



**HO-CHUNK NATION CODE (HCC)**  
**TITLE 6 – PERSONNEL, EMPLOYMENT AND LABOR CODE**  
**SECTION 8 – OCCUPATIONAL SAFETY AND HEALTH**  
**PROGRAM ACT OF 2002**  
**SUBSECTION 4 – ELECTRICAL SAFETY**

**ENACTED BY LEGISLATURE: MAY 20, 2002**

**LAST AMENDED AND RESTATED: December 6, 2022**

**CITE AS: 6 HCC § 8-4**

1. **Authority.** See basic document (Occupational Safety and Health Program Act).
2. **Purpose.** This subsection of the Occupational Safety and Health Program Act provides practices and procedures intended to provide for employee safety relative to electrical hazards in the workplace.
3. **Definitions.** See basic document (Occupational Safety and Health Program Act). In addition, the following definitions apply to this subsection.
  - a. “Accessible” as applied to wiring methods, means capable of being removed or exposed without damaging the building structure or finish, or not permanently closed in by the structure or finish of the building.
  - b. “Accessible” as applied to equipment, means admitting for close approach; not guarded by locked doors, elevation, or other effective means.
  - c. “Accessible, Readily (Readily Accessible)” means capable of being reached quickly for operation, renewal, or inspections, so that those needing ready access do not have to climb over or remove obstacles or to resort to portable ladders, chairs, etc.
  - d. “Ampacity” means the current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating.
  - e. “Attachment Plug (Plug Cap) or (Cap)” means a device that, by insertion in a receptacle, establishes a connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle.
  - f. “Barricade” means a physical obstruction such as tapes, cones, or A-frame-type wood or metal structures intended to provide a warning about and to limit access to a hazardous area.
  - g. “Barrier” means a physical obstruction that is intended to prevent contact with equipment or live parts or to prevent unauthorized access to a work area.

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h. “Bonding (Bonded)” means the permanent joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to conduct safely any current likely to be imposed.

i. “Bonding Jumper” means a reliable conductor to ensure the required electrical conductivity between metal parts required to be electrically connected.

j. “Branch Circuit” means the circuit conductors between the final overcurrent device protecting the circuit and the outlet(s).

k. “Circuit Breaker” means a device designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined overcurrent without damage to itself when properly applied within its range.

l. “Competent Person” means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them.

m. “Concealed” means rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

n. “Conductive” means suitable for carrying electric current.

o. “Conductor” means any of the following:

(1) Bare Conductor. A conductor having no covering or electrical insulation whatsoever.

(2) Covered Conductor. A conductor encased within material of composition or thickness that is not recognized by this standard as electrical insulation.

(3) Insulated Conductor. A conductor encased within material of composition and thickness that it is recognized by this standard as electrical insulation.

p. “De-energized” means free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth.

q. “Device” means a unit of an electrical system that is intended to carry but not utilize electric energy.

r. “Disconnecting Means” means a device, group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

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s. “Electrical Hazard” means a dangerous condition such that contact, or equipment failure can result in electric shock, are flash burn, thermal burn, or arc blast injury.

t. “Electrical Safety” means recognizing hazards associated with the use of electrical energy and taking precautions to reduce the risk associated with those hazards.

u. “Electrically Safe Work Condition” means a state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to verify the absence of voltage, and if necessary, temporarily grounded for personal protection.

v. “Exposed” as applied to live parts, means capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts that are not suitably guarded, isolated, or insulated. (NOTE: See “Accessible” and “Concealed”)

w. “Exposed” as applied to wiring methods, means on or attached to the surface, or behind panels designed to allow access. [NOTE: See “Accessible (As applied to wiring methods.)]

x. “Ground” means a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

y. “Grounded” means connected to the earth or to some conducting body that serves in place of the earth.

z. “Grounded Conductor” means a system or circuit conductor that is intentionally grounded.

aa. “Grounded, effectively” means intentionally connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the buildup of voltages that may result in undue hazards to connected equipment or to persons.

bb. “Grounding Conductor” means a conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes.

cc. “Ground-Fault Circuit-Interrupter” means a device intended for the protection of personnel that functions to de-energize a circuit or a portion within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

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dd. “Limited Approach Boundary” means an approach limit at a distance from an exposed energized electrical conductor or circuit part within a shock hazard exists.

ee. “Overcurrent” means any current in excess of the rated current of equipment or the ampacity of a conductor. It may result from overload, short circuit, or ground fault.

ff. “Overload” means the operation of equipment in excess of normal, full-load rating, or of a conductor in excess of rated ampacity that, when it persists for a sufficient length of time, would cause damage or dangerous overheating. A fault, such as a short circuit or ground fault, is not an overload. (See Overcurrent.)

gg. “Panelboard” means a single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent devices, and with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front. (See Switchboard.)

hh. “Qualified Person” means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.

ii. “Receptacle” means a contact device installed at the outlet for the connection of an attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.

jj. “Restricted Approach Boundary” means an approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased likelihood of electric shock, due to electrical arc-over combined with inadvertent movement.

kk. “Switchboard” means a large single panel, frame, or assembly of panels on which are mounted, on the face or back, or both, switches, overcurrent and other protective devices, buses, and (usually) instruments. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets. (See Panelboard.)

ll. “Voltage (of a circuit)”, means the greatest root-mean-square (rms) (effective) difference of potential between any two conductors of the circuit concerned.

mm. “Voltage, Nominal” means a nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 120/240 volts, 480Y/277 volts, 600 volts). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of equipment.

nn. “Working On (energized electrical conductors or circuit parts)”, means intentionally coming in contact with energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the PPE a person is wearing. There are two categories of “working on”: “*Diagnostic (testing)* is taking readings or measurements of electrical equipment, conductors, or circuit parts with approved test equipment that does not require making any physical change to the electrical equipment, conductors, or circuit parts. “*Repair*” is any physical alteration of electrical equipment, conductors, or circuit parts (such as making or tightening connections, removing or replacing components, etc.)

#### **4. Training Requirements.**

a. The training requirements contained in this section shall apply to employees exposed to an electrical hazard when the risk associated with that hazard is not reduced to a safe level by the electrical installation requirements. Such employees shall be trained to understand the specific hazards associated with electrical energy. They shall be trained in safety-related work practices and procedural requirements, as necessary, to provide protection from the electrical hazards associated with their respective job or task assignments. Employees shall be trained to identify and understand the relationship between electrical hazards and possible injury.

b. The training required by this section shall be classroom or on-the-job type, or a combination of the two. The type and extent of the training provided shall be determined by the risk to the employee.

c. Employees exposed to shock hazards and those responsible for the safe release of victims from contact with energized electrical conductors or circuit parts shall be trained in methods of release of victims from contact with exposed energized conductors or circuit parts. They shall be regularly instructed in methods of first aid and emergency procedures, such as approved methods of resuscitation, if their duties warrant such training. Refresher training shall occur annually.

#### **d. Qualified Persons.**

(1) A qualified person shall be trained and knowledgeable in the construction and operation of equipment or a specific work method and be trained to identify and avoid the electrical hazards that might be present with respect to that equipment or work method. Such persons shall also be familiar with the proper use of special precautionary techniques, electrical policies and procedures, personal protective equipment, insulating and shielding materials, and insulated tools and test equipment. A person can be considered qualified with respect to certain equipment and tasks but still be unqualified for others. Such persons permitted to work within the limited approach boundary shall, at a minimum, be additionally trained in all of the following:

(a) The skills and techniques necessary to distinguish exposed energized electrical conductors and circuit parts from other parts of electric equipment.

(b) The skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors and circuit parts.

(c) The approach distances specified in Table I and the corresponding voltages to which the qualified person will be exposed.

(d) The decision-making process necessary to determine the degree and extent of the hazard and the PPE and job planning necessary to perform the hierarchy of risk control methods as outlined in Section 9.

(2) An employee who is undergoing on-the-job training for the purpose of obtaining the skills and knowledge necessary to be considered a qualified person, and who in the course of such training, has demonstrated an ability to perform specific duties safely at his/her level of training, and who is under the direct supervision of a qualified person shall be considered to be a qualified person for the performance of those specific duties.

e. Unqualified Persons. Unqualified persons shall be trained in and be familiar with, any of the electrical safety-related practices necessary for their safety.

**5. Working On or Near Electrical Conductors or Circuit Parts.** Safety-related work practices shall be used to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is being performed on or near equipment or circuits that are or can become energized. The specific safety-related work practice shall be consistent with the nature and extent of the associated electric hazards.

a. Live parts to which an employee might be exposed shall be de-energized before an employee works on or near them, unless the employer can demonstrate that de-energizing introduces additional or increase hazards or is infeasible due to equipment design or operational limitations. Live parts that operate at less than 50 volts to ground are not required to be de-energized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.

(1) Examples of increased or additional hazards include, but are not limited to, interruption of life support equipment, deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment, or removal of illumination for an area.

(2) Examples of work that may be performed on or near energized circuit parts because of unfeasibility due to equipment design or operational limitations include performing diagnostics and testing (i.e. start-up or troubleshooting) of electric circuits that can only be performed with the circuit energized and work on circuits that form an integral part of a continuous industrial process in a chemical plant that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.

b. Only qualified persons shall be permitted to work on electrical equipment that has not been de-energized. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

c. Establishing and verifying an electrically safe work condition shall be achieved when performed in accordance with paragraph 6 and verified by the following process:

(1) Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.

(2) After properly interrupting the load current, open the disconnecting device(s) for each source.

(3) Wherever possible, visually verify that all blades of the disconnecting devices are fully open or that drawout-type circuit breakers are withdrawn to the test or fully disconnected position.

(4) Release stored electrical energy.

(5) Block or relieve stored nonelectrical energy in devices to the extent the circuit parts cannot be unintentionally energized by such devices.

(6) Apply lockout/tag-out devices in accordance with a documented and established policy.

(7) Use an adequately rated portable test instrument to test each phase conductor or circuit part to test for the absence of voltage. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the voltage detector is operating satisfactorily through verification on any known voltage source.

(8) Where the possibility of induced voltages or stored electrical energy exists, ground all circuit conductors and circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being de-energized could contact other exposed energized conductors or circuit parts, apply temporary protective grounding equipment rated for the available fault duty.

**6. Establishing an Electrically Safe Work Condition.** Each enterprise or department shall establish, document, and implement a lock-out/tag-out program. The lockout/tagout program shall specify lockout/tagout procedures to safeguard employees from exposure to electrical hazards. The lock-out/tag-out program and procedures shall also be applicable to the experience and training of the employees and conditions as they exist in the workplace, meet the requirements of 6 HCC § 8-5, and apply to fixed, permanently installed equipment, temporarily installed equipment, and portable equipment.

**7. Work Involving Electrical Hazards.** This section covers requirements for work involving electrical hazards such as the electrically safety-related work practices, assessments, precautions, and procedures when an electrically safe work condition cannot be established.

a. Safety-related work practices shall be used to protect employees from injury while they are exposed to electrical hazards from electrical conductors or circuit parts that are or can become energized.

b. When energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts are not put into an electrically safe work condition, and work is performed as permitted, all the following requirements shall apply:

- 1) Only qualified persons shall be permitted to work on electrical conductors or circuit parts that have not been put into an electrically safe condition.
- 2) A shock risk assessment shall be performed as required by this section.
- 3) An arc flash risk assessment shall be performed as required by this section.

c. Shock Risk Assessment. A shock risk assessment shall be performed to identify shock hazards, to estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health, and to determine if additional protective measures are required, including the use of PPE.

(1) Estimate of Likelihood and Severity. The estimate of likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health shall take into consideration the design of the electrical equipment, and the electrical equipment operating condition and the condition of maintenance. The results of the shock risk assessment shall be documented

(2) Shock Protection Boundaries. The shock protection boundaries identified as limited approach boundary and restricted approach boundary shall be applicable where employees are approaching exposed energized electrical conductors or circuit parts. Table I (page 10) shall be used for the distances associated with various ac system voltages. Table II shall be used for the distances associated with various dc system voltages.

a. Restricted Approach Boundary. No qualified person shall approach or take any conductive object closer to exposed energized electrical conductors or circuit parts than the restricted approach boundary set forth in Table III and Table IV, unless one of the following conditions applies:

- 1) The qualified person is insulated or guarded from energized electrical conductors or circuit parts operating at 50 volts or more. Insulating gloves and sleeves are considered insulation only with regard to the energized parts upon which work is performed.



2) The energized electrical conductors or circuit parts are insulated from the qualified person and from any other conductive object at a different potential.

(3) Limited Approach Boundary.

a. Unqualified person shall not be permitted to approach nearer than the limited approach boundary of energized conductors and circuit parts.

b. Where one or more unqualified persons are working at or close to the limited approach boundary, alerting methods (safety signs and tags, barricades, or attendants) shall be applied to advise the unqualified person(s) of the electrical hazard and warn him or her to stay outside of the limited approach boundary.

c. Where there is a need for an unqualified person(s) to cross the limited approach boundary, a qualified person shall advise the unqualified person(s) of the possible hazards and continuously escort the unqualified person(s) while inside the limited approach boundary. Under no circumstances shall unqualified person(s) be permitted to cross the restricted approach boundary.

(4) Restricted Approach Boundary. No qualified person shall approach or take any conductive object closer to live parts nearer than the restricted approach boundary set forth in Table I (page 12), unless one of the following conditions applies:

(a) The qualified person is insulated or guarded from the live parts (insulating gloves or insulating gloves and sleeves are considered insulation only with regard to the energized parts upon which work is being performed), and no insulated part of the qualified person's body enters the prohibited space set forth in Table I; or

(b) The live part is insulated from the qualified person and from any other conductive object at a different potential; or

(c) The qualified person is insulated from any other conductive object as during live-line bare-hand work.

(5) Arc Flash Risk Assessment.

(a) An arc flash assessment shall be performed to identify arc flash hazards, to estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health, and to determine if additional protective measures are required, including the use of PPE.

(b) The estimate of the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health shall take into consideration the design of the electrical equipment, including its overcurrent protective device and its operating time; and the electrical equipment operating condition and condition of maintenance.

(c) If additional protective measures are required, they shall be selected and implemented according to the hierarchy of risk control. When the additional protective measures include the use of PPE, the appropriate safety-related work practices, the arc flash boundary, and the PPE to be used within the arc flash boundary shall be determined.

(d) The results of the arc flash risk assessment shall be documented.

(6) Arc Flash Boundary.

(a) The arc flash boundary shall be the distance at which the incident energy equals 1.2 cal/cm<sup>2</sup> (5 J/cm<sup>2</sup>).

(b) The arc flash boundary shall be permitted to be determined by Table II [Section 10, paragraph (8)(a)] when the requirements of this table apply.

**Table I: Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Direct-Current Systems.**

**(All dimensions are distance from live part to employee.)**

(1)  Nominal System Voltage Range, Phase to Phase	(2) Limited Approach Boundary  Exposed Movable Conductor	(3) Limited Approach Boundary  Exposed Fixed Circuit Part	(4) Restricted Approach Boundary; Includes Inadvertent Movement Adder
Less than 50 V	Not specified	Not specified	Not specified
50 V to 300 V	10 ft 0 in	3 ft 6 in	Avoid contact
301 V to 1 kV	10 ft 0 in	3 ft 6 in	1 ft 0 in
1.1 kV to 5 kV	10 ft 0 in	5 ft 0 in	1 ft 5 in
5 kV to 15 kV	10 ft 0 in	5 ft 0 in	2 ft 2 in
15.1 kV to 45 kV	10 ft 0 in	8 ft 0 in	2 ft 9 in
45.1 kV to 75 kV	10 ft 0 in	8 ft 0 in	3 ft 6 in
75.1 kV to 150 kV	10 ft 8 in	10 ft 0 in	3 ft 10 in
150.1 kV to 250 kV	11 ft 8 in	11 ft 8 in	5 ft 3 in
250.1 kV to 500 kV	20 ft 0 in	20 ft 0 in	11 ft 6 in
500.1 kV to 800 kV	26 ft 0 in	26 ft 0 in	16 ft 5 in

(7) Protective Clothing and PPE for Application with an Arc Flash Risk Assessment. Where it has been determined that work will be performed within the arc flash boundary by paragraph (6) above, the arc flash risk assessment shall determine, and the enterprise/ department shall document, the incident energy exposure level of the worker (in calories per square centimeter). This incident energy exposure level shall be based on the working distance of the employee's face and chest areas from a prospective arc source for the specific task to be performed. Arc-rated (AR) Clothing and PPE shall be used by the employee based upon the incident energy exposure associated with the specific task. Recognizing that incident energy increases as the distance from the arc flash decreases, additional PPE shall be used for any parts of the body that are closer than the working distance at which the incident energy was determined. As an alternative, the PPE requirements of paragraph 10c(8) shall be permitted to be used in lieu of the detailed arc flash risk assessment approach described in paragraph (6) above.

**8. Work On or Near Uninsulated Overhead Lines.**

a. Uninsulated and Energized. Where work is performed in locations containing uninsulated energized overhead lines that are not guarded or isolated, precautions shall be taken to prevent employees from contacting such lines directly with any unguarded parts of their body or indirectly through conductive materials, tools, or equipment. Where the work to be performed is such that contact with uninsulated energized overhead lines is possible, the lines shall be de-energized and visibly grounded at the point of work, or suitably guarded.

b. De-energizing or Guarding. If the lines are to be de-energized, arrangements shall be made with the person or organization that operates or controls the lines to de-energize them and visibly ground them at the point of work. If arrangements are made to use protective measures, such as guarding, isolating, or insulation, these precautions shall prevent each employee from contacting such lines directly with any part of his or her body or indirectly through conductive materials, tools, or equipment.

c. The enterprise/department and employee shall be responsible to ensure that guards or protective measures are satisfactory for the conditions. Employees shall comply with established work methods and the use of protective equipment.

d. Approach Distances for Unqualified Persons. When unqualified employees are working on the ground or in an elevated position near overhead lines, the location shall be such that the employee and the longest conductive object the employee might contact cannot come closer to any unguarded, energized overhead power line than the limited approach boundary in Table I. If the voltage on the line exceeds 50 kV, the distance shall be 10 ft plus 4 in. for every 10 kV over 50 kV.

e. Vehicular and Mechanical Equipment.

(1) Where any vehicle or mechanical equipment structure will be elevated near energized overhead lines, it shall be operated so that the limited approach boundary distance of Table I, Column 2 is maintained. However, under any of the following conditions, the clearances shall be permitted to be reduced:

(a) If the vehicle is in transit with its structure lowered, the limited approach boundary to overhead lines shall be permitted to be reduced by 6 ft.

(b) If insulated barriers, rated for the voltages involved, are installed, and they are not part of an attachment to the vehicle, the clearance shall be permitted to be reduced to the design working dimensions of the insulating barrier.

(c) If the equipment is an aerial lift insulated for the voltage involved, and if the work is performed by a qualified person, the clearance (between the uninsulated portion of the aerial lift and the power line) shall be permitted to be reduced to the restricted approach boundary given in Table I, Column 4.

(2) Employees standing on the ground shall not contact the vehicle or mechanical equipment or any of its attachments, unless:

(a) The employee is using protective equipment rated for the voltage; or

(b) The equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted in (a) above.

(3) If any vehicle or mechanical equipment is capable of having parts of its structure elevated within the limited approach boundary of exposed movable conductors of energized overhead lines and is intentionally grounded, employees working on the ground near the point of grounding shall not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials (step and touch potential), which can develop within a few feet or more outward from the grounded point.

**9. Electrical Safety Program.**

a. Job Briefing.

(1) Before starting each job each job that involves exposure to electrical hazards, the employee in charge shall complete a job safety plan and conduct a job briefing with the employees involved. The briefing shall cover a description of the job and the individual tasks; identification of the electrical hazards associated with each task; a shock risk assessment in accordance with 7(c)(1) above for tasks involving a shock hazard; an arc flash risk assessment in accordance with 7(c)(5) above for tasks involving an arc flash hazard; and work procedures involved, special precautions, and energy source controls.

(2) If the work or operations to be performed during the workday or shift are repetitive and similar, at least one job briefing shall be conducted before the start of the first job of the day or shift. Additional job safety planning and job briefings shall be held if changes that might affect the safety of the employees occur during the course of the work.

(3) A brief discussion shall be satisfactory if the work involved is routine and if the employee, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion shall be conducted if:

(a) The work is complicated or particularly hazardous, or

(b) The employee cannot be expected to recognize and avoid the hazards involved in the job.

b. Alertness.

(1) Employees shall be instructed to be alert at all times where electrical hazards might exist.

(2) Employees shall not be permitted to work where electrical hazards exist while their alertness is recognizably impaired due to illness, fatigue, or other reasons.

c. Blind Reaching. Employees shall be instructed not to reach blindly into areas that might contain exposed electrical conductors or circuit parts where an electrical hazard exists.

d. Illumination.

(1) Employees shall not enter spaces where electrical hazards exist unless illumination is provided that enables the employees to perform the work safely.

(2) Where lack of illumination or an obstruction precludes observation of the work to be performed, employees shall not perform any task where an electrical hazard exists.

e. **Conductive Articles Being Worn.** Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn within the restricted approach boundary or where they present an electrical contact hazard with exposed energized electrical conductors or circuit parts.

f. **Conductive Materials, Tools, and Equipment Being Handled.**

(1) Conductive materials, tools, and equipment that are in contact with any part of an employee's body shall be handled in a manner that prevents unintentional contact with energized electrical conductors or circuit parts. Such materials and equipment shall include, but are not limited to, long conductive objects, such as ducts, pipes and tubes, conductive hose and rope, metal-lined rules and scales, steel tapes, pulling lines, metal scaffold parts, structural members, bull floats, and chains.

(2) Means shall be employed to ensure that conductive materials approach exposed energized electrical conductors or circuit parts no closer than that permitted by Table I.

g. **Confined or Enclosed Workspaces.** When an employee works in a confined or enclosed space (such as a manhole or vault) where an electrical hazard exists, the employee shall use protective shields, protective barriers, or insulating materials as necessary to against electrical hazards. Doors, hinged panels, and the like shall be secured to prevent their swinging into an employee and causing the employee to contact exposed energized electrical conductors or circuit parts where an electrical hazard exists if movement of the door, hinged panel, and the like is likely to create a hazard.

h. **Safety Interlocks.** Only a qualified person following the requirements for working inside the restricted approach boundary shall be permitted to defeat or bypass an electrical safety interlock over which the person has sole control, and then only temporarily while the qualified person is working on the equipment. The safety interlock system shall be returned to its operable condition when the work is complete.

i. **Housekeeping Duties.** Employees shall not perform housekeeping duties inside the limited approach boundary where there is a possibility of contact with energized electrical conductors or circuit parts, unless adequate safeguards (such as insulating equipment or barriers) are provided to prevent contact. Electrically conductive cleaning materials (including conductive solids such as steel wool, metabolized cloth, and silicon carbide, as well as conductive liquid solution) shall not be used inside the limited approach boundary unless procedures to prevent electrical contact are followed.

j. Occasional Use of Flammable Materials. Where flammable materials are present only occasionally, electric equipment capable of igniting them may not be used, unless measures are taken to prevent hazardous conditions from developing. Such materials include, but are not limited to flammable gases, vapors, or liquids; combustible dust; and ignitable fibers or flyings.

k. Overcurrent Protection Modification. Overcurrent protection of circuits and conductors shall not be modified, even on a temporary basis.

#### **10. Personal and Other Protective Equipment.**

a. Employees exposed to electrical hazards when the risk associated with that hazard is not adequately reduced by the applicable electrical installation requirements shall be provided with, and shall use, protective equipment that is designed and constructed for the specific part of the body to be protected and for the work to be performed.

b. Care of Equipment. Protective equipment shall be maintained in a safe, clean, and reliable condition and in accordance with manufacturers' instructions. The protective equipment shall be visually inspected before each use. Protective equipment shall be stored in a manner to prevent damage from physically damaging conditions and from moisture, dust, and other deteriorating agents.

c. Personal Protective Equipment.

(1) When an employee is working within the restricted approach boundary, he/she shall wear PPE in accordance with the shock risk assessment. When an employee is working within the arc flash boundary, he or she shall wear protective clothing and other PPE in accordance with the arc flash assessment. All parts of the body inside the arc flash boundary shall be protected.

(2) Employees will wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with energized electrical conductors or circuit parts or from flying objects resulting from an electrical explosion.

(3) Head, Face, Neck, and Chin Protection. Employees shall wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with energized electrical conductors or circuit parts or from flying objects resulting from an electrical explosion. Employees shall wear nonconductive protective equipment for the face, neck, and chin whenever there is a danger of injury from exposure to electric arcs or flashes or from flying objects resulting from electrical explosion. If employees wear hairnets or beard nets, or both, these items shall be arc rated.

(4) Eye Protection. Employees shall wear protective equipment for the eyes whenever there is danger of injury from electric arcs, flashes, or from flying objects resulting from electrical explosion.

(5) Hearing Protection. Employees shall wear hearing protection whenever working within the arc flash boundary.

(6) Body Protection. Employees shall wear arc-rated clothing wherever there is possible exposure to an electric arc flash above the threshold incident energy level for a second-degree burn [ $1.2 \text{ cal/cm}^2$  ( $5 \text{ J/cm}^2$ )].

(7) Hand and Arm Protection. Employees shall wear rubber insulating gloves with leather protectors where there is danger of hand injury from electric shock and burns due to contact with exposed energized electrical conductors or circuit parts. Hand and arm protection shall be worn where there is possible exposure to arc flash burn.

(8) Foot and Leg Protection. Where insulated footwear is used as protection against step and touch potential, dielectric overshoes shall be required. Insulated soles shall not be used as primary electrical protection.

(9) Protective Clothing and PPE.

Table II (page 17) shall be used to determine the required PPE.

(a) Energized parts that operate at less than 50 volts are not required to be de-energized to satisfy an “electrically safe work condition.” Consideration should be given to the capacity of the source; any overcurrent protection between the energy source and the worker, and whether the work task related to the source operating at less than 50 volts increases exposure to electrical burns or to explosion from an electric arc.

(b) Once the Arc Flash PPE Category has been identified, refer to Table III (page 19). This Table lists the requirements for protective equipment based on Arc Flash Category numbers 1 – through 4. This clothing and equipment shall be used when working within the Arc Flash Boundary.

(c) The PPE requirements of this section are intended to protect a person from arc flash hazards. While some situations may result in burns to the skin even with the protection described in Table III, burn injury should be reduced and survivable. Due to the explosive effect of some arc events, physical trauma injuries may occur. The PPE requirements of this section do not provide protection against physical trauma other than exposure to the thermal effects of an arc flash.



**Table II: Arc Flash PPE Categories for Direct Current (dc) Systems**

Equipment	Arc Flash PPE Category	Arc Flash Boundary
Storage batteries, dc switchboards, and other dc supply sources Parameters: Greater than or equal to 100 volts and less than or equal to 250 volts Maximum arc duration and minimum working distance: 2 sec @ 18 in		
Available fault current less than 4 kV	2	3 ft
Available fault current greater than or equal to 4 kV and less than 7 kV	2	4 ft
Available fault current greater than or equal to 7 kV and less than 15 kV	3	6 ft
Storage batteries, dc switchboards, and other dc supply sources Parameters: Greater than 250 volts and less than or equal to 600 volts Maximum arc duration and minimum working distance: 2 sec @ 18 in		
Available fault current less than 1.5 kV	2	3 ft
Available fault current greater than or equal to 1.5 kV and less than 3 kV	2	4 ft
Available fault current greater than or equal to 3 kV and less than 7 kV	3	6 ft
Available fault current greater than or equal to 7 kV and less than 10 kV	4	8 ft

Notes:

- (1) Apparel that can be expected to be exposed to electrolyte must meet both of the following conditions:
  - a. Be evaluated for electrolyte protection
  - b. Be arc rated
- (2) A two-second arc duration is assumed if there is no overcurrent protective device (OCPD) or if the fault clearing time is not known. If the fault clearing time is known and is less than 2 seconds, an incident energy analysis could provide a more representative result.

**Note 1:** When determining available fault current, the effects of cables and any other impedances in the circuit should be included. Power system modeling is the best method to determine the available short-circuit current at the point of the arc. Battery cell short-circuit current can be obtained from the battery manufacturer.

**Note 2:** The methods for estimating dc arc flash incident energy that were used to determine the categories for this table are based on open-air incident energy calculations. Open-air calculations were used because many battery systems and other dc process systems are in open areas or rooms. If the specific task is within an enclosure, it would be prudent to consider additional PPE protection beyond the value shown in this table.

d. Protective Clothing.

(1) Factors in Selection of Protective Clothing.

(a) Protective clothing includes shirts, pants, coveralls, jackets, and parkas worn routinely by workers who, under normal working conditions, are exposed to momentary electric arc and related thermal hazards. Arc-rated rainwear worn in inclement weather are included in this category.

(b) Clothing and equipment that provide worker protection from shock and arc flash hazards shall be used. Clothing and equipment required by the degree of exposure shall be permitted to be worn alone or be integrated with flammable, non-melting apparel. It shall cover associated parts of the body and all normal apparel that is not flash-flame resistant, while allowing movement and visibility. All PPE shall be maintained in a sanitary and reliable condition. Individual protection items will normally be used in conjunction with one another as a system to provide appropriate protection.

(c) Layering. Non-melting, flammable fiber garments shall be permitted to be used as under layers in conjunction with arc-rated garments in a layered system. A typical layering system may include cotton underwear, a cotton shirt and trouser, and an arc-rated coverall. Specific tasks may call for additional arc-rated layers to achieve the required protection level.

(d) Outer Layers. Garments worn as outer layers over arc-rated clothing, such as jackets, high-visibility apparel, or rainwear, shall also be made from arc-rated material.

(e) Under layers. Meltable fibers such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric under layers. Arc-rated garments worn as under layers that neither ignite nor melt and drip in the course of an exposure to electric arc and related thermal hazard generally provide a higher system arc rating than non-melting flammable fiber under layers.

(f) Coverage. Clothing shall cover potentially exposed areas as completely as possible. Shirt and coverall sleeves shall be fastened at the wrists, shirts shall be tucked into pants, and shirts, coveralls, and jackets shall be closed at the neck.

(g) Fit. Tight-fitting clothing shall be avoided. Loose-fitting clothing provides additional thermal insulation due to air spaces. Arc-rated apparel shall fit properly such that it does not interfere with the work task.

(h) Interference. The garment selected shall result in the least interference with the task but still provide the necessary protection. The work method, location, and task may influence the protective equipment selected.

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**Table III: Personal Protective Equipment (PPE)**

Arc-Flash PPE Category	PPE
1	<p><b>Arc-Rated Clothing, Minimum Arc Rating of 4 cal/cm<sup>2</sup> (16.75 J/cm<sup>2</sup>)<sup>a</sup></b>            Arc-rated long-sleeve shirt and pants or arc-rated coverall            Arc-rated face shield<sup>b</sup> or arc flash suit hood            Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner (AN)<sup>f</sup>  <b>Protective Equipment</b>            Hard hat            Safety glasses or safety goggles (SR)            Hearing protection (ear canal inserts)<sup>c</sup>            Heavy-duty leather gloves, arc-rated gloves, or rubber insulating gloves with leather protectors (SR)<sup>j</sup>            Leather footwear<sup>g</sup> (AN)</p>
2	<p><b>Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm<sup>2</sup> (33.5 J/cm<sup>2</sup>)</b>            Arc-rated long-sleeve shirt and pants or arc-rated coverall            Arc-rated flash suit hood or arc-rated face shield<sup>b</sup> and arc-rated balaclava            Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner (AN)<sup>f</sup>  <b>Protective Equipment</b>            Hard hat            Safety glasses or safety goggles (SR)            Hearing protection (ear canal inserts)<sup>c</sup>            Heavy-duty leather gloves, arc-rated gloves, or rubber insulating gloves with leather protectors (SR)<sup>j</sup>            Leather footwear<sup>g</sup></p>
3	<p><b>Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 40 cal/cm<sup>2</sup> (167.5 J/cm<sup>2</sup>)<sup>a</sup></b>            Arc-rated long-sleeve shirt (AR)            Arc-rated pants (AR)            Arc-rated coverall (AR)            Arc-rated arc flash suit jacket (AR)            Arc-rated arc flash suit pants (AR)            Arc-rated arc flash suit hood            Arc-rated gloves or rubber insulating gloves with leather protectors (SR)<sup>j</sup>            Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner (AN)<sup>f</sup>  <b>Protective Equipment</b>            Hard hat            Safety glasses or goggles (SR)            Hearing protection (ear canal inserts)<sup>c</sup>            Leather footwear<sup>g</sup></p>
4	<p><b>Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 40 cal/cm<sup>2</sup> (167.5 J/cm<sup>2</sup>)<sup>a</sup></b>            Arc-rated long-sleeve shirt (AR)            Arc-rated pants (AR)            Arc-rated coverall (AR)            Arc-rated arc flash suit jacket (AR)            Arc-rated arc flash suit pants (AR)            Arc-rated arc flash suit hood            Arc-rated gloves or rubber insulating gloves with leather protectors (SR)<sup>j</sup>            Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner (AN)<sup>f</sup>  <b>Protective Equipment</b>            Hard hat            Safety glasses or safety goggles (SR)            Hearing protection (ear canal inserts)<sup>c</sup>            Leather footwear<sup>g</sup></p>

AN: As needed (optional) AR: As required, SR: Selection Required.

<sup>a</sup> Arc rating is defined as the value attributed to materials that describes their performance to exposure to an electrical arc discharge.

<sup>b</sup>Face shields are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternately, an arc-rated arc flash suit hood is required to be worn.

<sup>c</sup>Other types of hearing protection are permitted to be used in lieu of or in addition to ear canal inserts provided they are worn under an arc-rated arc flash suit hood.

<sup>d</sup>Rubber insulating gloves with leather protectors provide arc flash protection in addition to shock protection. Higher class rubber insulating gloves with leather protectors, due to their increased material thickness, provide increased arc flash protection.

<sup>e</sup>Footwear other than leather or dielectric shall be permitted to be used provided it has been tested to demonstrate no ignition, melting, or dripping at the minimum arc rating for the respective arc flash PPE category.

<sup>f</sup>The arc rating of outer layers worn over arc-rated clothing as protection from the elements or for other safety purposes, and that are not used as part of a layered system, shall not be required to be equal to or greater than the estimated incident energy exposure.

(3) Arc Flash Protective Equipment.

(a) Arc Flash suits. Arc flash suit design shall permit easy and rapid removal by the wearer. The entire flash suit, including the hood's face shield, shall have an arc rating suitable for the arc-flash exposure. When exterior air is supplied into the hood, the air hoses and pump housing shall either be covered by arc-rated materials or constructed of non-melting and nonflammable materials.

(b) Face Protection. Face shields shall have an arc rating suitable for the arc flash exposure. Face shields with a wrap-around guarding to protect the face, chin, forehead, ears and neck area shall be used. Eye protection (safety glasses or goggles) shall always be worn under face shields or hoods.

(c) Hand Protection. Heavy-duty gloves or arc-rated gloves shall be worn where required for arc flash protection. Heavy-duty leather gloves are made entirely of leather with minimum thickness of 0.03 in. (0.7 mm) are unlined or lined with nonflammable, non-melting fabrics. Heavy-duty leather gloves have been shown to have an ATPV values in excess of 10 cal/cm<sup>2</sup> (41.9 J/cm<sup>2</sup>). Where insulating rubber gloves are used for shock protection, leather protectors shall be worn over the rubber gloves. The leather protectors worn over rubber insulating gloves provide additional arc flash protection for the hands for arc flash protection exposure.

(d) Foot Protection. Leather footwear or dielectric footwear provide some arc flash protection to the feet and shall be used in all exposures greater than 4 cal/cm<sup>2</sup> (16.75 J/cm<sup>2</sup>). Footwear other than leather or dielectric shall be permitted to be used provided it has been tested to demonstrate no ignition, melting, or dripping at the estimated incident energy exposure or the minimum arc rating for the respective arc flash PPE category.

(4) Care and Maintenance of Arc-Rated Clothing and Arc-Rated Arc Flash Suits.

(a) Inspection. Arc-rated apparel shall be inspected before each use. Work clothing or arc flash suits that are contaminated or damaged to the extent their protective qualities are impaired shall not be used. Protective items that become contaminated with grease, oil, or flammable liquids or combustible materials shall not be used.

(b) Manufacturer's Instructions. The garment manufacturer's instructions for care and maintenance of arc-rated apparel shall be followed.

(c) Clothing Material Characteristics.

1 Melting. Clothing consisting of fabrics, zipper tapes, and findings from flammable synthetic materials that melt at temperatures below 600°F, such as acetate, acrylic, polyester, nylon, polyethylene, polypropylene, and spandex shall not be used. These materials melt as a result of arc flash exposure conditions, form intimate contact with the skin, and aggravate the burn injury.

2 Flammability. Non-arc-rated cotton, polyester-cotton blends, silk, rayon, wool, nylon and nylon-cotton blends are flammable. Fabrics, zipper tapes, and findings made of these materials can ignite and continue to burn on the body, resulting in serious burn injuries.

3 Clothing and Other Apparel Not Permitted. Clothing and other apparel (such as hard hat liners and hair nets) made from materials that do not meet the requirements of paragraph 4(c) above regarding melting or made from materials that do not meet the flammability requirements, shall not be permitted to be worn.

## **11. Other Protective Equipment.**

a. Insulated Tools. Tools and handling equipment used within the restricted approach boundary shall be insulated. Insulated tools shall be protected from damage to the insulating material.

### (1) Requirements for Insulated Tools.

(a) Insulated tools shall be rated for the voltages on which they are used.

(b) Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.

(c) Insulated tools and equipment shall be inspected before each use. The inspection shall look for damage to the insulation or damage that can limit the tool from performing its intended function or could increase the potential for an incident (e. g., damaged tip on a screwdriver).

(2) Fuse or Fuseholder Handling Equipment. Fuse or fuse holder handling equipment, insulated for the circuit voltage, shall be used to remove or install a fuse if the fuse terminals are energized.

(3) Ropes and Handlines. Ropes and handlines used within the limited approach boundary shall be nonconductive.

(4) Fiberglass-Reinforced Plastic Rods. Fiberglass-reinforced plastic rod and tube used for live-line tools shall meet the requirements of ASTM F 711 and standards dealing with electrical installation requirements.

(5) Portable Ladders. Portable ladders shall have nonconductive side rails ~~if they are~~ when used within the limited approach boundary or where the employee or the ladder could contact ~~live-exposed~~ energized electrical conductors or circuit parts.

b. Barriers. Exposed energized electrical conductors or circuit parts operating at 50 volts or more shall be guarded by a barrier in accordance with paragraphs 11(a)(1) through 11(a)(5) to prevent unintentional contact while an employee is working within the restricted approach boundary of those conductors or circuit parts. Barriers shall be supported to remain in place and shall prevent unintentional contact by a person, tool, or equipment.

(1) Rubber Insulating Equipment. Rubber insulating equipment used for protection from unintentional contact with energized conductors or circuit parts shall be rated for the voltage and shall meet the requirements of this Ordinance.

(2) Voltage Rated Plastic Guard Equipment. Plastic guard equipment for protection of employees from accidental contact with live parts, or to protect the employee or energized equipment or material from contact with ground, shall meet the requirements of the ASTM standards given in Table V.

(3) Physical or Mechanical Barriers. Physical or mechanical (field fabricated) barriers shall be installed no closer than the restricted approach distance given in Table I. While the barrier is being installed, the restricted approach boundary distance specified in Table I shall be maintained, or the energized conductors or circuit parts shall be placed in an electrically safe work condition.

a. Alerting Techniques.

(1) Safety Signs and Tags. Safety signs, safety symbols, or tags shall be used where necessary to warn employees about electrical hazards that might endanger them. Such signs and tags shall meet the requirements of Table IV.

(2) Barricades. Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas containing live parts. Conductive barricades shall not be used where it might cause an electrical hazard. Barricades shall be placed no closer than the limited approach boundary given in Table I.

(3) Attendants. If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees. The primary duty and responsibility of an attendant providing manual signaling and alerting shall be to keep unqualified employees outside a work area where the unqualified employee might be exposed to electrical hazards. An attendant shall remain in the area as long as there is a potential for employees to be exposed to the electrical hazards.

b. Standards for Other Protective Equipment. Other protective equipment required in this section shall conform to the standards given in Table IV.

**12. Use of Specific Safety-Related Equipment and Work Practices.**

a. Test Instruments and Equipment Use. Only qualified persons shall perform testing work on electric circuits or equipment.

b. Visual Inspection. Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before the equipment is used. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service, and no employee shall use it until repairs and tests necessary to render the equipment safe have been made.

c. Rating of Equipment. Test instruments and equipment and their accessories shall be rated for the circuits and equipment to which they will be connected and shall be designed for the environment in which they will be used.

d. Energizing and De-energizing Electrical Power Circuits.

(1) Routine Opening and Closing of Circuits. Load-rated switches, circuit breakers, or other devices specifically designed as disconnecting means shall be used for the opening, reversing, or closing of circuits under load conditions. Cable connectors not of the load-break type, fuses, terminal lugs, and cable splice connections shall not be permitted to be used for such purposes, except in an emergency.

**Table IV: Standards on Other Protective Equipment**

<b>Subject</b>	<b>Number and Title</b>
Arc Protective Blankets	ASTM F2676, <i>Standard Test Method for Determining the Protective Performance of an Arc Protective Blanket for Electric Arc Hazards</i>
Arc Protective Blankets – Selection Care, and Use	ASTM F3272, <i>Standard Guide for Selection, Care, and Use of Arc Protective Blankets</i>
Blankets	ASTM D1048, <i>Standard Specification for Rubber Insulating Blankets</i>
Blankets – In-Service Care	ASTM F479, <i>Standard Specification for In-Service Care of Insulating Blankets</i>
Covers	ASTM D1049, <i>Standard Specification for Rubber Insulating Covers</i>
Fiberglass Rods – Live Line Tools	ASTM F711, <i>Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live Line Tools</i>
Insulated Hand Tools	ASTM F1505, <i>Standard Specification for Insulated and Insulating Hand Tools</i>
Ladders	ANSI ASC A14.1, <i>American National Standard for Ladders – Wood -Safety Requirements</i> ANSI ASC A14.3, <i>American National Standard for Ladders – Fixed - Safety Requirements</i> ANSI ASC A14.4, <i>American National Standard Safety Requirements for Job-Made Ladders</i> ANSI ASC A14.5, <i>American National Standard for Ladders – Portable Reinforced Plastic - Safety Requirements</i>
Line Hose	ASTM D1050, <i>Standard Specification for Rubber Insulating Line Hoses</i>
Line Hose and Covers – In-Service Care	ASTM F478, <i>Standard Specification for In-Service Care of Insulating Line Hose and Covers</i>
Plastic Guard	ASTM F712, <i>Standard Test Methods and Specifications for Electrically Insulating Plastic Guard Equipment for Protection of Workers</i>
Sheeting	ASTM F1742, <i>Standard Specification for PVC Insulating Sheeting</i> ASTM F2320, <i>Standard Specification for Rubber Insulating Sheeting</i>
Safety signs and tags	ANSI Z535, <i>Series of Standards for Safety Signs and Tags</i>
Shield Performance on Live Line Tool	ASTM F2522, <i>Standard Test Method for Determining the Protective Performance of a Shield Attached on Live Line Tools or on Racking Rods for Electric Arc Hazards</i>
Temporary Protective Grounds – In-Service Testing	ASTM F2249, <i>Standard Specification for In-Service Test Methods for Temporary Grounding Jumper Assemblies Used on De-energized Electric Power Lines and Equipment</i>
Temporary Protective Grounds – Test Specification	ASTM F855, <i>Standard Specification for Temporary Protective Grounds to Be Used on De-energized Electric Power Lines and Equipment</i>

ASTM – American Society for Testing and Materials  
ANSI ASC – American National Standards Institute

(2) Reclosing Circuits after Protective Device Operation. After a circuit is de-energized by the operation of a circuit protective device, the circuit shall not be manually re-energized until it has been determined that the equipment and circuit can be safely energized. The repetitive manual reclosing of circuit breakers or re-energizing circuits through replaced fuses is shall be prohibited. When it is determined from the design of the circuit and the overcurrent devices involved that the automatic operation of a device was caused by an overload rather than a fault condition, examination of the circuit or connected equipment shall not be required before the circuit is re-energized.

e. Portable Electric Equipment. This section applies to the use of cord and plug connected equipment, including flexible cord sets (extension cords).



(1) Handling. Portable equipment shall be handled in a manner that will not cause damage. Flexible electric cords connected to equipment shall not be used for raising or lowering the equipment. Flexible cords shall not be fastened with staples or hung in such a fashion as could damage the outer jacket or insulation.

(2) Grounding Type Equipment.

(a) A flexible cord used with grounding type equipment shall contain an equipment grounding conductor

(b) Attachment plugs and receptacles shall not be connected or altered in a manner that would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles. Additionally, these devices shall not be altered to allow the grounding pole of a plug to be inserted into slots intended for connection to the current-carrying conductors.

(c) Adapters that interrupt the continuity of the equipment grounding conductor shall not be used.

(3) Visual Inspection of Portable Cord and Plug Connected Equipment and Flexible Cord Sets.

(a) Frequency of Inspection. Before use on any shift, portable cord and plug connected equipment shall be visually inspected for external defects (such as loose parts, deformed and missing pins, or damage to outer jacket or insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket). An exception is that cord- and plug-connected equipment and flexible cord sets (extension cords) that remain connected once they are put in place and are not exposed to damage shall not be required to be visually inspected until they are relocated.

(b) Defective Equipment. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service, and no employee shall use it until repairs and tests necessary to render the equipment safe have been made.

(c) Proper Mating. When an attachment plug is to be connected to a receptacle (including on a cord set), the relationship of the plug and receptacle contacts shall first be checked to ensure that they are of mating configurations.

(4) Conductive Work Locations. Portable electric equipment used in highly conductive work locations (such as those inundated with water or other liquids) or in job locations where employees are likely to contact water or conductive liquids, shall be approved for those

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locations. In job locations where employees are likely to contact or be drenched with water or conductive liquids, ground-fault circuit-interrupter protection for personnel shall also be followed.

(5) Connecting Attachment Plugs.

(a) Employees' hands shall not be wet when plugging and unplugging flexible cords and cord and plug equipment, if energized equipment is involved.

(b) Energized plug and receptacle connection shall be handled only with insulating protective equipment if the condition of the connection provides a conductive path to the employee's hand (if, for example, a cord connector is wet from being immersed in water).

(c) Locking-type connectors shall be installed after connection.

**13. Administration and Enforcement.** See Section 12 of the Occupational Safety and Health Program Act.

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**Legislative History:**

01/09/02	Legislature posts for 45-day Public Review.
05/20/02	Enacted as Electrical Safety (6 HCC § 8-4) by Legislative Resolution 5/20/02E.
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