# Personal Protective Equipment

OSHA 3151-02R 2023

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# Contents

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OSHA requires that many categories of PPE meet or be equivalent to standards approved by the American National Standards Institute (ANSI). ANSI has been preparing safety standards since the 1920s, when the first safety standard was approved to protect the heads and eyes of industrial workers. Employers who need to provide PPE in the categories listed below must make certain that any new equipment procured meets the cited ANSI standard. Existing PPE stocks must meet the ANSI standard in effect at the time of its manufacture or provide protection equivalent to PPE manufactured to the ANSI criteria. Employers should inform employees who provide their own PPE of the employer's selection decisions and ensure that any employee-owned PPE used in the workplace conforms to the employer's criteria, based on the hazard assessment, OSHA requirements and ANSI standards. OSHA requires PPE to meet the following ANSI standards:

- Eye and Face Protection: ANSI Z87.1-2010, ANSI Z87.1-2003,

## Training Employees in the Proper Use of PPE

Employers are required to train each employee who must use PPE. Employees must be trained to know at least the following:

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

Employers shall make sure that each employee demonstrates an understanding of the PPE training (i.e., in a language they understand) as well as the ability to properly wear and use PPE before they are allowed to perform work requiring the use of the PPE. If an employer believes that a previously trained employee .MC ETEMC /P geH8.1 (s i)-1.7mprBDC 80aE.orm w.on understanl

## Types of Eye Protection

- **Laser safety goggles.** These specialty goggles protect against intense concentrations of light produced by lasers. The type of laser safety goggles an employer chooses will depend upon the equipment and operating conditions in the workplace.
- **Face shields.** These transparent sheets of plastic extend from the eyebrows to below the chin and across the entire width of the employee's head. Some are polarized for glare protection. Face shields protect against potential splashes or sprays of hazardous liquids, droplets, and particles but will not provide adequate protection against impact hazards. Face shields used in combination with goggles or safety spectacles will provide additional protection against splash and impact hazards.

Each type of protective eyewear is designed to protect against specific hazards. Employers can identify the specific workplace hazards that threaten employees' eyes and faces by completing a hazard assessment as outlined in the earlier section.

## Welding Operations

The intense light associated with welding operations can cause serious, sometimes permanent, eye damage if operators do not wear proper eye protection. The intensity of light or radiant energy produced by welding, cutting or brazing operations varies according to a number of factors including the task producing the light, the electrode size and the arc current. Table 1 shows the minimum protective shades for filter lenses for a variety of welding, cutting and brazing operations in general industry and in the shipbuilding industry.

## Table 1: Filter Lenses for Protection Against Radiant Energy

| Operations | Plate thickness inches | Plate thickness mm | Minimum* protective shade |
|---|---|---|---|
| Shielded metal arc welding | < 3 | < 60 | 7 |
| | 3 - 5 | 60 - 160 | 8 |
| | 5 - 8 | 160 - 250 | 10 |
| | > 8 | 250 - 550 | 11 |
| Gas metal arc welding and ux cored arc welding | | < 60 | 7 |
| | | 60 - 160 | 10 |
| | | 160 - 250 | 10 |
| | | 250 - 500 | 10 |
| Gas tungsten arc welding | | < 50 | 8 |

| Welding Operation | Shade Number |
|---|---|
| Heavy cutting, more than 6 inches | 5 or 6 |
| Gas welding (light), up to 1/8-inch | 4 or 5 |
| Gas welding (medium), 1/8- to 1/2-inch | 5 or6 |
| Gas welding (heavy), more than 1/2-inch | 6 or8 |

Source: 29 CFR 1926.102(c)(1).

## Laser Operations

Laser light radiation can be extremely dangerous to the unprotected eye and direct or reflected beams can cause permanent eye damage. Laser retinal burns can be painless, so it is essential that all personnel in or around laser operations wear appropriate eye protection.

Laser safety goggles should protect for the specific wavelength of the laser and must be of sufficient optical density for the energy involved. Safety goggles intended for use with laser beams must be labeled with the laser wavelengths for which they are intended to be used, the optical density of those wavelengths and the visible light transmission.

The table below lists maximum power or energy densities and appropriate protection levels for optical densities 5 through 8.

### Table 3: Selecting Laser Safety Glass

| Intensity, CW maximum | Attenuation |
|---|---|

Protective headgear must comply with any of the following consensus standards ANSI Z89.1-2009, ANSI Z89.1-2003, or ANSI Z89.1-1997 or provide an equivalent level of protection.

## Size and Care Considerations

Head protection that is either too large or too small is inappropriate for use, even if it meets all other requirements. Protective headgear must fit appropriately on the body and for the head size of each individual. Most protective headgear comes in a variety of sizes with adjustable headbands to ensure a proper fit (many adjust in 1/8-inch increments). A proper fit should allow sufficient clearance between the shell and the suspension system for ventilation and distribution of an impact. The hat should n (o)-5.5 (68M)-10.2 (o)-11.7 (nu5 (t)TJ9 3(f)-11.3 (l)-63i)-0.8 (b)

s-4.1 (n)-7.4 (d d)-4.5 (a)-47 (s)o en5 (a)-40.6 (t)T (e b)e118 7lectr iaa lss i stsnr

Always replace a hard hat if it sustains an impact, even if damage is not noticeable. Suspension systems are offered as replacement parts and should be replaced when damaged or when excessive wear is noticed. It is not necessary to replace the entire hard hat when deterioration or tears of the suspension systems are noticed.

## Foot and Leg Protection

Employees who face possible foot or leg injuries from falling or rolling objects or from crushing or penetrating materials should wear protective footwear. Also, employees whose work involves exposure to hot substances or corrosive or poisonous materials must have protective gear to cover exposed body parts, including legs and feet. If an employee's feet may be exposed to electrical hazards, non-conductive footwear should be worn. On the other hand, workplace exposure to static electricity may necessitate the use of conductive footwear.

Examples of situations in which an employee should wear foot and/or leg protection include:

- When heavy objects such as barrels or tools might roll onto or fall on the employee's feet;
- Working with sharp objects such as nails or spikes that could pierce the soles or uppers of ordinary shoes;
- Exposure to molten metal that might splash on feet or legs;
- Working on or around hot, wet or slippery surfaces; and
- Working when electrical hazards are present.

Protective footwear must comply with any of the following consensus standards; ASTM F-2412-2005, "Standard Test Methods for Foot Protection," and ASTM F-2413-2005, "Standard Specification for Performance Requirements for Protective Footwear", ANSI Z41-1999, "American National Standard for Personal Protection - Protective Footwear", or ANSI Z41-1991, "American National Standard for Personal Protection - Protective Footwear", or provide equivalent protection. All ANSI-approved footwear has a protective toe

because it provides insulation, reducing the conductive ability of the shoes. Silk, wool and nylon socks can produce static electricity and should not be worn with conductive footwear. Conductive shoes must be removed when the task requiring their use is completed. Note: Employees exposed to electrical hazards must never wear conductive shoes.

Electrical hazard, safety-toe shoes are nonconductive and will prevent the wearers' feet from completing an electrical circuit to the ground. These shoes can protect against open circuits of up to 600 volts in dry conditions and should be used in conjunction with other insulating equipment and additional precautions to reduce the risk of an employee becoming a path for hazardous electrical energy. The insulating protection of electrical hazard, safety-toe shoes may be compromised if the shoes become wet, the soles are worn through, metal particles become embedded in the sole or heel, or employees touch conductive, grounded items. Note: Nonconductive footwear must not be used in explosive or hazardous locations.

## Foundry Shoes

In addition to insulating the feet from the extreme heat of molten metal, foundry shoes keep hot metal from lodging in shoe eyelets, tongues or other shoe parts. These snug-fitting leather or leather-substitute shoes have leather or rubber soles and rubber heels. All foundry shoes must have built-in safety toes.

## Care of Protective Footwear

As with all protective equipment, safety footwear should be inspected prior to each use. Shoes and leggings should be checked for wear and tear at reasonable intervals. This includes looking for cracks or holes, separation of materials, broken buckles or laces.

The soles of shoes should be checked for pieces of metal or other embe.

- Area requiring protection (hand only, forearm, arm).
- Grip requirements (dry, wet, oily).
- Thermal protection.
- Size and comfort.
- Abrasion/resistance requirements.

Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:

- Gloves made of leather, canvas or metal mesh;

## Fabric and Coated Fabric Gloves

Fabric and coated fabric gloves are made of cotton or other fabric to provide varying degrees of protection.

- Fabric gloves protect against dirt, slivers, chafing and abrasion, and remain flexible at low temperatures. Butyl rubber does not perform well with aliphatic and aromatic hydrocarbons and halogenated solvents.

- Natural (latex) rubber gloves are comfortable to wear, which makes them a popular general-purpose glove. They feature outstanding tensile strength, elasticity, and temperature resistance. In addition to resisting abrasions caused by grinding and polishing, these gloves protect employees' hands from most water solutions of acids, alkalis, salts, and ketones. Latex gloves have caused allergic reactions in some individuals and may not be appropriate for all employees. Hypoallergenic gloves, glove liners and powderless gloves are possible alternatives for employees who are allergic to latex gloves.

## Table 4: Chemical Resistance Selection Chart for Protective Gloves

| Chemical | Neoprene | Latex/Rubber | Butyl | Nitrile |
|---|---|---|---|---|
| Acetaldehyde* | VG | G | VG | G |
| Acetic acid | VG | VG | VG | VG |
| Acetone* | G | VG | VG | P |
| Ammonium hydroxide | VG | VG | VG | VG |
| Amyl acetate* | F | P | F | P |
| Aniline | G | F | F | P |
| Benzaldehyde* | F | F | G | G |
| Benzene* | P | P | P | F |
| Butyl acetate | G | F | F | P |
| Butyl alcohol | VG | VG | VG | VG |
| Carbon disul de | F | F | F | F |
| Carbon tetrachloride* | F | P | P | G |
| Castor oil | F | P | F | VG |
| Chlorobenzene* | F | P | F | P |
| Chloroform* | G | P | P | F |
| Chloronaphthalene | F | P | F | F |

| Chemical | Neoprene | Latex/Rubber | Butyl | Nitrile |
|---|---|---|---|---|
| Ethylene dichloride* | F | P | F | P |
| Ethylene glycol | VG | VG | VG | VG |
| Formaldehyde | VG | VG | VG | VG |
| Formic acid | VG | VG | VG | VG |
| Freon 11 | G | P | F | G |
| Freon 12 | G | P | F | G |
| Freon 21 | G | P | F | G |
| Freon 22 | G | P | F | G |
| Furfural* | G | G | G | G |
| Gasoline, leaded | G | P | F | VG |
| Gasoline, unleaded | G | P | F | VG |
| Glycerin | VG | VG | VG | VG |
| Hexane | F | P | P | G |
| Hydrazine (65%) | F | G | G | G |
| Hydrochloric acid | VG | G | G | G |
| Hydro uoric acid (48%) | VG | G | G | G |
| Hydrogen peroxide (30%) F | | | | |

## Body Protection

Employees who face possible bodily injury of any kind that cannot be eliminated through engineering, work practice or administrative controls must wear appropriate body protection while performing their jobs. In addition to cuts and radiation, the following are examples of workplace hazards that could cause bodily injury:

- Temperature extremes;
- Hot splashes from molten metals and other hot liquids;
- Potential impacts from tools, machinery and materials;
- Hazardous ch.8494 (r)-4m678i0 fr18.6 (y)-21 (:)TJETEMCm( 0 gs0 05 20

type of noise must not exceed 140 dB. Examples of situations or tools that may result in impact or impulse noises are powder-actuated nail guns, the use of a punch press or drop hammers.

**Table 5: Permissible Noise Exposures**

| Duration per day, in hours | Sound level in dB* |
| --- | --- |
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over an eight-hour period, the employer is required to institute a hearing conservation program that includes regular testing of employees' hearing by qualified professionals. Refer to 29 CFR 1910.95(c) for a description of the requirements for a hearing conservation program.

Some types of hearing protection include:

- Single-use earplugs are made of waxed cotton, foam, silicone rubber or fiberglass wool. They are self-forming and, when properly inserted, they work as well as most molded earplugs.
- Pre-formed or molded earplugs are individually fitted by a professional and can be disposable or reusable. Reusable plugs should be cleaned after each use.
- Earmuffs require a perfect seal around the ear. Glasses, facial hair, long hair or facial movements such as chewing may reduce the protective value of earmuffs.

## Personal Fall Protection Systems

If a workplace hazard assessment reveals that employees face potential injury from fall hazards, and engineering controls cannot be used to eliminate the hazard, personal fall protection systems are another option for employers. "Personal fall protection system" (PFPS) means a system (including all components) an employer uses to provide protection from falling or to safely arrest an employee's fall if one occurs. Examples of personal fall protection systems include personal fall arrest systems, positioning systems, and travel restraint systems.

29 CFR 1910.140 sets forth requirements for personal fall protection systems. There are several types of these systems:

- Travel restraint systems consist of a combination of an anchorage, anchorage connector, lanyard (or other means of connection), and body support that an employer uses to eliminate the possibility of an employee going over the edge of a walking-working surface.

# OSHA Regional Offices

Region 1
Boston Regional Office
(CT*, ME*, MA*, NH, RI, VT*)
JFK Federal Building
25 New Sudbury Street, Room E340
Boston, MA 02203
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Region 2
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201 Varick Street, Room 670
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(212) 337-2378 (212) 337-2371 Fax

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(DE, DC, MD*, PA, VA*, WV)
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Philadelphia, PA 19106-3309
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*These states and territories operate their own OSHA-approved job safety and health plans and cover state and local government employees as well as private sector employees. The Connecticut, Illinois, Maine, Massachusetts, New Jersey, New York and Virgin Islands programs cover public employees only. (Private sector workers in these states are covered by Federal OSHA). States with approved programs must have standards that are identical to, or at least as effective as, the Federal OSHA standards.

Note: To get contact information for OSHA area offices, OSHA-approved State Plans and OSHA consultation projects, please visit us online at www.osha.gov or call us at 1-800-321-OSHA (6742).

## How to Contact OSHA

Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to help ensure these conditions for America's workers by setting and enforcing standards, and providing training, education and assistance. For more information, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

**For assistance, contact us.**
**We are OSHA. We can help.**

# Appendix A: OSHA Standards that Require PPE

## 29 CFR 1910, General Industry

**Standards that Require the Employer to Provide PPE:**

| | |
|---|---|
| 1910.28 | Duty to have fall protection and falling object protection |
| 1910.66 | Powered platforms for building maintenance |
| 1910.67 | Vehicle-mounted elevating and rotating work platforms |
| 1910.94 | Ventilation |
| 1910.119 | Process safety management of highly hazardous chemicals |
| 1910.120 | Hazardous waste operations and emergency response |
| 1910.132 | General requirements (personal protective equipment) |
| 1910.133 | Eye and face protection |
| 1910.134 | Respiratory protection |
| 1910.135 | Occupational head protection |
| 1910.136 | Occupational foot protection |
| 1910.137 | Electrical protective devices |
| 1910.138 | Hand protection |
| 1910.140 | Personal fall protection systems |
| 1910.157 | Portable fire extinguishers |
| 1910.160 | Fixed extinguishing systems, general |
| 1910.183 | Helicopters |
| 1910.218 | Forging machines |
| 1910.242 | Hand and portable powered tools and equipment, general |
| 1910.243 | Guarding of portable power tools |
| 1910.252 | General requirements (welding, cutting and brazing) |
| 1910.261 | Pulp, paper, and paperboard mills |
| 1910.262 | Textiles |
| 1910.268 | Telecommunications |
| 1910.269 | Electric power generation, transmission and distribution |
| 1910.333 | Selection and use of work practices |
| 1910.335 | Safeguards for personnel protection |
| 1910.1000 | Air contaminants |
| 1910.1003 | 13 carcinogens, etc. |
| 1910.1017 | |

**Standards that Require the Employer to Provide PPE at No Cost to the Employee:**

1910.95 Occupational noise exposure
1910.134 Respiratory protection
1910.146 Permit-required con ned spaces
1910.156 Fire brigades
1910.266 Logging operations
1910.1001 Asbestos
1910.1018 Inorganic Arsenic
1910.1025 Lead
1910.1027 Cadmium
1910.1028 Benzene
1910.1030 Bloodborne pathogens
1910.1044 1,2-dibromo-3-chloropropane
1910.1045 Acrylonitrile
1910.1047 Ethylene oxide
1910.1048 Formaldehyde
1910.1050 Methylenedianiline
1910.1051 1,3-Butadiene
1910.1052 Methylene chloride
1910.1450 Occupational exposure to chemicals in laboratories

## 29 CFR 1915, Shipyard Employment

**Standards that Require the Employer to Provide PPE:**

1915.12 Precautions and the order of testing before entering con ned

**Standards that Require the Employer to Provide PPE at No Cost to the Employee:**

1915.154 Respiratory Protection
1915.1001 Asbestos

## 29 CFR 1917, Marine Terminals

**Standards that Require the Employer to Provide PPE:**

1917.22 Hazardous cargo
1917.25 Fumigants, pesticides, insecticides and hazardous waste
1917.26 First aid and lifesaving facilities
1917.91 Eye and face protection

1917.22

| | |
|---|---|
| 1926.95 | Criteria for personal protective equipment |
| 1926.96 | Occupational foot protection |
| 1926.100 | Head protection |
| 1926.101 | Hearing protection |
| 1926.102 | Eye and face protection |
| 1926.104 | Safety belts, lifelines and lanyards |
| 1926.105 | Safety nets |
| 1926.106 | Working over or near water |
| 1926.250 | General requirements for storage |
| 1926.300 | General requirements (Hand and power tools) |
| 1926.302 | Power-operated hand tools |
| 1926.304 | Woodworking tools |
| 1926.353 | Ventilation and protection in welding, cutting and heating |
| 1926.354 | Welding, cutting and heating in way of preservative coatings |
| 1926.416 | General requirements (Electrical) |
| 1926.451 | General requirements (Scaffolds) |
| 1926.453 | Aerial lifts |
| 1926.501 | Duty to have fall protection |
| 1926.502 | Fall protection systems criteria and practices |
| 1926 Subpart CC | Cranes and derricks |
| 1926.551 | Helicopters |
| 1926.701 | General requirements (Concrete and masonry construction) |
| 1926.760 | Fall protection (Steel erection) |
| 1926.800 | Underground construction |
| 1926.951 | Tools and protective equipment |
| 1926.955 | Overhead lines |
| 1926.1101 | Asbestos |

**Standards that Require the Employer to Provide PPE at No Cost to the Employee:**

| | |
|---|---|
| 1926.60 | Methylenedianiline |
| 1926.62 | Lead |
| 1926.103 | Respiratory protection |