriate:

	Class 1	Class 2	Class 3
Speed of Traffic	25 mph	25 – 50 mph	Over 50 mph
Volume of Activity	Low	Medium	High
Minimum Area of Background / Retroreflective Material	217 in ² / 155 in ²	775 in ² / 201 in ²	1240 in ² / 310 in ²

Facilitator Notes

Lesson

Roadway construction workers are frequently exposed to hazards caused by moving vehicles and equipment from both within and outside the work area. It is important for them to be easily visible to drivers and operators at all times and in all weather conditions. It is advisable that all workers utilize high visibility garments during roadway construction, regardless of their activities.

8. Do high visibility garments need special care?

High visibility garments may be adversely affected by repeated washing and excessive wear. Most high visibility colors fade over time and lose their reflectivity and brightness.

When purchasing garments, special attention should be paid to the quality, fabric and way in which the components are assembled. Under the new ANSI/ISEA 107-1000 standard, most garments now contain strips of retroreflective material. These strips are especially susceptible to wear and loss of performance after repeated use. Often the retroreflective strips are applied by heat adhesion instead of being sewn. The material may peel after washing and excessive wear.

New materials and fabrics are introduced regularly that have longer wear lives and better performance. It pays in safety as well as long-term cost to make sure you are buying the correct garment for your job, and maintaining the garments appropriately.

9. Question and summary period.

To have an effective safety program, a manager must be responsible for its coordination. First line supervisors must be convinced of the hazard and must be held accountable for employees' use of personal protective equipment. A safety program for new employees is a necessary part of any orientation program. An ongoing safety program should be used to motivate employees to continue to use protective gear.

8. How much added visibility to retro-reflective materials provide? *Show slide 3.31.*



9. Elicit additional questions and summarize. *Slide 3.32.*



Facilitator Notes**Lesson**

Teaming the correct personal protective equipment with a good training program can give the worker a large measure of safety where other controls are inadequate or impossible. Personal protective equipment can be effective only if the equipment is selected based on its intended use, employees are trained in its use, and the equipment is properly tested, maintained and worn. In the final analysis the best protection comes from an interested management and workforce committed to sound work practices.

10. Transition to
prepare participants for
Module 4.

10. Transition to Module 4.

Personal Protective Equipment

Objective: This activity should familiarize participants with various types of personal protective equipment, particularly respiratory protection. At the end of this activity, students should be able to recognize various types of PPE, the hazards for which it is designed, and the proper use, donning (putting-on) and doffing (taking-off) of the equipment.

Materials:

- Various types of masks and respirators
- Various types of hearing protection
- Various types of gloves
- Other equipment, as available and appropriate

Time: 12 minutes

Activity: Demonstrate various types of PPE, explaining the specific hazards for which the equipment is designed. Allow several students to come to the front of the class and assist the instructor in demonstrating its proper use, including donning and doffing.

Some PPE may be suited to pass around the class, allowing participants to look more closely.