

Filter Lenses for Protection Against Radiant Energy

Operations	Electric Size 1/32 in.	Arc Current	Minimum* Protective Shade
Shielded metal arc welding	Less than 3	Less than 60	7
	3-5	60-160	8
	5-8	160-250	10
	More than 8	250-550	11
Gas metal arc welding and flux cored arc welding		less than 60	7
		60-160	10
		160-250	10
		250-500	10
Gas Tungsten arc welding		less than 50	8
		50-150	8
		150-500	10
Air carbon Arc cutting	(Light)	less than 500	10
	(Heavy)	500-1000	11
Plasma arc welding		less than 20	6
		20-100	8
		100-400	10
		400-800	11
Plasma arc cutting	(light)**	less than 300	8
	(medium)**	300-400	9
	(heavy)**	400-800	10
Torch brazing			3
Torch soldering			2
Carbon arc welding			14

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Operations	Plate thickness—inches	Plate thickness—mm	Minimum* Protective Shade
Gas Welding:			
Light	Under 1/8	Under 3.2	4
Medium	1/8 to 1/2	3.2 to 12.7	5
Heavy	Over 1/2	Over 12.7	6
Oxygen cutting:			
Light	Under 1	Under 25	3
Medium	1 to 6	25 to 150	4
Heavy	Over 6	Over 150	5

* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

(b) *Criteria for protective eye and face devices.* (1) Protective eye and face devices purchased after July 5, 1994 shall comply with ANSI Z87.1-1989, "American National Standard Practice for Occupational and Educational Eye and Face Protection," which is incorporated by reference, or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American National Standards Institute.

Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W. room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., suite 700, Washington, DC.

(2) Eye and face protective devices purchased before July 5, 1994 shall comply with the ANSI "USA standard for Occupational and Educational Eye and Face Protection," Z87.1-1968 or shall be demonstrated by the employer to be equally effective. This

incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W. room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., suite 700, Washington, DC.

4. Sections 1910.135 and 1910.136 are revised to read as follows:

§1910.135 Head protection.

(a) *General requirements.* (1) Each affected employee shall wear protective helmets when working in areas where there is a potential for injury to the head from falling objects.

(2) Protective helmets designed to reduce electrical shock hazard shall be worn by each such affected employee when near exposed electrical conductors which could contact the head.

(b) *Criteria for protective helmets.* (1) Protective helmets purchased after July 5, 1994 shall comply with ANSI Z89.1-1986, "American National Standard for Personnel Protection—Protective Headwear for Industrial Workers—Requirements," which is incorporated by reference, or shall be demonstrated to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American National Standards Institute. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., suite 700, Washington, DC.

(2) Protective helmets purchased before July 5, 1994 shall comply with the ANSI standard "American National Standard Safety Requirements for Industrial Head Protection," ANSI Z89.1-1969, or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., suite 700, Washington, DC.

§1910.136 Foot protection.

(a) *General requirements.* Each affected employee shall wear protective footwear when working in areas where there is a danger of foot injuries due to falling and rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electrical hazards.

(b) *Criteria for protective footwear.* (1) Protective footwear purchased after July 5, 1994 shall comply with ANSI Z41-1991, "American National Standard for Personnel Protection—Protective Footwear," which is incorporated by

reference, or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American National Standards Institute. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., suite 700, Washington, DC.

(2) Protective footwear purchased before July 5, 1994 shall comply with the ANSI standard "USA Standard for Men's Safety-Toe Footwear," Z41.1-1967, which is incorporated by reference, or shall be demonstrated by the employer to be equally effective. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Ave., N.W., room N2634, Washington, D.C. or at the Office of the Federal Register, 800 North Capitol Street NW., suite 700, Washington, DC.

5. A new §1910.138 is added to read as follows.

1910.138 Hand protection.

(a) *General requirements.* Employers shall select and require employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes.

(b) *Selection.* Employers shall base the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards and potential hazards identified.

6. Appendices A and B to Subpart I are added to read as follows.

Appendix A to Subpart I—References for further information (Non-mandatory)

The documents in Appendix A provide information which may be helpful in understanding and implementing the standards in Subpart I.

1. Bureau of Labor Statistics (BLS). "Accidents Involving Eye Injuries." Report 597, Washington, D.C.: BLS, 1980.

2. Bureau of Labor Statistics (BLS). "Accidents Involving Face Injuries." Report 604, Washington, D.C.: BLS, 1980.

3. Bureau of Labor Statistics (BLS). "Accidents Involving Head Injuries." Report 605, Washington, D.C.: BLS, 1980.

4. Bureau of Labor Statistics (BLS). "Accidents Involving Foot Injuries." Report 626, Washington, D.C.: BLS, 1981.

5. National Safety Council. "Accident Facts", Annual edition, Chicago, IL: 1981.

6. Bureau of Labor Statistics (BLS). "Occupational Injuries and Illnesses in the United States by Industry." Annual edition, Washington, D.C.: BLS.

7. National Society to Prevent Blindness. "A Guide for Controlling Eye Injuries in Industry." Chicago, IL: 1982.

Appendix B to Subpart I—Non-mandatory Compliance Guidelines for Hazard Assessment and Personal Protective Equipment Selection

This Appendix is intended to provide compliance assistance for employers and employees in implementing requirements for a hazard assessment and the selection of personal protective equipment.

1. *Controlling hazards.* PPE devices alone should not be relied on to provide protection against hazards, but should be used in conjunction with guards, engineering controls, and sound manufacturing practices.

2. *Assessment and selection.* It is necessary to consider certain general guidelines for assessing the foot, head, eye and face, and hand hazard situations that exist in an occupational or educational operation or process, and to match the protective devices to the particular hazard. It should be the responsibility of the safety officer to exercise common sense and appropriate expertise to accomplish these tasks.

3. *Assessment guidelines.* In order to assess the need for PPE the following steps should be taken:

a. *Survey.* Conduct a walk-through survey of the areas in question. The purpose of the survey is to identify sources of hazards to workers and co-workers. Consideration should be given to the basic hazard categories:

- (a) Impact
- (b) Penetration
- (c) Compression (roll-over)
- (d) Chemical
- (e) Heat
- (f) Harmful dust
- (g) Light (optical) radiation

b. *Sources.* During the walk-through survey the safety officer should observe: (a) sources of motion; i.e., machinery or processes where any movement of tools, machine elements or particles could exist, or movement of personnel that could result in collision with stationary objects; (b) sources of high temperatures that could result in burns, eye injury or ignition of protective equipment, etc.; (c) types of chemical exposures; (d) sources of harmful dust; (e) sources of light radiation, i.e., welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc.; (f) sources of falling objects or potential for dropping objects; (g) sources of sharp objects which might pierce the feet or cut the hands; (h) sources of rolling or pinching

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objects which could crush the feet; (i) layout of workplace and location of co-workers; and (j) any electrical hazards. In addition, injury/accident data should be reviewed to help identify problem areas.

c. *Organize data.* Following the walk-through survey, it is necessary to organize the data and information for use in the assessment of hazards. The objective is to prepare for an analysis of the hazards in the environment to enable proper selection of protective equipment.

d. *Analyze data.* Having gathered and organized data on a workplace, an estimate of the potential for injuries should be made. Each of the basic hazards (paragraph 3.a.) should be reviewed and a determination made as to the type, level of risk, and seriousness of potential injury from each of the hazards found in the area. The possibility of exposure to several hazards simultaneously should be considered.

4. *Selection guidelines.* After completion of the procedures in paragraph 3, the general procedure for selection of protective equipment is to: a) Become familiar with the potential hazards and the type of protective equipment that is available, and what it can do: i.e., splash protection, impact protection, etc.; b) compare the hazards associated with the environment: i.e., impact velocities,

masses, projectile shape, radiation intensities, with the capabilities of the available protective equipment; c) select the protective equipment which ensures a level of protection greater than the minimum required to protect employees from the hazards; and d) fit the user with the protective device and give instructions on care and use of the PPE. It is very important that end users be made aware of all warning labels for and limitations of their PPE.

5. *Fitting the device.* Careful consideration must be given to comfort and fit. PPE that fits poorly will not afford the necessary protection. Continued wearing of the device is more likely if it fits the wearer comfortably. Protective devices are generally available in a variety of sizes. Care should be taken to ensure that the right size is selected.

6. *Devices with adjustable features.* Adjustments should be made on an individual basis for a comfortable fit that will maintain the protective device in the proper position. Particular care should be taken in fitting devices for eye protection against dust and chemical splash to ensure that the devices are sealed to the face. In addition, proper fitting of helmets is important to ensure that it will not fall off during work operations. In some cases a chin strap may be necessary to keep the helmet on an

employee's head. (Chin straps should break at a reasonably low force, however, so as to prevent a strangulation hazard). Where manufacturer's instructions are available, they should be followed carefully.

7. *Reassessment of hazards.* It is the responsibility of the safety officer to reassess the workplace hazard situation as necessary, by identifying and evaluating new equipment and processes, reviewing accident records, and reevaluating the suitability of previously selected PPE.

8. *Selection chart guidelines for eye and face protection.* Some occupations (not a complete list) for which eye protection should be routinely considered are: carpenters, electricians, machinists, mechanics and repairers, millwrights, plumbers and pipe fitters, sheet metal workers and tinsmiths, assemblers, sanders, grinding machine operators, lathe and milling machine operators, sawyers, welders, laborers, chemical process operators and handlers, and timber cutting and logging workers. The following chart provides general guidance for the proper selection of eye and face protection to protect against hazards associated with the listed hazard "source" operations.

Eye and Face Protection Selection Chart

Source	Assessment of Hazard	Protection
IMPACT—Chipping, grinding machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, and sanding.	Flying fragments, objects, large chips, particles sand, dirt, etc.	Spectacles with side protection, goggles, face shields. See notes (1), (3), (5), (6), (10). For severe exposure, use faceshield.
HEAT—Furnace operations, pouring, casting, hot dipping, and welding.	Hot sparks	Faceshields, goggles, spectacles with side protection. For severe exposure use faceshield. See notes (1), (2), (3).
	Splash from molten metals	Faceshields worn over goggles. See notes (1), (2), (3).
	High temperature exposure	Screen face shields, reflective face shields. See notes (1), (2), (3).
CHEMICALS—Acid and chemicals handling, degreasing plating.	Splash	Goggles, eyecup and cover types. For severe exposure, use face shield. See notes (3), (11).
	Irritating mists	Special-purpose goggles.
DUST—Woodworking, buffing, general dusty conditions.	Nuisance dust	Goggles, eyecup and cover types. See note (8).
LIGHT and/or RADIATION— Welding: Electric arc Welding: Gas Cutting, Torch brazing, Torch soldering Glare	Optical radiation	Welding helmets or welding shields. Typical shades: 10-14. See notes (9), (12)
	Optical radiation	Welding goggles or welding face shield. Typical shades: gas welding 4-8, cutting 3-6, brazing 3-4. See note (9)
	Optical radiation	Spectacles or welding face-shield. Typical shades: 1.5-3. See notes (3), (9)
	Poor vision	Spectacles with shaded or special-purpose lenses, as suitable. See notes (9), (10).

Notes to Eye and Face Protection Selection Chart:

- (1) Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards should be provided. Protective devices do not provide unlimited protection.
- (2) Operations involving heat may also involve light radiation. As required by the standard, protection from both hazards must be provided.
- (3) Faceshields should only be worn over primary eye protection (spectacles or goggles).
- (4) As required by the standard, filter lenses must meet the requirements for shade designations in §1910.133(a)(5). Tinted and shaded lenses are not filter lenses unless they are marked or identified as such.
- (5) As required by the standard, persons whose vision requires the use of prescription (Rx) lenses must wear either protective devices fitted with prescription (Rx) lenses or protective devices designed to be worn over regular prescription (Rx) eyewear.
- (6) Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.
- (7) Caution should be exercised in the use of metal frame protective devices in electrical hazard areas.
- (8) Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.
- (9) Welding helmets or faceshields should be used only over primary eye protection (spectacles or goggles).

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(10) Non-sideshield spectacles are available for frontal protection only, but are not acceptable eye protection for the sources and operations listed for "impact."

(11) Ventilation should be adequate, but well protected from splash entry. Eye and face protection should be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.

(12) Protection from light radiation is directly related to filter lens density. See note (4). Select the darkest shade that allows task performance.

9. Selection guidelines for head protection.

All head protection (helmets) is designed to provide protection from impact and penetration hazards caused by falling objects. Head protection is also available which provides protection from electric shock and burn. When selecting head protection, knowledge of potential electrical hazards is important. Class A helmets, in addition to impact and penetration resistance, provide electrical protection from low-voltage conductors (they are proof tested to 2,200 volts). Class B helmets, in addition to impact and penetration resistance, provide electrical protection from high-voltage conductors (they are proof tested to 20,000 volts). Class C helmets provide impact and penetration resistance (they are usually made of aluminum which conducts electricity), and should not be used around electrical hazards.

Where falling object hazards are present, helmets must be worn. Some examples include: working below other workers who are using tools and materials which could fall; working around or under conveyor belts which are carrying parts or materials; working below machinery or processes which might cause material or objects to fall; and working on exposed energized conductors.

Some examples of occupations for which head protection should be routinely considered are: carpenters, electricians, linemen, mechanics and repairers, plumbers and pipe fitters, assemblers, packers, wrappers, sawyers, welders, laborers, freight handlers, timber cutting and logging, stock handlers, and warehouse laborers.

10. *Selection guidelines for foot protection.* Safety shoes and boots which meet the ANSI Z41-1991 Standard provide both impact and compression protection. Where necessary, safety shoes can be obtained which provide puncture protection. In some work situations, metatarsal protection should be provided, and in other special situations electrical conductive or insulating safety shoes would be appropriate.

Safety shoes or boots with impact protection would be required for carrying or handling materials such as packages, objects,

parts or heavy tools, which could be dropped; and, for other activities where objects might fall onto the feet. Safety shoes or boots with compression protection would be required for work activities involving skid trucks (manual material handling carts) around bulk rolls (such as paper rolls) and around heavy pipes, all of which could potentially roll over an employee's feet. Safety shoes or boots with puncture protection would be required where sharp objects such as nails, wire, tacks, screws, large staples, scrap metal etc., could be stepped on by employees causing a foot injury.

Some occupations (not a complete list) for which foot protection should be routinely considered are: shipping and receiving clerks, stock clerks, carpenters, electricians, machinists, mechanics and repairers, plumbers and pipe fitters, structural metal workers, assemblers, drywall installers and lathers, packers, wrappers, craters, punch and stamping press operators, sawyers, welders, laborers, freight handlers, gardeners and grounds-keepers, timber cutting and logging workers, stock handlers and warehouse laborers.

11. *Selection guidelines for hand protection.* Gloves are often relied upon to prevent cuts, abrasions, burns, and skin contact with chemicals that are capable of causing local or systemic effects following dermal exposure. OSHA is unaware of any gloves that provide protection against all potential hand hazards, and commonly available glove materials provide only limited protection against many chemicals. Therefore, it is important to select the most appropriate glove for a particular application and to determine how long it can be worn, and whether it can be reused.

It is also important to know the performance characteristics of gloves relative to the specific hazard anticipated: e.g., chemical hazards, cut hazards, flame hazards, etc. These performance characteristics should be assessed by using standard test procedures. Before purchasing gloves, the employer should request documentation from the manufacturer that

the gloves meet the appropriate test standard(s) for the hazard(s) anticipated.

Other factors to be considered for glove selection in general include:

(A) As long as the performance characteristics are acceptable, in certain circumstances, it may be more cost effective to regularly change cheaper gloves than to reuse more expensive types; and,

(B) The work activities of the employee should be studied to determine the degree of dexterity required, the duration, frequency, and degree of exposure of the hazard, and the physical stresses that will be applied.

With respect to selection of gloves for protection against chemical hazards:

(A) The toxic properties of the chemical(s) must be determined; in particular, the ability of the chemical to cause local effects on the skin and/or to pass through the skin and cause systemic effects;

(B) Generally, any "chemical resistant" glove can be used for dry powders;

(C) For mixtures and formulated products (unless specific test data are available), a glove should be selected on the basis of the chemical component with the shortest breakthrough time, since it is possible for solvents to carry active ingredients through polymeric materials; and,

(D) Employees must be able to remove the gloves in such a manner as to prevent skin contamination.

12. *Cleaning and maintenance.* It is important that all PPE be kept clean and properly maintained. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision.

For the purposes of compliance with §1910.132 (a) and (b), PPE should be inspected, cleaned, and maintained at regular intervals so that the PPE provides the requisite protection.

It is also important to ensure that contaminated PPE which cannot be decontaminated is disposed of in a manner that protects employees from exposure to hazards.

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