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1.0 PURPOSE AND SCOPE

(5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.1.17, 5.1.18)

This standard establishes the Washington River Protection Solutions LLC (WRPS) Electrical Safety Program (ESP). The ESP provides the minimum requirements for safe electrical system design and installation, electrical safe work practices and defines electrical safety training for employees.

This standard applies to all WRPS and subcontractor employees. This standard does not apply to equipment or installations that are under the exclusive control of Electrical Utilities (EU) for the purpose of metering, transmission and distribution of electrical energy.

Specific electrical safety requirements (e.g., 29 CFR 1926 Subpart V) applicable to subcontractors working within 10 feet of energized power transmission lines are implemented through the subcontract preliminary hazard assessment (PHA) and work package planning process.

This standard implements requirements of National Fire Protection Association (NFPA) 70-2005, National Electrical Code, NFPA 70E-2004, Standard for Electrical Safety in the Workplace, 29 CFR 1910 Subpart S, Electrical, and 29 CFR 1926 Subpart K, Electrical.

2.0 IMPLEMENTATION

This standard is effective on the date shown in the header.

3.0 STANDARD

3.1 Roles and Responsibilities

3.1.1 Project Manager

Responsible for appointing a representative from the following work groups to serve as the Authority Having Jurisdiction (AHJ) for electrical matters:

- Engineering
- Electrical Craft
- Industrial Safety.

3.1.2 Safety & Health Manager

- Appoints the Electrical Safety Program Coordinator (ESPC).
- Ensures qualified Safety Professionals participate in electrical work planning meetings and walk downs when requested.
- Ensures qualified Safety Professionals are available to assist in the completion of Electrical Hazard Evaluations.

3.1.3 Electrical Safety Program Coordinator

- Serves as chairperson of the WRPS Electrical Safety Committee (ESC).

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- Serves as the Industrial Safety AHJ member.
- Promotes and coordinates electrical safety initiatives within the company.
- Coordinates electrical safety initiatives and activities with DOE and other Hanford contractors.

3.1.4 Base Operations Manager, SST Retrieval & Closure Operations Manager, Tank Farm Projects, and 222-S Laboratory Manager

- Review and approve Energized Electrical Work Permits.

3.1.5 Maintenance, Operations, and Construction Managers

- Ensure work group participation on the WRPS ESC.
- Ensure that safe work practices described in National Fire Protection Association (NFPA) 70E are used by workers under their direction, including non-electrical workers who use portable electrical tools and equipment.
- Ensure that employees performing electrical work or using portable electric tools and equipment are qualified to safely perform their assigned task.
- Appoint an individual(s) to facilitate the completion of Electrical Hazard Evaluations in accordance with Section 3.10.5. Request assistance from Planners, Engineers, Safety Professionals, Electrical Workers, Operations Engineers and others, as appropriate.
- Ensure that approved personal protective equipment (PPE) for electrical work, is provided and used by those workers who are exposed to electrical hazards. Electrical PPE shall provide a level of protection commensurate to the level of hazard.
- Ensure that workers exposed to electrical hazards do not wear clothing and accessories (e.g., meltable-fiber clothing and metallic objects) that may worsen injuries in the event of an electrical accident.
- Ensures lead terminations are documented on the work document or Lifted/Landed Lead Record form (A-6003-876) prior to lifting and landing leads as required by the work document instructions or by direction of the Field Work Supervisor.

3.1.6 Central Design Authority & Standards Manager

- Identifies a qualified electrical engineer to serve as the Engineering AHJ member.
- Ensures electrical system designs are compliant with NFPA 70, National Electrical Code (NEC).
- Ensures electrical drawings, facility modifications packages, and other design documents are in compliance with WRPS standards.
- Ensures qualified engineers perform shock hazard analysis, flash hazard analysis, and other analysis.

- Ensures qualified Engineers are available to assist in the completion of Electrical Hazard Evaluations.

3.1.7 Electrical Safety Committee Members

- Openly promote the ESC and electrical safety issues throughout the company by communicating regularly with craft, supervisors, managers and safety personnel to identify electrical safety concerns and suggestions for electrical safety program improvements.
- Review electrical safety incidents, including lessons learned and occurrence reports, to identify trends and ensure that corrective actions have been effectively implemented.
- Identify the need for new electrical safety initiatives.
- Identify opportunities for improving electrical safety awareness training and participate in the development and communication of such initiatives.
- Participate in electrical safety event investigations by serving as subject matter expert to the event investigation team.
- Participate in electrical safety assessments and inspections, ad hoc subcommittees, and special teams as assigned.
- Actively participate in scheduled ESC meetings.

3.1.8 Authority Having Jurisdiction

(5.1.17, 5.1.18)

- Enforces and interprets the National Electrical Code (NFPA 70) (NEC); Standard for Electrical Safety in the Workplace (NFPA 70E); 29 CFR 1910, Subpart S; and 29 CFR 1926, Subpart K.
- Unanimously agrees to all decisions and interpretations.
- The Central Design Authority & Standards AHJ representative prepares and issues the formal documented interpretations of the AHJ.
- Documents AHJ decisions and interpretations in ESC meeting minutes, submits to Correspondence Control per TFC-BSM-AD-C-03, and publishes on the WRPS Electrical Safety web page.
- Represents the WRPS at external electrical safety meetings as appropriate (the ESC chairperson may assign others to perform this function).
- The Central Design Authority & Standards AHJ representative provides oversight of the company's NEC Inspector(s).

3.2 Electrical Safety Training

(5.1.1, 5.1.11, 5.1.12, 5.1.18)

1. All WRPS and subcontractor employees shall attend electrical safety training, commensurate to their exposure to electrical hazards in accordance with 29 CFR 1910.332. The minimum electrical safety training shall include:
 - All employees take Hanford General Employee Training (HGET)
 - Workers who may be exposed to electrical hazards shall have electrical safety training, commensurate to their assigned duties, as identified and listed in their ITEM Training Profile
 - An employee who operates a circuit breaker shall have knowledge and training in the safe operation of the equipment and the hazards involved
 - Refresher training, to update regulations and electrical safety criteria, should be provided at intervals not to exceed three years.
2. Electrical workers (qualified persons) shall attend First Aid training. This training shall be repeated at intervals not to exceed two years.
3. All employees that work on de-energized electrical components being controlled by a lockout/tagout must be trained as an authorized worker in accordance with DOE-0336.
4. First line managers, field work supervisors, and persons-in-charge (PICs) shall receive the same level of electrical safety training as the workers for whom they supervise if those workers have the potential to be exposed to electrical hazards.
5. Personnel responsible for conducting pre-job meetings and directing electrical work outside the Limited Approach Boundary must comply with the appropriate PIC qualification requirements. PICs who direct the performance of Safe Condition Checks and Safe to Work Checks must satisfy the training requirements specified in 3.2.6 below.
6. Personnel (i.e., PIC) who conduct pre-job meetings and direct work teams performing Safe Condition Checks or Safe To Work Checks for the purpose of establishing an Electrically Safe Work Condition, shall maintain the qualification specified in 1 above and have the training listed below:
 - NFPA 70E, “Standards for Electrical Safety,” with refresher training at intervals not to exceed 36 months
 - First Aid/CPR/AED training, at intervals not to exceed two years. Evidence of First Aid/CPR/AED training shall be certified annually by a review of training records
 - Lockout/Tagout Training.
7. Personnel (i.e., Electrical Supervisors) who direct pre-job meetings and Electrical Workers performing task(s) within the Limited Approach Boundary must have the skills and knowledge related to the construction and operation of the electrical equipment and

installation and has received safety training to recognize and avoid the hazards involved. In addition to maintaining the training requirements specified in 3.2.5 and 3.2.6 above, Electrical Supervisors shall be proficient in:

- The approach distances specified in NFPA 70E, Table 130.2(C) and the corresponding voltages to which the qualified person will be exposed
 - The skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors and circuit parts
 - The skills and techniques necessary to distinguish exposed energized electrical conductors and/or circuit parts from other parts of electric equipment
 - The skills and techniques necessary to recognize electrical shock hazards, arc flash hazards, and appropriate controls, and
 - The proper use of the special precautionary techniques, PPE (including arc-flash, insulating, and shielding materials), and insulated tools and test equipment.
8. A pre-job briefing shall be conducted in accordance with TFC-OPS-MAINT-C-02 before starting work.

3.3 Electrical Equipment Approval and Use Requirements

(5.1.1, 5.1.4, 5.1.5, 5.1.6, 5.1.7, 5.1.8, 5.1.11, 5.1.13)

1. All installed and portable electrical equipment used within WRPS shall be approved by the AHJ per Article 110.2 of NFPA 70, NEC.
2. Electrical equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees and used and stored in accordance with 29 CFR 1910.302, 303, and 333.
3. Electrical equipment is approved under the following conditions:
 - The manufacture's name, trademark, or other descriptive markings identifying the organization responsible for the product is on the equipment and is legible, and
 - If it is accepted, certified, listed, labeled, or otherwise determined to be safe by an OSHA recognized NRTL, as indicated by an NRTL label applied by the manufacturer, or
 - If it has been labeled by an NRTL representative following an NRTL field evaluation, or
 - After non-listed equipment has been field tested and found to be acceptable in accordance with the guidelines established by the AHJ.

NOTE 1: Electrical equipment acquired prior to October 13, 2003 (legacy equipment) may remain in service, so long as it has not been modified, found to be defective, or damaged, and does not present a level of hazard to the workers.

NOTE 2: Nationally recognized testing laboratories are listed on the OSHA web site at <http://www.osha.gov/dts/otpca/nrtl/index.html>.

4. Equipment shall be suitable for its intended purpose and used in accordance with the manufacturer's instructions and any instructions or requirements of the NTRL listing or labeling.
5. Equipment that is approved for use in dry locations is authorized to be used outdoors with a GFCI when the equipment is protected from rainfall, water spray, snow, or accumulations of moisture from inclement weather conditions, with a maximum relative humidity up to 80%. Equipment is authorized for use with a relative humidity greater than 80% if the equipment has been evaluated and approved for Extended Environmental Conditions.
6. All portable electric equipment shall be visually inspected for external damage (such as loose parts, deformed and missing pins, or damage to outer jacket) and for evidence of internal damage (such as pinched or crushed outer jacket) before being used on any shift. Damaged or defective equipment shall be immediately removed from service and not be used. Flexible cords and cables will be protected from accidental damage. Sharp corners and projections shall be avoided.

NOTE: Cord-and-plug connected equipment that remains connected once put in place and is not exposed to damage are not required to be visually inspected until they are relocated.

7. Special purpose equipment and installation (electric signs, electric welders, elevators, cranes, etc.) shall be evaluated on a case-by-case basis and safeguarded in accordance with 29 CFR 1910.306 and the appropriate sections of the NEC.
8. Electrical installations or equipment use in hazardous locations (containing flammable vapors, liquids, gases, etc.) shall be evaluated on a case-by-case basis and safeguarded in accordance with 29 CFR 1910.307 and the appropriate sections of the NEC.
9. Special systems (over 600 volts, emergency power, etc.) shall be evaluated on a case-by-case basis and safeguarded in accordance with 29 CFR 1910.308 and the appropriate sections of the NEC.
10. Portable electric heaters shall contain a switch designed to de-energize the heating elements in the event the heater is tipped over.

3.4 Installation/Modification Requirements

1. Wiring design and protection shall be developed and installed by qualified personnel and verified compliant with the NEC and applicable 29 CFR 1910.304 and 305 requirements.
2. NEC inspections are required for all new electrical installations and modifications to existing electrical installations covered by the most current edition of the NEC.

3. All electrical installations, systems, wiring, and connected utilization equipment shall, be maintained in a safe condition free from recognized hazards that are likely to harm employees. Unsafe electrical systems and equipment that present an imminent hazard to personnel shall be de-energized and removed from service until repaired or replaced, unless de-energizing would introduce additional or increased hazards.

NOTE: [TFC-PRJ-P-C-02](#) provides details on requesting NEC inspections.

3.5 Electrical Safe Work Practices

(5.1.1, 5.1.9, 5.1.10, 5.1.11, 5.1.14, 5.1.15, 5.1.18)

This section applies to all electrical work >50 volts.

Personnel may perform electrical work only to the level for which they have been trained, qualified, and authorized to perform.

1. The requirements of the lockout/tagout program, as described in DOE-0336, must be used for the control of unexpected releases of hazardous energy or materials. A field walkdown including the Controlling Organization, Field Work Supervisor, Facility Electrician, and Facility Engineer will be performed for electrical work activities involving Controlling Organization lockout/tagouts. This walkdown is to identify electrical work activity boundary isolations, Safe Condition Checks, and Safe-To-Work Checks.
2. Electrical PPE shall be based on electrical hazard analysis or the tables provided in Attachment A.
3. Operation of electrical breakers directly fed from 300-600 volt utility transformers (e.g. main circuit breakers) must be evaluated and documented on an Electrical Hazard Evaluation to determine PPE appropriate for the incident energy at the working distance.
4. Personnel who operate circuit breakers other than those directly fed from a 300-600 volt utility transformer, electrical disconnect switches, and similar switch gear equipment, up to 600 volts, with doors closed and all covers in place shall wear, as a minimum (an Electrical Hazard Evaluation is not required):
 - Hearing protection
 - Non-melting (untreated natural fiber) pants and long-sleeve shirt
 - Safety glasses
 - Leather or insulating gloves.

EXCEPTION: *If either of the following conditions are met, the above minimum PPE for shock or electrical hazards is not required.*

- a. *The circuit is rated 240 volts or less, is supplied by one transformer, and the transformer supplying the circuit is rated less than 125KVA*
- b. *The incident energy is less than 1.2 cal/cm² at the working distance.*

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5. In accordance with 29 CFR 1910.335, appropriate signs, tags, barricades, or attending personnel shall be used to warn and protect employees from hazards that could cause injury due to electric shock, burns, or failure of electric equipment parts.
6. Equipment other than cord-and-plug connected, and circuits, capable of being energized, must be treated as live if they are not locked out and tagged out in accordance with DOE-0336. Equipment with a cord and plug can be considered de-energized when the plug is under the exclusive control of the Authorized Worker performing the work.
7. Live parts to which an employee may be exposed shall be put into an electrically safe work condition before an employee works on or near them (within the limited approach boundary), unless work on energized components can be justified. (5.1.18)
8. Managers shall ensure that all workers are provided with protective clothing and PPE that is appropriate for the potential shock or arc flash to which they may be exposed. (5.1.4, 5.1.18)
9. Non-conducting and insulating equipment must be used and stored according to the manufacturer's instructions.
10. Electrical protective equipment shall be verified (before use) to have satisfied all required tests, e.g., rubber gloves have been air tested. Electrical protective equipment that has an expired testing date or fails visual or functional inspection must be removed from service.

NOTE: Electrical protective equipment repair must be performed by qualified personnel.
11. Only NRTL approved equipment shall be used for performing electrical testing. All electrical test equipment shall be designed, rated, and approved for their intended use. It shall be visually inspected for external damage before each use. Damaged or defective equipment shall be immediately removed from service.
12. Non-contact, or proximity voltage testers, shall not be used to verify an electrically safe work condition for purposes of hazardous energy control.
13. Wiring and equipment barriers for unfinished electrical work shall be left in an NEC compliant condition (i.e., conductors left in a properly installed enclosure, landed on a properly installed device) or have physical barriers with properly installed signage based on the Limited Approach Boundary.
14. The use of tape on exposed conductors shall not be considered an adequate barrier for worker protection unless in an enclosure and used by an electrically qualified worker.
15. For unfinished electrical work the NEC compliant condition is not intended to be a fully designed and inspected component but one that would meet the intent of that condition. A qualified electrical worker, electrical AHJ, or qualified electrical engineer is considered capable of making the determination for meeting the intent of NEC compliant conditions.

3.6 Ground Fault Circuit Interrupters

(5.1.6, 5.1.16, 5.1.17, 5.1.18)

1. Ground Fault Circuit Interrupter protection (GFCI) for personnel protection shall be provided and used whenever portable electrical tools and equipment are used with temporary wiring methods or extension cord sets for construction, repair, maintenance, remodeling, and similar activities. This applies to portable tools and equipment connected to 125 volt, single phase, 15-, 20-, 30-amp receptacle outlets.
2. If a receptacle is installed or exists as part of the permanent wiring of the building or structure and is used for temporary electrical power, GFCI interrupter protection for personnel shall be provided. Cord sets or devices incorporating GFCI protection for personnel identified for portable use shall be permitted.
3. Portable electrical tools and equipment that is being used out of doors or in damp or wet locations shall always be provided with GFCI protection.
4. GFCIs shall be installed as required by the NEC, including:
 - On 125 volt outside receptacles
 - Within six feet of a sink
 - In damp or wet (standing water) work areas
 - On all 125 volt receptacles that are not part of the permanent structure wiring (including extension cords) and that are in use by personnel.
5. Permanently installed GFCIs shall be tested monthly in accordance with the manufacturer's instructions.

Exception: GFCI receptacles and GFCI circuit breakers permanently installed in trailers, facilities and in-service temporary or permanent power stations shall be tested in accordance with the manufacturer's instructions. Those not being tested monthly (due to inaccessibility, presence of a greater hazard, status of facility occupation, etc.) must be documented and this document shall be maintained available for review by the AHJ. The documentation must address the location of the GFCI, why it cannot be tested and how the facility will control/prevent its use. These GFCIs must be tested satisfactorily prior to use or alternate methods to provide GFCI protection of personnel must be provided (i.e., currently tested portable GFCI device).

6. Portable GFCIs shall be tested before each use. The test sequence is:
 - A visual inspection is performed to detect any obvious defects, broken or damaged parts. Any GFCI that is determined to be defective in any way shall be immediately removed from service.
 - The reset button is pressed and it is verified that voltage is provided at the outlet.

- The test button is pressed and it is verified that there is no voltage at the outlet (this causes the GFCI to trip; a click can be heard or felt whenever the GFCI trips).
 - The reset button is pressed and it is verified that power has been restored at the outlet.
7. GFCIs that fail to respond as stated in this procedure shall not be used and management shall be informed of the failed test. A work request shall be initiated to have qualified electricians re-inspect, troubleshoot, and repair the GFCI so that it can be restored to service. Refer to 3-EDS-180, "Inspection and Test of Ground Fault Circuit Interrupter Receptacles and Circuit Breakers."

3.7 Receptacle Outlets

(5.1.6, 5.1.16, 5.1.17, 5.1.18)

1. All 125 volt, single phase, 15-, 20-, 30-amp receptacle outlets that are not a part of the permanent wiring of the building or structure, and that are in use by personnel, shall have GFCI protection.
2. When receptacle outlets will be used to supply temporary power to safety type equipment (e.g., lighting, monitoring functions), with the assistance of a knowledgeable person (electrical engineer/electrician) evaluate the existing and additional loading to ensure it is within the capacity of the branch circuit. If necessary, restrict use of other receptacle outlets on the same branch circuit.
3. Avoid overloading branch electrical circuits. Electrical loads such as a portable 1000-1500 watt space heater will draw 9-13 amps and a coffee pot rated 900-1100 watts will draw 8-9 amps. Review the labeling on plug-in devices to identify specific power requirements. Typical branch circuits supply multiple loads and are only rated for 15 or 20 amps. See Section 3.11 for resetting tripped protective devices.

3.8 Assured Equipment Grounding Conductor Program

(5.1.6, 5.1.16, 5.1.17, 5.1.18)

1. All cord sets, receptacles not part of the permanent wiring, and equipment connected by cord-and-plug shall be provided GFCI protection or maintained through the Assured Equipment Grounding Conductor Program (AEGCP).
2. A documented AEGCP shall be continuously maintained if a greater hazard would be created if power was interrupted, if the receptacle outlets or tools and equipment are of a design that is not compatible with GFCI protection, or when GFCI equipment is not available. This applies to temporary power supplied to equipment used by personnel and for all cord sets, receptacles not part of the permanent wiring of the building or structure, and equipment connected by cord-and-plug that is used for construction-like activities, maintenance, repair, remodeling, demolition of buildings, structures, equipment or similar activities.

3. The AEGCP is implemented through the Preventive Maintenance Program. The following tests shall be performed on all cord sets, receptacles not part of the permanent wiring of the building or structure, and cord-and-plug-connected equipment required to be connected to an equipment grounding conductor:
- a. All equipment grounding conductors shall be tested for continuity and shall be electrically continuous.
 - b. Each receptacle and attachment plug shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal.
 - c. All required tests shall be performed as follows:
 - 1) Before first use on site;
 - 2) When there is evidence of damage;
 - 3) Before equipment is returned to service following any repairs;
 - 4) Before equipment is used after any incident which can be reasonably suspected to have caused damage (for example, when a cord set is run over);
 - 5) Cords being used shall be inspected quarterly.

Quarter	Months
First	(December*), January, February, March
Second	(March*), April, May, June
Third	(June*), July, August, September
Fourth	(September*), October, November, December

*Inspections for the next quarter are allowed to occur during the last month of the previous quarter.

- 6) Equipment covered by this section shall not be used unless it has been inspected for the current quarter.
 - 7) Quarterly inspection tags (G605911), or equivalent, shall be applied on in a visible location near the cord cap (both ends for cord sets.)
- d. Equipment or cords not meeting the requirements of the AEGCP can be controlled to prevent use following approval by the AHJ. In these cases, equipment or cords remaining in service shall be de-energized and controlled by applying a lock and tag in accordance with Hanford Site Lockout/Tagout, DOE-0336. The associated Lockout/Tagout Authorization Form must include special instructions to ensure the lockout/tagout will not be cleared from the affected equipment or cord until the AEGCP requirements have been met.

- e. Periodic AEGCP testing in areas posing a greater hazard can be suspended following approval by the AHJ, if entry into the area is controlled to prevent access by personnel until the requirements of the AEGCP have been met.
- f. These tests shall be recorded and made available to the AHJ. The test record shall identify each receptacle, cord set, and cord-and-plug connected equipment that passed the test and shall indicate the last date it was tested or the interval for which it was test. The record shall be kept by means of logs, color coding, or other effective means and shall be maintained until replaced by a more current record.

3.9 Working on or Near Live Parts

(5.1.13, 5.1.16, 5.1.18)

1. Electrical equipment shall be de-energized to the maximum extent feasible before crossing the limited, restricted, or prohibited approach boundary to perform work on the equipment.
2. Entry into an electrical approach boundary by a qualified worker requires an Energized Electrical Work Permit (A-6003-873), approved by the appropriate Level 1 Manager.
 - Minimum clear distances shall be maintained from exposed electrical live parts in accordance with NFPA 70E and 29 CFR 1910.303 and 333.
3. The only work that can be performed by qualified personnel on or near energized equipment, without an Energized Electrical Work Permit is the following:

NOTE: The following exceptions require identification of known and potential hazards (shock and arc flash), identification of all required PPE and insulated tools, and identification of protective measures and equipment to be used when performing the work. Refer to Section 3.10.

- Working on energized parts that operate at LESS THAN 50 VOLTS potential.
- Testing and calibration of electrical equipment that can only be performed with the circuit energized under an existing approved procedure.
- Performing Safe Condition Checks and Safe-To-Work Checks for lockout/tagout operations.
- Performing troubleshooting that requires the equipment to be energized.
- Performing visual inspections.
- Installation of temporary protective measures such as protective shields/barriers, rubber insulating equipment, voltage rated plastic guard equipment, and physical or mechanical barriers. Use of these temporary protective measures shall be documented in the work record.

3.10 Working Within the Limited Approach Boundary or Flash Protection Boundary

(5.1.13, 5.1.16, 5.1.18)

1. Work performed on energized electrical circuits, or near exposed live parts shall be performed by qualified personnel using appropriate PPE.
2. Unqualified persons that are not escorted by a qualified person shall not be permitted to enter areas that are required to be accessible to qualified employees only, unless the electric conductors and equipment involved are in an electrically safe work condition.
3. Where there is a specific need for an unqualified person(s) to cross the Limited Approach Boundary, a qualified person shall advise the unqualified person of the possible hazards, and continuously escort the unqualified person(s) while inside the Limited Approach Boundary. Under no circumstance shall the escorted unqualified person(s) be permitted to cross the Restricted Approach Boundary.
4. No qualified person shall approach or take any conductive object closer to exposed live parts operating at 50 volts or more than the Restricted Approach Boundary set forth in NFPA 70E, Table 130.2(C), unless any of the following apply:
 - The qualified person is insulated or guarded from the live parts operating at 50 volts or more (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 uninsulated part of the qualified person's body crosses the Prohibited Approach boundary set forth in NFPA 70E, Table 130.2(C).
 - The live part operating at 50 volts or more is insulated from the qualified person and from any other conductive object at a different potential
 - The qualified person is insulated from any other conductive object as during live-line bare-hand work.
5. An Electrical Hazard Evaluation (A-6005-432) shall be completed and documented to identify shock and arc flash hazards, determine appropriate safe work practices, protective clothing, and electrical PPE to be used before any person approaches exposed live parts within the limited approach boundary or the flash protection boundary.

Exception: The energy in circuits where all of the following conditions exist is not considered adequate to sustain an arc and establishment of an Arc Flash Protection boundary is not required under these circuit conditions:

- The circuit is rated 240 volts or less
- The circuit is supplied by one transformer
- The transformer supplying the circuit is rated less than 125 kVA.

NOTE: Circuits providing 120/240 volt power to the Double Shell and Single Shell Tank Farms, except the 242-A Evaporator, are fed from a single transformer less than 125KVA. Contact Engineering regarding 120/240 volt circuits in other facilities to determine incident energy levels. (5.2.4)

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6. Electrical Load Study Engineering Calculations must determine the incident energy exposure and flash protection boundary in accordance with NFPA 70E, Section 130.3. Calculations shall be prepared, reviewed, approved, and released in accordance with [TFC-ENG-DESIGN-C-10](#).
7. Click the link to access released Electrical Load Studies.
8. When an electrical load study engineering calculation or AHJ approved analysis is not available, the Hazard/Risk Category and required PPE for the specific activity must be determined using Attachment A.

NOTE: When available short circuit current and fault clearing times in Attachment A, Notes 1-6 are not available, an approved Electrical Hazard Evaluation may be used to authorize visual inspections to obtain equipment configuration and equipment data.

9. The flash protection boundary for systems operating at 600 volts and below shall be four feet unless calculated in accordance with NFPA 70E, Section 130.3.
10. At least two qualified workers shall be assigned to any work inside of a limited approach boundary or flash protection boundary of exposed parts operating at more than 300 volts phase to phase or phase to ground.
11. Signs (designed in accordance with 29 CFR 1910.145), barricades, or attendants must be used to isolate the work area and warn others of the exposed energized electrical circuits. Electrical safety warning signs are worded as follows:

**DANGER – ELECTRICAL HAZARDS -
AUTHORIZED PERSONNEL ONLY**

12. Conductive accessories such as rings, watches, bracelets, metal frame glasses, metal hats, etc., shall not be worn where they present an electrical contact hazard with exposed energized conductors or circuit parts unless they are rendered non-conductive by covering, wrapping, or other insulation.
13. All electrical shocks shall be immediately reported. Affected personnel shall be evaluated at a Hanford occupational medical provider first aid station. Refer to [TFC-ESHQ-S_CMLI-C-02](#).
14. Visual inspection by escorted unqualified persons closer than the limited approach boundary.
 - 1) An EEWP is not required for visual inspections.
 - 2) For the unqualified person(s) to cross the limited approach boundary, a qualified person shall advise him or her of the possible hazards and continuously escort the unqualified person(s) while inside the limited approach boundary. Under no circumstance shall the escorted unqualified person(s) be permitted to cross the restricted approach boundary.
 - 3) PPE requirements applicable to the conditions encountered must be used.
 - 4) Applicable safety requirements and precautions must be properly applied.

- 5) Operation of start, stop, reset, and keypad buttons or switches is authorized with concurrence of the qualified escort. No tools are permitted to be used for this operation.
15. Work on or near live parts by escorted unqualified persons closer than the limited approach boundary.

The use of temporary barrier material to accommodate routine access by unqualified person(s) to enclosures with exposed energized conductors shall not be used as a permanent substitute for the installation of permanent protective barriers.

- 1) An EEWP is not required for installation of temporary barrier material by a qualified person.
- 2) A qualified person shall verify or install temporary barrier material to establish a temporary electrically safe work condition for the unqualified person(s).
- 3) Temporary barrier material does not require NEC inspection.
- 4) For the unqualified person(s) to cross the limited approach boundary, a qualified person shall advise him or her of the possible hazards and continuously escort the unqualified person(s) while inside the limited approach boundary. Under no circumstance shall the escorted unqualified person(s) be permitted to cross the restricted approach boundary.
- 5) PPE requirements applicable to the conditions encountered must be used.
- 6) Applicable safety requirements and precautions must be properly applied.
- 7) Upon completion of work by the unqualified person, the qualified person will remove the temporary barrier material.
- 8) Temporary barrier material may remain in place for short periods of time during evolutions or work requiring repetitive access. Refer to TFC-ENG-DESIGN-C-06 for Engineering Change Notice (ECN) requirements.

NOTE: The duration of a short period is to be evaluated on a case by case basis. Temporary barrier material shall not remain in place for extended periods of time as a substitute for the installation of permanent barriers. Temporary barrier material may deteriorate or become detached within the enclosure. With proper evaluation it is acceptable to allow temporary barriers to remain in place for short periods of time with verification upon each entry into the enclosure when repetitive entries are required over a shift or several consecutive shifts.

3.11 Resetting Tripped Protective Devices

Electrical protective devices may be, but are not limited to, fuses, circuit breakers, or equipment protective devices (e.g., motor thermal units, government-furnished property, etc.).

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1. After a circuit is de-energized by a protective device, the circuit must not be manually re-energized until it has been determined by a qualified person(s) that the equipment and circuit can be safely re-energized.
2. Electrical protective devices must be reset in the following sequence:
 - a. The cause of the trip is investigated by an electrician with proper troubleshooting techniques and test equipment to determine what condition occurred and that the equipment and circuit may be safely reenergized. The cause must be found, corrected, and understood to preclude repeat failures or unsafe conditions.
 - b. The electrical protective device is reset or replaced if the device is a fuse.

NOTE: All 120 VAC, single-pole GFCI receptacles that trip during use may be reset one time without completing the above sequence.

3.12 Performing Work Near or Affecting Electrical Utilities

1. Electrical Utilities must be consulted as soon as practical when planning work that may affect their equipment or facilities.
2. It is not permitted to come closer than ten feet, including the length of conductive equipment, to overhead power lines with voltages up to 50 kilovolts (kV) phase-to-phase or phase-to-ground. Refer to NFPA 70E, Article 130.2 (C) and Table 130.2 (C) for minimum approach distances.
3. If a vehicle is in transit with its structure lowered, the minimum clearance to overhead power lines up to 50 kV may be reduced to four feet. See DOE-RL-92-36, "Hanford Site Hoisting and Rigging Manual," for minimum clearance requirements of vehicles covered by DOE-RL-92-36.
4. Electrical Utilities must be notified at least 48 hours before performing any of the following operations or activities:
 - Moving any equipment taller than fourteen feet under overhead power lines
 - Operating equipment within twenty horizontal feet from overhead high-voltage (over 600 V) power lines.

NOTE 1: The Hanford site electrical dispatcher is located at Building 251-W. The electrical dispatcher may be reached at 373-2321 or 373-7753 (see "Electrical Dispatcher" in the Hanford Yellow Pages). The Richland city electrical dispatcher may be reached at 943-4428 (after hours and weekends).

NOTE 2: Requirements for operating cranes are described in DOE-0359, "Hanford Site Electrical Safety Program (HSESP)," 5.12, "Mobile Cranes Operating Near Energized Overhead Lines."

3.13 Drilling into Walls, Floors, or Outdoor Slabs and Excavations Containing Buried Electrical Cables

TFC-ESHQ-S-STD-30 describes the procedure for excavating, trenching, and shoring.

1. A documented plan shall be prepared for work requiring drilling, cutting or penetrating deeper into walls, floors, or other surfaces that may contain hidden electrical obstructions.
2. All pertinent drawings and documentation must be reviewed. Before the job is started, the job site must be reviewed to determine if obstructions are in the drilling or excavating path.
3. Electrical circuits or conductors in the drilling or excavating path must be de-energized to the maximum extent feasible before the job is started.
4. If it has been determined by the facility Operations manager that de-energizing will introduce additional risk or is not feasible, justification for not de-energizing the electrical circuits or conductors in the drilling or excavating path must be entered in the work plan/package and signed by the facility Operations manager prior to starting the job.
5. If the presence and location of electrical circuits or conductors cannot be accurately identified and de-energized, appropriate mitigating controls must be used. At a minimum, workers doing blind penetrations must use appropriate voltage-rated gloves with protective outer leather gloves and non-conductive safety glasses with side shields.
6. Suspected cable locations must be periodically verified with hand-held detection equipment or other acceptable means of locating utility installations.

3.14 Shift Routines, Inspections, and Surveillances

Managers and supervisors have the responsibility to ensure that shift routines, inspections, or surveillances that require working within the limited, restricted, or prohibited approach space (e.g., removing/opening electrical covers, working near exposed energized parts) are conducted by personnel qualified to work within those spaces.

For the purpose of accessing enclosures with a white label stating "CABINET HAS BEEN EVALUATED TO NOT CONTAIN ANY EXPOSED ELECTRICAL LIVE PARTS AT OR ABOVE 50 VOLTS TO GROUND FOR ROUTINE WORK SCOPE ONLY AS DEFINED IN ELECTRICAL SAFETY PROCEDURE," the definition of routine work scope shall be Nuclear Chemical Operator (NCO) and Stationary Operating Engineer (SOE) rounds procedures (as designated with a prefix of "TF-OR-"), and HPT Task Survey Plans to support the NCO, CHEM-TECHS and SOE rounds procedures that have documentation that reflects a proper electrical hazard evaluation has been performed and electrical hazards mitigated.

3.15 Use of Extension Cords and Relocatable Power Taps

1. The following requirements apply to the use of extension cords:
 - Extension cords shall be inspected prior to use and shall not be used if damaged.

- Extension cords shall be used only when necessary, and only temporarily.
 - Extension cord wattage rating shall be greater than the tool or equipment plugged in.
 - Extension cords shall be routed so they are protected from pinching or damage, and do not create a trip hazard.
 - Extension cords shall be of the proper length. Extension cords shall not be connected in series (daisy-chained), unless specifically designed and approved for this use.
 - Extension cords will be unplugged and properly stored when not in use.
2. Extension cords should not be run through doorways or pinch points unless other alternatives are not available. If an extension cord must be run through a doorway or pinch point, all of the following must be met:
- Fire Boundary Doorways shall not be blocked open without the Fire Marshall's approval,
 - The cord must be routed to prevent a tripping hazard,
 - The doorway or pinch point must be blocked open to prevent closing on the cord, and
 - The cord must be provided with a heavy gage protective device such as Conduct (r) On-Floor Cord Protector at least 18 inches in length, and positioned to prevent damage to the cord due to inadvertent closure of the door or pinch point.
3. Relocatable power taps (RPTs) and surge protection devices (SPDs) shall be connected only to permanently installed branch circuit receptacles. They shall not be connected (daisy chained) to other power taps, SPDs, or to extension cords.
4. Large electrical loads such as space heaters and heat generating devices (e.g., coffee pots), and appliances shall not be connected to RPTs unless the RPT has been listed and approved for such use.

3.16 Electrical Generators and Portable Light Plants

1. Portable Electric Generators.
- a. Portable electric generators (easily carried or wheeled by personnel) are required to be accepted and labeled by an [NRTL](#) or the AHJ.
 - b. Portable generators are not required to be grounded if all of the following conditions are met:
 - Labeling on the generator does not require grounding;

- The generator is only being used to supply cord-and-plug connected equipment items through GFCI receptacles mounted on the generator; and

NOTE: An extension cord set with one to three molded receptacles may be connected to a receptacle on the generator. A portable GFCI may be used in lieu of a mounted GFCI on existing generators.

- The generator is not used to supply equipment for electric power distribution.

2. Vehicle Mounted Generators.

- a. Vehicle mounted generators are required to be accepted and labeled by an NEC, NRTL, or AHJ approval.

- b. Vehicle mounted generators are not required to be grounded if all of the following conditions are met:

- Labeling on the generator or vehicle does not require grounding;
- The generator is only being used to supply cord-and-plug connected equipment items through GFCI receptacles mounted on the generator or vehicle; and

NOTE: An extension cord set with one to three molded receptacles may be connected to a receptacle on the generator or vehicle. A portable GFCI may be used in lieu of a mounted GFCI on existing generators.

- The generator is not used to supply equipment for electric power distribution.

3. Portable light plants are required to be grounded when in use including when the light pole is deployed or stowed.

4.0 DEFINITIONS

Authority Having Jurisdiction (AHJ). A person knowledgeable in the requirements of NFPA 70, NFPA 70E, 29 CFR 1910, Subpart S, and 29 CFR 1926, Subpart K, and assigned to interpret and enforce these electrical safety requirements on the Hanford Site.

Designated National Electrical Code inspector. A National Electrical Code (NEC) inspector designated by the WRPS AHJ and who represents the NEC authority having jurisdiction.

Electrical Energized Work Permit. The standard method used to document a work plan used before performing energized electrical work as recommended by NFPA 70E, Article 130.1 (A).

Exposed parts (as applied to live parts). Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts not suitably guarded, isolated, or insulated.

Flash hazard analysis. A study investigating a worker's potential exposure to arc-flash energy, conducted for the purpose of injury prevention and the determination of safe work practices and the appropriate levels of PPE.

Flash protection boundary. An approach limit at a distance from exposed live parts within which a person could receive a second degree burn if an electrical arc flash were to occur.

Ground fault circuit interrupter. A device whose function is to interrupt the electric current to the load when a fault current to ground exceeds some pre-determined value that is less than that required to operate the overcurrent protective device of the supply circuit.

Limited approach boundary. An approach limit at a distance from an exposed live part within which a shock hazard exists.

Nationally Recognized Testing Laboratory. An organization which is recognized by OSHA in accordance with 29 CFR 1910.7 and which tests for safety, and lists, or labels, or accepts equipment or materials.

Prohibited approach boundary. An approach limit at a distance from an exposed live part within which work is considered the same as making contact with the live part.

Qualified person. One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.

Restricted approach boundary. An approach limit at a distance from an exposed live part within which there is an increased risk of shock, due to electrical arc over combined with inadvertent movement, for personnel working in close proximity to the live part.

Safe Condition Check. The comprehensive inspection or test of the lockout/tagout boundary performed for/by the Controlling Organization Qualified Worker to ensure that the lockout/tagout boundary is controlled to prevent exposure from all identified sources of hazardous energy/material.

Safe-To-Work Check. The inspection or test the Authorized Worker performs to ensure that no hazardous energy exists where they will perform servicing or maintenance.

Troubleshooting and testing. Actions necessary to measure voltage and current and to verify the operability of equipment without repairing or replacing components.

Working near. Any activity inside the limited approach boundary of exposed energized electrical conductors or circuit parts that are not put into an electrically safe work condition.

Working on. Coming in contact with exposed energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing.

5.0 SOURCES

5.1 Requirements

1. 10 CFR 851, "Worker Safety and Health Program."
2. 29 CFR 1910, Subpart I, "Personal Protective Equipment," 1910.137, "Electrical Protective Equipment."
3. 29 CFR 1910, Subpart S, "Electrical."
4. 29 CFR 1910.302, "Electric Utilization Systems."
5. 29 CFR 1910.303, "General Requirements (electrical)."
6. 29 CFR 1910.304, "Wiring Design and Protection."
7. 29 CFR 1910.305, "Wiring Methods, Components, and Equipment for General Use."
8. 29 CFR 1910.306, "Specific Purpose Equipment and Installations."
9. 29 CFR 1910.307, "Hazardous Locations."
10. 29 CFR 1910.308, "Special Systems."
11. 29 CFR 1910.331, "Scope."
12. 29 CFR 1910.332, "Training."
13. 29 CFR 1910.333, "Selection and Use of Work Practices."
14. 29 CFR 1910.334, "Use of Equipment."
15. 29 CFR 1910.335, "Safeguards for Personal Protection."
16. 29 CFR 1926, Subpart K, "Electrical."
17. NFPA 70-2005, "National Electrical Code (NEC)."
18. NFPA 70E-2004, "Standard for Electrical Safety Requirements for Employee Workplace."

5.2 References

1. DOE-0336, "Hanford Site Lockout/Tagout."
2. DOE-0344, "Hanford Site Trenching, Excavation and Shoring Procedure."
3. DOE-HDBK-1092-98, DOE Handbook, "Electrical Safety."
4. Interoffice Memorandum WRPS-0900997, "Arc Flash Hazard Analysis for Circuits Less than or Equal to 240 Volts."

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5. Interoffice Memorandum WRPS-0901679, "Evaluations Memo for Facility Arc Flash Exemptions."
6. Interoffice Memorandum 79F00-JCH-08-018, "Ground Fault Circuit Interrupter Testing Program Requirements."
7. Interoffice Memorandum WRPS-1000397, "AHJ Interpretation of Requirement to Prevent Use of Any Equipment Which Has Not Met the Requirement of the Assured Equipment Grounding Conductor Program."
8. Interoffice Memorandum WRPS-1001716, "AHJ Interpretation of Training Requirements for Qualified Electrical Supervisors And) Field Work Supervisors."
9. TFC-ENG-DESIGN-C-06, "Engineering Change Control."
10. TFC-ENG-DESIGN-C-10, "Engineering Calculations."
11. TFC-ESHQ-S_CMLI-C-02, "Injury and Illness Events."
12. TFC-ESHQ-S_SAF-C-02, "Job Hazard Analysis."
13. TFC-ESHQ-S_SAF-C-09, "NRTL Requirements for Electrical Equipment."
14. TFC-ESHQ-S-STD-29, "Competent/Qualified Persons."
15. TFC-ESHQ-S-STD-30, "Implementation of DOE-0344, Excavating, Trenching, and Shoring."
16. TFC-OPS-MAINT-C-02, "Pre-Job Briefing and Post Job Reviews."
17. TFC-PRJ-P-C-02, "NEC Compliance Inspection."

ATTACHMENT A – HAZARD/RISK CATEGORY CLASSIFICATION AND PPE MATRIX

Task (Equipment Energized, Work Within Flash Protection Boundary)	PPE Level Risk Category	V-rated Gloves	V-rated Tools
Panelboards Rated 240 V and Below — Notes 1 and 3			
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N
Work on energized parts, including voltage testing	1	Y	Y
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Remove/install CBs or fused switches	1	Y	Y
Panelboards or Switchboards Rated >240 V and up to 600 V (with molded case or insulated case circuit breakers) — Notes 1 and 3			
CB or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
600 V Class Motor Control Centers (MCCs) — Notes 2 (except as indicated) and 3			
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch or starter operation with enclosure doors closed	0	N	N
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
CB or fused switch or starter operation with enclosure doors open	1	N	N
Opening hinged covers (to expose bare, energized parts)	1	N	N
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Work on control circuits with energized parts >120 V, exposed	2*	Y	Y
Insertion or removal of individual starter “buckets” from MCC — Note 4	3	Y	N
600 V Class Switchgear (with power circuit breakers or fused switches) — Notes 5 and 6			
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure doors closed	0	N	N
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
CB or fused switch operation with enclosure doors open	1	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts >120 V, exposed	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	3	N	N
Insertion or removal (racking) of CBs from cubicles, doors open	3	N	N
Other 600 V Class (277 V through 600 V, nominal) Equipment — Note 3			
Opening hinged covers (to expose bare, energized parts)	1	N	N
Cable trough or tray cover removal or installation	1	N	N
Miscellaneous equipment cover removal or installation	1	N	N
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Application of safety grounds, after voltage test	2*	Y	N
Revenue meters (kW-hour, at primary voltage and current) Insertion or removal	2*	Y	N
Note: V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done. V-rated Tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done. 2* means that a double-layer switching hood and hearing protection are required for this task in addition to the other Hazard/Risk Category 2 requirements.			
Notes: 1. 25 kA short circuit current available, 0.03 second (2 cycle) fault clearing time. 2. 65 kA short circuit current available, 0.03 second (2 cycle) fault clearing time. 3. For ≤10 kA short circuit current available, the hazard/risk category required may be reduced by one number. 4. 42 kA short circuit current available, 0.33 second (20 cycle) fault clearing time. 5. 35 kA short circuit current available, up to 0.5 second (30 cycle) fault clearing time. 6. For ≤25 kA short circuit current available, the hazard/risk category required may be reduced by one number.			

**ATTACHMENT A – HAZARD/RISK CATEGORY CLASSIFICATION AND PPE MATRIX
(cont.)**

Protective Clothing and Equipment Category	Risk	Protective System for Hazard/Risk Category					
		-1 ³	0	1	2	3	4
Non-melting or Untreated Natural Fiber							
a. T-Shirt (short-sleeve)		X	-	-	X	X	X
b. Shirt (long-sleeve)		-	X	-	-	-	-
c. Pants (long)		X	X	X	X	X	X
FR Clothing (Note 1)							
a. Long-sleeve shirt		-	-	X	X	X ⁹	X
b. Pants		-	-	X ⁴	X ⁶	X ⁹	X
c. Coverall		-	-	(5)	(7)	X ⁹	(5)
d. Jacket, parka, or rainwear		-	-	AN	AN	AN	AN
FR Protective Equipment							
a. Flash suit jacket (multilayer)		-	-	-	-	-	X
b. Flash suit pants (multiplayer)		-	-	-	-	-	X
c. Head protection							
1. Hard hat		-	-	X	X	X	X
2. FR hard hat liner		-	-	-	-	AR	AR
d. Eye protection							
1. Safety glasses		X	X	X	AL	AL	AL
2. Safety goggles		-	-	-	AL	AL	AL
e. Face and head area protection							
1. Arc-rated face shield, or flash suit hood		-	-	-	X ⁸	-	-
2. Flash suit hood		-	-	-	-	X	X
3. Hearing protection (ear canal inserts)		-	-	-	X ⁸	X	X
f. Hand protection – Leather gloves (note 2)							
1. Safety glasses		-	-	AN	X	X	X
g. Foot protection – Leather work shoes							
1. Safety glasses		-	-	AN	X	X	X
Minimum combined Arc Flash Rating (cal/cm²)							
		-	N/A	4	8	25	40
Typical number of clothing layers							
		-	1	1	1 or 2	2 or 3	≥ 3
AN = As needed AL = Select on in group AR = As required X = Minimum required							
Typical Protective Clothing Systems for Hazard/Risk Category / PPE Level:							
0 Non-melting, flammable materials (i.e., untreated cotton, wool, rayon, or silk, or blends of these materials) with a fabric weight at least 4.5 oz/yd ²							
1 FR shirt and FR pants or FR coverall							
2 Cotton underwear — conventional short sleeve and brief/shorts, plus FR shirt and FR pants							
3 Cotton underwear plus FR shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls							
4 Cotton underwear plus FR shirt and FR pants plus multilayer flash suit							
Notes:							
1. Arc rating for a garment is expressed in cal/cm ²							
2. If VR gloves required, leather protectors worn external to rubber gloves satisfy requirement.							
3. Hazard/Risk Category Number “-1” is determined by notes 3 or 6 of NFPA 70E-2004 Table 130.7(C)(9)(a)							
4. Regular weight (minimum 12 oz/yd ² fabric weight), untreated, denim cotton blue jeans are acceptable in lieu of FR pants. FR pants used for Hazard/Risk Category 1 shall have minimum arc rating of 4.							
5. May use FR coveralls (minimum arc rating of 4) instead of FR shirt and FR pants.							
6. If FR pants have a minimum arc rating of 8, long pants of non-melting or untreated natural fiber are not required beneath the FR pants.							
7. May use FR coveralls (minimum arc rating of 4) over non-melting or untreated natural fiber pants and T-shirt.							
8. Face shield (minimum arc rating of 8) is required with wrap-around guarding to protect face, forehead, ears, and neck (or may use a flash suit hood).							
9. May use two sets of FR coveralls (inner minimum arc rating of 4 and outer minimum arc rating of 5) instead of FR coveralls, FR shirt, and FR pants over non-melting or untreated natural fiber clothing.							