

SEMINAR 206: ROOM 412 ATLANTIC CITY CONVENTION CENTER

ELECTRIC SIGNS
Code and Safety Updates
By Randy Wright



"Making The Sign Industry A Safer Place"

www.rkwconsulting.org

SEMINAR RULES:

- There are no Rules
- All Questions need to be asked
- Stop at any time for an explanation

SEMINAR PARTS:

Part 1: Review and status of the codes and standards

Part 2: Personal Safety for the Sign Installer

Your Presenter: Randall K. Wright RKW CONSULTING

- 36 Years in the electric sign industry
- 17 Years consulting as an electric and neon sign system specialist
- 31 Years in the fire service
- Seminar presentation for education
- Consultant for United States Sign Council

NFPA 70 NEC Code Panel 18

Voting (Special Expert) member

1987-2002 as Association Member 2008- Currently as Consultant

UNDERWRITER LABORATORIES

Member of four UL STPs: Standards Technical Panels

- UL 48 Electric Signs
- UL 2161 Transformers and Power Supplies
- UL 814 GTO Wire
- UL 879 Sign Components

Writes for:

- Sign Builder Magazine
- I.A.E.I news
- USSC Newsletter
- Neon Installation Guide
- Fire Litigation Perspectives

Fire Investigation:

- Provide Cause and Origin information for Neon Signs
- Expert testimony for Neon Sign Fire cases
- Trial and Deposition Demonstrations
- Code Authorities on Neon Sign Fire Prevention

Provide review and edit information:

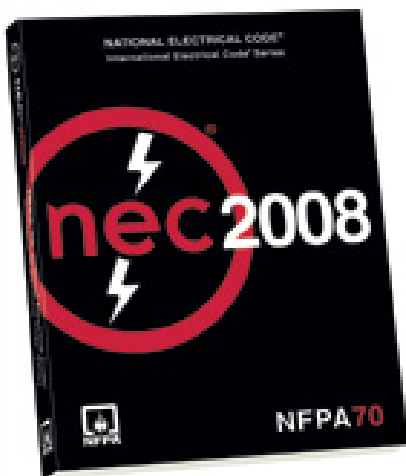
- Lighting A Professional Advantage (IAEI Manual)
- Neon Installation Guide
- UL 48 Electric Signs
- UL 879 Sign Components
- UL 814 Gas-Tube-Sign Cable
- UL 2161 Neon Transformers and Power Supplies
- NFPA 70- National Electric Code

Section I: Review and Status of Current Codes and Standards

NEC National Electric Code

NFPA 70 National Electric Code 2008 NEC

Available for Adoption January 1, 2008



Stay tuned for changes from the 2005

UL 48 Ed. 14 Electric Signs...In Effect

The current standard is still in effect
Last activity: October 23-2007
Information available <http://csds.ul.com>

UL 48 Ed. 15th Electric Signs...Proposed

Current status still under construction
Last activity:
 Comments due June 08-2006
 Vote due June 08- 2006
Results. Could not reach consensus.

UL 814 Gas-Tube-Sign-Cable...In Effect

Last Activity December 14, 2005

UL 879 Ed 8 Sign Components...Effective 09-05-2008

Due to a flurry of products requiring retesting the existing document was re-looked at. Since some of the required changes affected currently safe Listed and Recognized products changes needed to be made that were overlooked by the STP.

Due to the many required changes and time needed for product retesting the effective date was moved from June 6, 2007 till September 5, 2008

The STP members, UL staff, invited manufacturers and your sign association went to work to fix the problems.

Task Groups were formed and assigned specific tasks.

Proposal Reviews:

 01-19-2007 Comments and vote 3-20-2007
 02-23-2007 Comments and vote 4-09-2007
 04-25-2007 Comments and vote 06-08-2007

Recirculation:

 08-10-2007 Comments and vote 09-10-2007
 08-17-2007 Comments and vote 09-17-2007

Task Group work still not complete.

Stay tuned for further changes Information available <http://csds.ul.com>

UL 2161 Ed 1 Neon transformers and power supplies Effective

Currently no activity

Section II Personal Safety for the Sign Installer

When you can do no wrong?



The company is required by State and federal regulation to provide a safe work environment and safety training for their employees. These regulations are easily accessible directly from your insurance carrier, the regulatory agencies, and safety training providers or via the internet.

www.osha.gov

Someone in your organization should be assigned as the responsible person for safety. Larger organizations may need a number of personnel and divide up the responsibilities. Each company should have a written safety plan and provide it to each employee, have regular safety meetings and training in the use of the equipment and procedures required to perform their work safely.

The sign installer depending on the size of the company could be responsible for loading the vehicle (Fork lift training, gantry crane operation, portable lift equipment, to name a few) and securing the load for travel to the site. During these operations; head, eye, hand and foot protection may be required. Hole drilling and bolting, welding, cable and strap type tie downs may be required. From the initial loading of the trucks to the completed installation and service completed in the field, safety equipment becomes part of our daily routine.

General requirements. - 1910.132

1910.132(a)

Application. Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

1910.132(b)

Employee-owned equipment. Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

1910.132(c)

Design. All personal protective equipment shall be of safe design and construction for the work to be performed.

1910.132(d)

Hazard assessment and equipment selection.

The employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE).

1. If such hazards are present, or likely to be present, the employer shall:
Select, and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment;
Communicate selection decisions to each affected employee; and, Select PPE that properly fits each affected employee. Note: Non-mandatory Appendix B contains an example of procedures that would comply with the requirement for a hazard assessment.
2. The employer shall verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated; the person certifying that the evaluation has been performed; the date(s) of the hazard assessment; and, which identifies the document as a certification of hazard assessment.

1910.132(e)

Defective and damaged equipment. Defective or damaged personal protective equipment shall not be used.

1910.132(f) Training.

1. The employer shall provide training to each employee who is required by this section to use PPE. Each such employee shall be trained to know at least the following:
 - When PPE is necessary
 - What PPE is necessary;
 - How to properly don, doff, adjust, and wear PPE;
 - The limitations of the PPE; and,
 - The proper care, maintenance, useful life and disposal of the PPE.
2. Each affected employee shall demonstrate an understanding of the training specified in paragraph (f)(1) of this section, and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE.
3. When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by paragraph (f)(2) of this section, the employer shall retrain each such employee.

Circumstances where retraining is required include, but are not limited to, situations where:

- Changes in the workplace render previous training obsolete; or
 - Changes in the types of PPE to be used render previous training obsolete; or
 - Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.
4. The employer shall verify that each affected employee has received and understood the required training through a written certification that contains the name of each employee trained, the date(s) of training, and that identifies the subject of the certification.

1910.132(g)

Paragraphs (d) and (f) of this section apply only to 1910.133, 1910.135, 1910.136, and 1910.138. Paragraphs (d) and (f) of this section do not apply to 1910.134 and 1910.137. [39 FR 23502, June 27, 1974, as amended at 59 FR 16334, April 6, 1994; 59 FR 33910, July 1, 1994; 59 FR 34580, July 6, 1994]

Safety and Health Regulations for Construction

1926.1 Purpose and Scope

1926.1(a)

This part sets forth the safety and health standards promulgated by the Secretary of Labor under section 107 of the Contract Work Hours and Safety Standards Act. The standards are published in Subpart C of this part and following subparts.

1926.1(b)

Subpart B of this part contains statements of general policy and interpretations of section 107 of the Contract Work Hours and Safety Standards Act having general applicability.

1926.102(a) General.

1. Employees shall be provided with eye and face protection equipment when machines or operations present potential eye or face injury from physical, chemical, or radiation agents.
2. Eye and face protection equipment required by this Part shall meet the requirements specified in American National Standards Institute, Z87.1-1968, Practice for Occupational and Educational Eye and Face Protection.
3. Employees whose vision requires the use of corrective lenses in spectacles, when required by this regulation to wear eye protection, shall be protected by goggles or spectacles of one of the following types:
 - Spectacles whose protective lenses provide optical correction;
 - Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles;
 - Goggles that incorporate corrective lenses mounted behind the protective lenses.
4. Face and eye protection equipment shall be kept clean and in good repair. The use of this type equipment with structural or optical defects shall be prohibited.
5. Table E-1 shall be used as a guide in the selection of face and eye protection for the hazards and operations noted.

(Table E-1 reprinted in Appendix of Handout)

6. Protectors shall meet the following minimum requirements:
 - They shall provide adequate protection against the particular hazards for which they are designed.
 - They shall be reasonably comfortable when worn under the designated conditions.
 - They shall fit snugly and shall not unduly interfere with the movements of the wearer.
 - They shall be durable.
 - They shall be capable of being disinfected.
 - They shall be easily cleanable.
7. Every protector shall be distinctly marked to facilitate identification only of the manufacturer.
8. When limitations or precautions are indicated by the manufacturer, they shall be transmitted to the user and care taken to see that such limitations and precautions are strictly observed
9. When limitations or precautions are indicated by the manufacturer, they shall be transmitted to the user and care taken to see that such limitations and precautions are strictly observed.

1926.102(a) General.

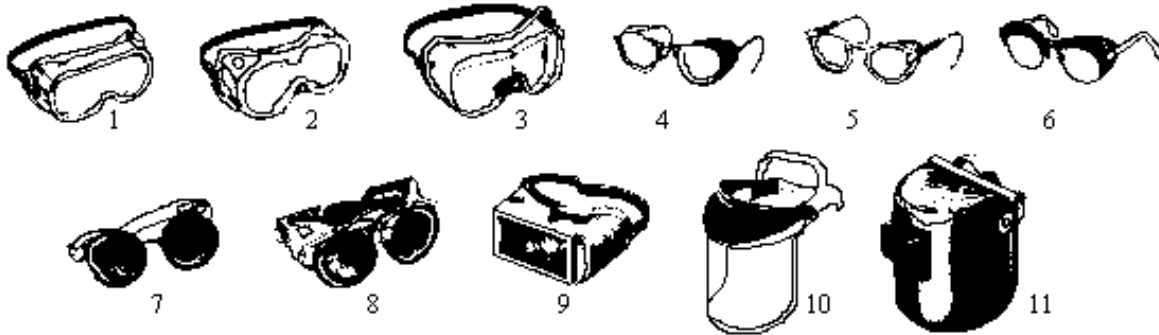
1926.102(b)

- Protection against radiant energy-
- 1926.102(b)(1)
- Selection of shade numbers for welding filter. Table E-2 shall be used as a guide for the selection of the proper shade numbers of filter lenses or plates used in welding. Shades more dense than those listed may be used to suit the individual's needs.

(Table E-2 in Appendix of Handout)

Eye and Face Protection. - 1926.102

Various types of eye and face protection:



Eye protection needs to be comfortable, low maintenance and be suitable either for, or with corrective lenses. In some cases, more than one type of safety glasses may be required. For example, most sign installers are required to do drilling, chipping, welding and cutting operations. Clear lenses are needed for certain operations while tinted goggles and welding helmets are needed for protection when cutting and welding.

You only get one set of eyes and you need to protect them.

Always wear good quality protection suited for the work you are performing.

Head Protection. - 1926.100

1926.100(a)

Employees working in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock and burns, shall be protected by protective helmets.

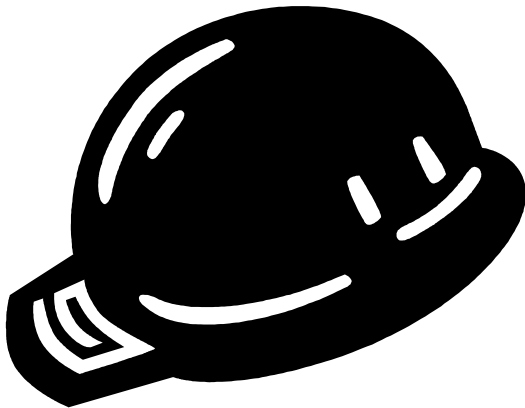
1926.100(b)

Helmets for the protection of employees against impact and penetration of falling and flying objects shall meet the specifications contained in American National Standards Institute, Z89.1-1969, Safety Requirements for Industrial Head Protection.

1926.100(c)

Helmets for the head protection of employees exposed to high voltage electrical shock and burns shall meet the specifications contained in American National Standards Institute, Z89.2-1971.

Hard hats, as we call them, come in many styles, level of protection and can be provided with many accessories.



Baseball Caps don't count

Some include face shields, provisions for use in a welding helmet and with liners for cold weather comfort, to name a few. When purchasing head protection; comfort, adjustability and in some cases, style will assist in the continuous use of the equipment. Most importantly, always select a product with the level of protection required for the job and environment likely to be encountered. Hard hats are generally thought to protect you from things falling from above.

[Hearing Protection. - 1926.101](#)

[1926.101\(a\)](#)

Wherever it is not feasible to reduce the noise levels or duration of exposures to those specified in Table D-2, Permissible Noise Exposures, in 1926.52, ear protective devices shall be provided and used.

[1926.101\(b\)](#)

Ear protective devices inserted in the ear shall be fitted or determined individually by competent persons.

1926.101(c)

Plain cotton is not an acceptable protective device.

Air compressors, hammer drills, portable welding and grinding equipment may all require some level of hearing protection. Sign installers can be subjected to many different types and levels of noise from new construction sites, to existing manufacturing facilities. Be prepared and select the appropriate level of protection to protect your hearing. Most hearing loss occurs over time and affects us as we age.

1910.138(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.

1910.138(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.

Hand Protection. - 1910.138

Clothes - Hand Protection. Pants, shirts, coats, gloves, leathers and nomex hoods all need to be suited to the work done and environment encountered. Pants, shirts and coats should be flame retardant if welding and cutting. Gloves we use need to be suitable for heat (welding and cutting), abrasion (metal, glass, and plastic cutting and handling), dielectric (high voltage wiring) and general comfort in cold weather climates.

Occupational foot protection. - 1926.96

Safety-toe footwear for employees shall meet the requirements and specifications in American National Standard for Men's Safety-Toe Footwear, Z41.1-1967.

Same reference as follows 1910-136

Occupational foot protection. - 1910.136

1910.136(a)

General requirements. The employer shall ensure that each affected employee uses protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electrical hazards.

1910.136(b)

Criteria for protective footwear.

1910.136(b)(1)

Protective footwear purchased after July 5, 1994 shall comply with ANSI Z41-1991, "American National Standard for Personal Protection-Protective Footwear," which is incorporated by reference as specified in Sec. 1910.6, or shall be demonstrated by the employer to be equally effective.

1910.136(b)(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 as specified in Sec. 1910.6, or shall be demonstrated by the employer to be equally effective.

Occupational foot protection.

Shoes - Foot Protection. Shoes other than being warm and comfortable need to be selected for safety in climbing, working on ladders and in buckets, on roofs and catwalks. The soles will need to be oil resistant and the boots of a quality to resist the welding and cutting operations

Ergonomics -manual lifting

Even if there are no guidelines specific to your industry, as an employer you still have an obligation under the General Duty Clause, Section 5(a)(1) to keep your workplace free from recognized serious hazards, including ergonomic hazards. OSHA will cite for ergonomic hazards under the General Duty Clause or issue ergonomic hazard letters where appropriate as part of its overall enforcement program.

OSHA encourages employers where necessary to implement effective programs or other measures to reduce ergonomic hazards and associated MSDs. A great deal of information is currently available from OSHA, NIOSH, and various industry and labor organizations on how to establish an effective ergonomics program, and OSHA urges employers to avail themselves of these resources.

OSHA will use the General Duty Clause to cite employers for ergonomic hazards. Under the OSH Act's General Duty Clause, employers must keep their workplaces free from recognized serious hazards, including ergonomic hazards. This requirement exists whether or not there are voluntary guidelines.

Ergonomics. Manual lifting, kneeling and repeated motions that could injure joints may require items such as kneeling pads or knee pads, back support belts and wrist support.

Back support belt shown



Photos compliments of Omark Safety

[Respiratory Protection. - 1910.134](#)

[1910.134\(a\)\(1\)](#)

In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination.

This shall be accomplished as far as feasible by accepted 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 shall be used pursuant to this section.

[1910.134\(a\)\(2\)](#)

Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protection program which shall include the requirements outlined in paragraph (c) of this section.

[1910.134\(b\)](#)

Definitions. See Standard for a complete list.

[1910.134\(c\)](#) **IN PART ONLY**

Respiratory protection program. This paragraph requires the employer to develop and implement a written respiratory protection program with required worksite-specific procedures and elements for required respirator use. The program must be administered by a suitably trained program administrator.

Selection of respirators. This paragraph requires the employer to evaluate respiratory hazard(s) in the workplace, identify relevant workplace and user factors, and base respirator selection on these factors. The paragraph also specifies appropriately protective respirators for use in IDLH atmospheres, and limits the selection and use of air-purifying respirators.

[1910.134\(d\)\(1\)](#) **IN PART ONLY**

General requirements.

[1910.134\(d\)\(1\)\(i\)](#)

The employer shall select and provide an appropriate respirator based on the respiratory hazard(s) to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.

[1910.134\(d\)\(1\)\(ii\)](#)

The employer shall select a NIOSH-certified respirator. The respirator shall be used in compliance with the conditions of its certification.

- *This section very long and not all will apply. As with all the regulations please read and understand the ramifications.*

[Respiratory Protection. - 1910.134](#)

Respiratory Protection. Sign installers are subjected to all types of environments. When involved in processes like grinding, sanding, cleaning, and remote areas where you may be subjected to insulation of certain types you will need to wear respiratory protection like a mask. Most safety supply companies have a number of types and selections suited to the environment you will be subjected to.

A simple particle respirator can make a huge difference



Lockout and tagging of circuits. - 1926.417

1926.417(a)

Controls. Controls that are to be deactivated during the course of work on energized or deenergized equipment or circuits shall be tagged.

1926.417(b)

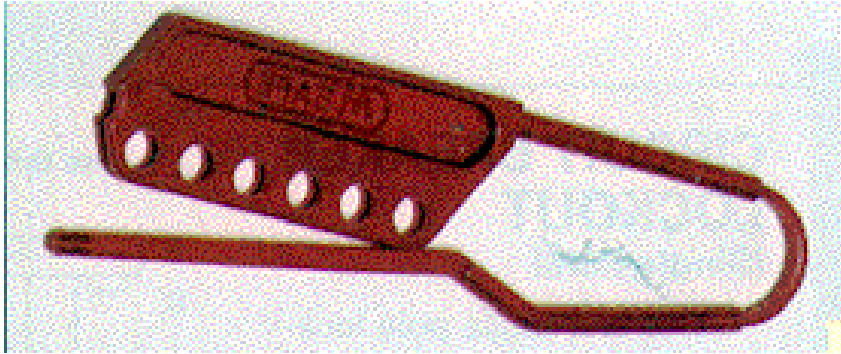
Equipment and circuits. Equipment or circuits that are deenergized shall be rendered inoperative and shall have tags attached at all points where such equipment or circuits can be energized.

1926.417(c)

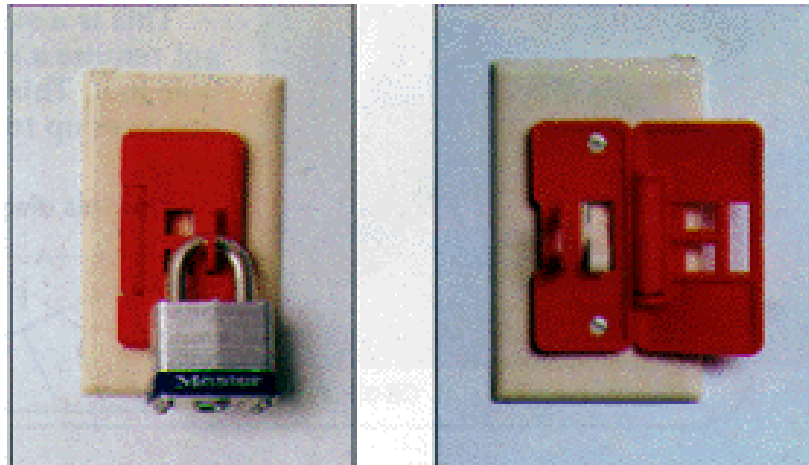
Tags. Tags shall be placed to identify plainly the equipment or circuits being worked on. [58 FR 35181, June 30, 1993; 61 FR 9227, March 7, 1996; 61 FR 41738, August 12, 1996]

Lockout / Tagout Protection. Remember when we work on neon 15,000 volts is high voltage. Line voltage (120 volts) can kill. Remote disconnects are required to be lockable, always carry a lock and tag, it may save your life.

Lockouts for knife type switch disconnects



Lockouts for wall switch disconnects



Fall Protection Personal

Fall Protection. Employees required to work more than six feet (1.8 m) above ground or six feet (1.8 m) over an unprotected level below is required to have fall protection.

Fall protection safety equipment is intended for only one fall. Once used the equipment must be replaced.

The most common fall protection used in our industry is a harness and lanyard attached to our bucket or crane boom. Attachment points are provided on the main sections of the booms and a lanyard is attached from your harness to the attachment point. We will review and discuss fall protection and life lines in the next lesson.

Warnings: Always read all instructions and warnings contained on the product and the packaging before using any fall protection equipment.

Inspection: All fall protection equipment should be inspected prior to each use.

Training: All workers should be trained by a Competent Person in the proper use of fall protection products.

Harness attaches in back with lanyard and to the boom of the bucket not the bucket itself.



Duty to have fall protection. - 1926.501

1926.501(a)

"General."

1926.501(a)(1)

This section sets forth requirements for employers to provide fall protection systems. All fall protection required by this section shall conform to the criteria set forth in 1926.502 of this subpart.

1926.501(a)(2)

The employer shall determine if the walking/working surfaces on which its employees are to work have the strength and structural integrity to support employees safely. Employees shall be allowed to work on those surfaces only when the surfaces have the requisite strength and structural integrity.

1926.501(b)

1926.501(b)(1)

"Unprotected sides and edges." Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.

Review Questions

1. Is it required for the employer to provide PSP Personal Safety Equipment?
 1. Yes
 2. No
 3. Must be furnished by the employee
 4. All the above
2. Can the employee furnish his or her own equipment?
 1. Provided the employer identifies the hazards
 2. Trains the employee on the care and use of the equipment
 3. Checks to see the equipment is in good repair
 4. All the above

3. When is eye and face protection required?
 1. Whenever the employee leaves the locker room for work
 2. When a danger from physical, chemical, or radiation agents is present
 3. Before each shift is started
 4. All the above
4. When is head protection required to prevent the possible danger of head injury?
 1. From impact
 2. From falling or flying object
 3. From electric shock and burns
 4. All the above
5. Are ergonomic hazards enforceable if a specific standard is not?
 1. Can be enforced under the general duty clause
 2. Yes
 3. When unprotected hazards are identified
 4. All the above
6. How is respiratory protection selected?
 1. Color coordinated with your hard hat
 2. Based on the hazards encountered at the job site
 3. To match company colors
 4. All the above
7. When are we required to wear fall protection?
 1. When working more than 6' above another surface
 2. When working in a bucket truck
 3. While working on a roof
 4. All the above

Answers:

1. 1
2. 4
3. 2
4. 4
5. 4
6. 2
7. 4

Appendix

TABLE E-1 - Eye and Face Protector Selection Guide
(For Table E-1, [Click Here](#))

1. GOGGLES, Flexible Fitting - Regular Ventilation
2. GOGGLES, Flexible Fitting - Hooded Ventilation
3. GOGGLES, Cushioned Fitting - Rigid Body
4. SPECTACLES, Metal Frame, with Sideshields (1)
5. SPECTACLES, Plastic Frame - with Sideshields (1)
6. SPECTACLES, Metal-Plastic Frame - with Sideshields (1)
7. WELDING GOGGLES, Eyecup Type - Tinted Lenses (2)
- 7A. CHIPPING GOGGLES, Eyecup Type - Clear Safety Lenses
8. WELDING GOGGLES, Coversepc Type - Tinted Lenses (2)
- 8A. CHIPPING GOGGLES, Coverspec Type - Clear Safety Lenses
9. WELDING GOGGLES, Coverspec Type - Tinted Plate Lens (2)
10. FACE SHIELD (Available with Plastic or Mesh Window)
11. WELDING HELMETS (2)

Footnote(1) Non-side shield spectacles are available for limited hazard use requiring only frontal protection.

Footnote(2) See Table E-2, in paragraph (b) of this section, Filter Lens Shade Numbers for Protection Against Radiant Energy.

Table E-1

Applications		
Operation	Hazards	Recommended protectors: Bold type numbers signify preferred protection
Acetylene-Burning, Acetylene-Cutting, Acetylene-Welding	Sparks, harmful rays, molten metal, flying particles.....	7, 8, 9.
Chemical Handling	Splash, acid burns, fumes.....	2, 10 (For sever exposure add 10 over 2).
Chipping.....	Flying particles.....	1, 3, 4, 5, 6, 7A, 8A.
Electric (arc) welding.....	Sparks, intense rays, molten metal.....	9, 11, (11 in combination with 4, 5, 6, in tinted lenses advisable)
Furnace operations.	Glare, heat, molten metal.....	7, 8, 9 (For severe exposure add 10).
Grinding-Light.....	Flying particles.....	1, 3, 4, 5, 6, 10.
Grinding-Heavy.....	Flying particles.....	1, 3, 7A, 8A (For severe exposure add 10)
Laboratory.....	Chemical splash, glass breakage.....	2 (10 when in combination with 4, 5, 6).
Machining.....	Flying particles.....	1, 3, 4, 5, 6, 10.
Molten metals.....	Heat, glare, sparks, splash.....	7, 8, (10 in combination with 4, 5, 6, in tinted lenses)
Spot welding.....	Flying particles, sparks.....	1, 3, 4, 5, 6, 10

Selection of shade numbers for welding filter. Table E-2 shall be used as a guide for the selection of the proper shade numbers of filter lenses or plates used in welding. Shades more dense than those listed may be used to suit the individual's needs.

TABLE E-2 - FILTER LENS SHADE NUMBERS FOR PROTECTION AGAINST RADIANT ENERGY

Welding operation	Shade number
Shielded metal-arc welding 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes.....	10
Gas-shielded arc welding (nonferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes.....	11
Gas-shielded arc welding (ferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes.....	12
Shielded metal-arc welding 3/16-, 7/32-, 1/4-inch diameter electrodes.....	12
5/16-, 3/8-inch diameter electrodes.....	14
Atomic hydrogen welding.....	10-14
Carbon-arc welding.....	14
Soldering.....	2
Torch brazing.....	3 or 4
Light cutting, up to 1 inch.....	3 or 4
Medium cutting, 1 inch to 6 inches.....	4 or 5
Heavy cutting, over 6 inches.....	5 or 6
Gas welding (light), up to 1/8-inch.....	4 or 5
Gas welding (medium), 1/8-inch to 1/2-inch.....	5 or 6
Gas welding (heavy), over 1/2-inch.....	6 or 8

Laser protection.

Employees whose occupation or assignment requires exposure to laser beams shall be furnished suitable laser safety goggles which will protect for the specific wavelength of the laser and be of optical density (O.D.) adequate for the energy involved. Table E-3 lists the maximum power or energy density for which adequate protection is afforded by glasses of optical densities from 5 through 8.

Member service provided by:

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