

## **PERSONAL PROTECTIVE EQUIPMENT**

### **General: 1910.132**

Personal protection equipment shall meet the requirements of Subpart I. This includes *eye and face, respiratory, head, foot, clothing, electrical, and fall* protection.

Employer must ensure equipment is provided, used, and maintained. This includes protection from *absorption, inhalation, or physical contact*.

Torso protection comes from clothing. Use only wool, 100% cotton, or flame retardant synthetics.

Arm and hand protection comes from gloves and sleeves.

Rubber is the best material for electrical insulation.

Leather and rubberized fabric is appropriate for some purposes.

### **Eye and Face: 1910.133**

Employer must provide where there is reasonable possibility of preventable injury. The requirements include be adequate, fit snugly, not unduly interfere with movement, be durable, easy to clean, and capable of being disinfected, be kept in good repair, meet ANSI standards.

Safety glasses must be marked for manufacturer. Shields, hoods, or goggles may be needed to protect from acids.

### **Respiratory: 1910.134**

A respiratory program must be used if necessary to protect health. Respirators are in three classes:

Air purifying: Do not use in oxygen deficient atmospheres.

Air supplying: For providing atmosphere.

Combination air purifying and supplying

### **Head: 1910.135**

Head injuries are caused by falling or flying objects, or by bumping the head. Protection must *resist penetration and absorb* the shock of a blow. There are three classes:

A - general service, limited voltage protection

B - utility service, high voltage helmets

C - special service, metallic, no voltage protection.

### **Foot: 1910.136**

Occupational footwear must meet *safety-toe* requirements. Other protection may be required including *conductive, electrical hazard, and sole puncture*. Three classes are based on impact and compression resistance

75 - 75 ft-lb. impact, 2500 lb. compression

50 - 50 ft-lb. impact, 1750 lb. compression

30 - 30 ft-lb. impact, 1000 lb. compression.

### **Hearing: 1910.95**

High noise levels cause *permanent* hearing loss. Protection depends on the type noise.

Waxed cotton, foam, or fiberglass wool earplugs are self-forming and work as well as most molded plugs.

Plain cotton is ineffective.

Earmuffs need a perfect seal. Glasses, long sideburns, long hair, and chewing or facial movements reduce.

For extremely noisy situations, use plugs and muffs. These change the nature of all sound.

### **Fall Protection**

Fall protection equipment is required if working more than 4 feet high on poles, towers, or similar structures. Conditions that could cause losing grip are ice, high winds, no hand hold, or contaminants. Rigging shall prevent a free fall to no more than 6 feet and contact with a lower level.

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## **ELECTRICAL PROTECTIVE EQUIPMENT**

### **Design Requirements: OSHA 1910.137**

Insulating blankets, matting, covers, line hose, gloves, and sleeves made of rubber must meet material specifications and test procedures are ANSI / ASTM standards.

### **Manufacturing and Marking**

Each item is marked with class and type. Other markings such as manufacturer and size may be used. Markings are non-conducting and do not impair insulating qualities. Markings on gloves are confined to the cuff portion.

<b>CLASS</b>	<b>COLOR</b>	<b>USE VOLTAGE</b>	<b>GAUNTLET CUFF-INCH</b>
0	red	1,000	1
1	white	7,000	1
2	yellow	17,500	2
3	green	26,500	3
4	orange	36,000	4

Type I is manufactured of natural or synthetic rubber that can be damaged by ozone.

Type II is made of ozone resistant elastomers that are very stiff.

Ozone is a form of oxygen found at voltages over 10 kV. Type 1 equipment can be damaged by corona cutting which is ozone action when rubber is under mechanical stress. Type 1 can also be damaged by ultraviolet rays.

### **In-Service Care and Use**

Equipment shall be maintained in safe, reliable condition. Store the equipment to protect it from light, temperature extremes, excessive humidity, ozone, and injurious substances. Leave in original shape.

Equipment is inspected before each day's use and following any incident that may have caused damage. Squeeze the inside and bend the outside to check for cracks. Turn the equipment inside out and repeat. Holes can be found by air pressure. Roll the cuff of the glove to inflate. Hold near the face to detect leakage.

Remove rings, watches, jewelry, and sharp objects. Apply talc to reduce perspiration and aid in fitting and removal of rubber gloves.

Do not use insulating equipment with any defects. Chemicals and petroleum based products cause texture changes such as swelling, softening, hardening, or becoming sticky. Wipe off contaminants immediately.

Clean with a mild detergent and warm water then thoroughly rinse. This can be done in a commercial tumble-dry washing machine. Dry before inspection and use.

Protector gloves are worn over insulating gloves. The minimum distance from the protector gauntlet to the glove cuff is shown in the table. Protectors are not required with Class 0 gloves when dexterity is required. Any class of glove may be used without protectors if it is one class higher. However, it may not be reused at a higher voltage until it has been tested.

Protective equipment is subject to periodic tests. Certification shall indicate the equipment that passed and the date it was tested. This can be marking the equipment or entering in logs.

Line hose and covers when the insulation is suspect.

Blankets and sleeves before first use, then annually.

Gloves before first issue, then every six month.

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## WORKING ON OR NEAR ENERGIZED

### General:

Persons or equipment must not approach closer than 10 feet to any energized line. Four inches are added for each 10,000 volts above 50 kV.

### Minimum Approach Distances - Qualified: 1910.269(l)

Only qualified employees may work on energized parts of equipment operating at 50 volts or more. Ensure that the employee does not approach or take any conductive object closer to exposed parts than set forth in the Table R-6. Three exceptions are

- i. the employee is insulated from the energized part
- ii. the energized part is insulated
- iii. the employee is insulated from other exposed conductive objects during live-line bare-hand work.

TABLE R-6

<b>Nominal volts KV</b>	<b>Ph to gnd ft-in</b>	<b>Ph to Ph ft-in</b>
0.05 - 1.0	avoid contact	avoid contact
1.1 - 15.0	2-1	2-2
15.1 - 36.0	2-4	2-7
36.1 - 46.0	2-7	2-10
46.1 - 72.5	3-0	3-6
72.6 - 121	3-2	4-3
138 - 145	3-7	4-11
161 - 169	4-0	5-8
230 - 242	5-3	7-6
345 - 362	8-6	12-6
500 - 550	11-3	18-1
765 - 800	14-11	26-0

### Apparel: 1910.269(l)

When working within reaching distance of exposed energized parts the employee must remove or render non-conductive all exposed conductive articles such as chains, rings, wrist watches or bands, unless the items do not increase the hazards.

Clothing protects from flashes and burns. Natural fabrics, such as wool or 100 percent cotton are fire-resistant, comfortable and adaptable. Flame retardant synthetics are acceptable. Others are prohibited: acetate, nylon, polyester, rayon.

### Ladders

Metal ladders shall not be used around electrical equipment. The base of extension ladders should be separated from the building by one-fourth the length of the ladder. Anti-skid pads should be placed on the feet of ladders.

### Lighting

Adequate lighting must be provided to identify components.

### Material Handling

Material handling and storage applies to mobile cranes. Certification records must include date of inspections, signature of the person performing, and the identification number. The records must be made monthly on critical items like brakes, hooks, and ropes. The minimum clearance from any part of the crane to any line is 10 feet. During no load transit, the clearance must be at least four feet.

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## **OTHER: OSHA 1910.269**

### **Application**

The section covers other general items of interest from 269. Although not a summary, it highlights.

i. Employers covered by OSHA have the general duty to furnish each employee a place of employment that is free from recognized hazards.

ii. An enclosed space has limited means of entry or egress that is designed for periodic entry, and is not expected to contain hazardous atmosphere [1910.269(e)]. Workers who enter or serve as attendants shall be trained in the hazards of entry and rescue procedures. The internal atmosphere must be checked for hazardous conditions before entry. While work is being performed in the space, a person with first aid training must be immediately available outside the enclosed space.

iii. Live-line tools are used by qualified employees while working on potentially energized lines [1910.269(j)]. Some are commonly called hot-sticks. The material is fiberglass-reinforced plastic or wood. Each tool must be wiped clean and visually inspected before use each day. The tools must be removed from service every 2 years for examination, cleaning, repair, and testing.

iv. Material handling and storage must comply with Subpart N. This applies to mobile cranes. Certification records must include date of inspections, signature of the person performing, and the identification number. The records must be made monthly on critical items like brakes, hooks, and ropes. The minimum clearance from any part of the crane to any line is 10 feet. During no load transit, the clearance must be at least four feet.

v. Testing and test facilities applies to high-voltage and high-power testing done in the field or the shop [1910.269(o)]. It does not apply to routine inspection and maintenance measurements made by qualified employees. Employees must be trained in safe work practices upon initial assignment to the test area with periodic reviews. Permanent test areas shall be guarded by barriers. Temporary test sites may use barriers, colored safety tape or observers. An isolated ground-return must be provided to prevent current flow in the ground grid. High capacitance equipment must be discharged through a resistor.

vi. Critical components of mechanical elevating equipment shall be inspected before use each shift [1910.269(p)]. The operator of a line truck may not leave his position at the controls while a load is suspended. A designated employee other than the operator shall observe the safe approach distance to energized lines. The insulated portion of an aerial lift operated by a qualified worker may come closed than the approach distance.

vii. Work performed on or near overhead lines is covered in [1910.269(q)]. Poles must be tested to assure they can carry the additional load. When working on an energized line, a ground wire must be run from pole ground to the truck bed and to a temporary ground rod. Persons performing live-line bare-hand work must be specifically trained in the technique and safety requirements. Refresher training is also required. Work may not be performed in adverse weather conditions that would make the work hazardous. Dual controls are required, but the lower are only used in an emergency.

viii. A ladder or device is used to enter a manhole exceeding 4 feet in depth [1910.269(t)]. While work is being performed in a manhole with energized conductors, a worker on the surface must be trained in first-aid and CPR. Occasionally, the employee on the surface can enter the manhole. Normal housekeeping and inspection can be performed by one employee working alone if the worker is protected from all hazards.

ix. Special conditions apply to capacitors, and metering transformers [1910.269(w)]. Capacitors should be de-energized for five minutes before being short-circuited. Capacitors should be stored and transported with the terminals shorted. The secondary of a current transformers must not be opened while the transformer is energized. Excessive voltage could build on the secondary.

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