Hanford Site Electrical Safety Program (HSESP)

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Approved for Public Release;
Further Dissemination Unlimited
**CHANGE SUMMARY**

**General Changes:** Formatting and minor wording changes made throughout the document to ease in reading. References to specific documents and standards have been removed from most areas in the Program and placed in the Reference section.

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<td>Various</td>
<td>Periods added to the end of lists that formed full sentences for consistency in the document</td>
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### Section Changed | Change Summary
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**Appendix I** | Added - New flowcharts to assist in application of 29 CFR 1926, Subpart CC.
**Appendix J** | Added – New flowchart to assist with application of 29 CFR 1926, Subpart CC.
**Appendix K** | Added – New flowchart to assist with application of 29 CFR 1926, Subpart CC.
**Appendix L** | Added – New flowchart to assist with application of 29 CFR 1926, Subpart CC.
**Attachment 1** | Added - New Definitions and Acronyms.

This Change Summary contains only the changes made to this revision. Previous Change Summary detailing all historical changes for this document is available by contacting Integrated & Site Wide Safety Systems (I&SWSS).
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1.0 PURPOSE AND SCOPE

This document establishes the Hanford Site Electrical Safety Program (HSESP), herein called the Program. The Program provides the requirements for electrical safe work practices and electrical safety training. Compliance with this Program ensures a workplace free from unplanned exposure to electrical hazards for all employees of participating Hanford Site contractors, subcontractors, sub-tier contractors, and vendors. This Program will also minimize the risk to Hanford Site equipment and facilities from the hazards of electricity. This Program implements specific requirements of the following:

- National Fire Protection Association (NFPA) 70-2014, National Electrical Code (NEC)
- NFPA 70E-2009, Standard for Electrical Safety in the Workplace
- Code of Federal Regulations (CFR), Title 29, Occupational Safety and Health Administration (OSHA), 1910 Subpart S (29 CFR 1910), Electrical
- 29 CFR 1926, Subpart K, Electrical
- 29 CFR 1926, Subpart CC, Cranes & Derricks in Construction
- 29 CFR 1926, Subpart O, Motor Vehicles, Motorized Equipment, and Marine Operations
- 10 CFR Part 851 Worker Safety and Health Program
- American Society of Mechanical Engineers B30.5, Mobile and Locomotive Cranes

NOTE: This Program does not contain all requirements of the above documents, in the event of a conflict between this document and the requirements listed above, the conflict would be resolved by the HSESP committee per their charter.

This document does not cover any of the following:

- Installations or work involving automotive, watercraft, and similar equipment
- Installations under the exclusive control of Electrical Utilities (EU) for the purpose of metering, transmission, and distribution of electrical energy
- Lockout/Tagout activities: Department of Energy (DOE)-0336, Hanford Site Lockout/Tagout Procedure, provides requirements for lockout/tagout and shall take precedence over similar requirements in NFPA 70E if there is a conflict
- Telecommunications workers performing work under 29 CFR 1910.268

EU complies with the National Electric Safety Code (NESC) and 29 CFR 1910.269, Electric Power Generation, Transmission, and Distribution. EU participates in the Program by providing technical advice on matters relating to EU systems.

Definitions of terms specific to this Program are found in Attachment 1 or NFPA and CFR source documents listed in Section 7.0, References.
This document supersedes DOE Richland Operations Office (RL) Richland Requirements Document (RRD)-005, Section D, Electrical Safety Requirements, and Section E, Electrical Design and Installation Requirements.

2.0 IMPLEMENTATION

This Program shall be implemented per DOE-approved contractor implementation plans.

3.0 ROLES AND RESPONSIBILITIES

3.1 Mission Support Contractor (MSC)

To administer the HSESP, the MSC shall:

- Appoint an Electrical Safety Program Coordinator, responsible for:
  - Ensuring training courses are audited to validate they meet program requirements
  - Maintaining a current list of Authorities Having Jurisdiction (AHJs) for each participating contractor
  - Coordinating electrical safety activities and initiatives with DOE and other Hanford Site contractors
  - Ensuring that meeting summaries, interpretations, lessons learned, and other information related to electrical safety is effectively communicated
  - Maintaining an HSESP website, accessible by all Hanford Site contractors, for electrical safety information
- Document decisions/interpretations and recommendations by the HSESP Committee, the Hanford Electrical Codes Board (HECB), and the Hanford Workplace Electrical Safety Board (HWESB)
- Maintain two technical boards as the core of the HSESP, the HECB and the HWESB
- Provide administrative support for the HSESP Committee, the HECB, and the HWESB

3.2 Prime Hanford Contractors

Each Prime Hanford Contractor shall ensure:

- The name(s) of the individual(s) appointed as Authority Having Jurisdiction (AHJ), as defined in NFPA 70 and NFPA 70E, are submitted to DOE and the Electrical Safety Program Coordinator
• Personnel (to the lowest sub-tier contractor) who face a risk of electrical hazard are trained and qualified to perform the assigned work in accordance with this Program

• Safe work practices, as described in this Program, are used by workers under their direction, including non-electrical workers who use portable electric tools and equipment to perform maintenance, construction, and demolition activities

• Electrical equipment and supporting equipment (e.g., light poles, power poles) are installed using appropriate technical standards and approved instructions and procedures

• Electrically knowledgeable members of the HSESP Committee, HECB, and HWESB are appointed

• Electrical Installation Permits (EIPs) (A-6005-707) are obtained for all electrical system installations and modifications

• NEC inspections are scheduled at inspection points designated in the EIP and for re-inspection of corrected violations

• Program Assessments are performed in accordance with Section 5.19

• Electrical incidents are investigated and trended, and significant incidents are communicated with the other Hanford Site contractors and the HSESP Committee in a timely manner

3.3 Hanford Site Electrical Safety Program (HSESP) Committee

The HSESP Committee shall be the collective interpretive authority for the HSESP, as per the Charter (Attachment 2, Hanford Site Electrical Safety Program [HSESP] Committee Charter).

3.4 Hanford Electrical Codes Board (HECB)

The HECB shall provide:

• Technical support and advice to the NFPA 70 AHJ(s)

• The opportunity for all Hanford Site projects, facilities, and contractors to be represented by a designated Point of Contact (POC)

• Periodic meetings to serve as open forums for discussion of issues presented by NEC Inspectors, HSESP POCs, and other stakeholders

• Recommendations to the AHJ(s) on any disputes not resolved with the NEC Inspectors

3.5 Hanford Workplace Electrical Safety Board (HWESB)

The HWESB shall provide:

• Technical support and advice to the NFPA 70E AHJ(s)
• The opportunity for all Hanford Site projects, facilities, and contractors to be represented by designated POCs
• Periodic meetings to serve as open forums for discussion of issues presented by POCs and other stakeholders
• Discussions of electrical events or trends across the DOE Complex

3.6 Authority Having Jurisdiction (AHJ)

The AHJ shall:
• Enforce and interpret all required documents stated in Section 1.0, Purpose and Scope, as they apply to this Program
• Document company specific AHJ decisions and interpretations

3.7 National Electrical Code (NEC) Inspectors

NEC Inspectors shall:
• Be independent from the work they inspect. They shall not inspect work for which they have direct line management, engineering, or construction responsibility
• Act as a field representative of the AHJ(s) to administer and enforce the NEC
• Maintain qualifications established in Section 4.8 of this Program
• Issue EIPs (A-6005-707)
• Consult with designers and installers on NEC compliance issues
• Perform field inspections for installations and modifications of electrical systems and equipment
• Issue NEC inspection reports to the EIP holder
• Present disputed NEC inspection reports and issues to the company AHJ(s) for resolution

3.8 Project/Construction/Maintenance/Operations/Engineering Managers

Project/Construction/Maintenance/Operations/Engineering Managers shall ensure:
• Participation on the HECB and HWESB
• Safe work practices, as described in this Program and NFPA 70E, are used by workers under their direction, including non-electrical workers
• Approved personal protective equipment (PPE) for electrical work is provided and used by workers who are exposed to electrical hazards
• Work assignments do not exceed personnel qualifications
• Personnel are trained to the requirements listed in Section 4.0, Electrical Safety Training and Qualifications
3.9 **Qualified Instrument Specialist/Supervisor**

Qualified Instrument Specialist/Supervisor shall:

- Ensure work is performed within the controls of the work document(s)
- Understand and follow the shock and arc flash hazard analysis
- Ensure work is performed commensurate with qualifications (See Section 4.0, *Electrical Safety Training and Qualifications*)
- Identify and communicate potentially unsafe electrical conditions

3.10 **Qualified Electrical Worker/Supervisor**

Qualified Electrical Worker/Supervisor shall:

- Ensure work is performed within the controls of the work document(s)
- Understand and follow the shock and arc flash hazard analysis
- Ensure work is performed commensurate with qualifications (See Section 4.0, *Electrical Safety Training and Qualifications*)
- Identify and communicate potentially unsafe electrical conditions

3.11 **All Personnel**

All personnel shall:

- Comply with applicable requirements of this Program
- Immediately report all electrical shocks, other than obvious static shocks, and be evaluated at a Hanford Site Occupational Medical Contractor first aid station

**NOTE:** *Static shocks should be evaluated on a case-by-case basis, or as requested by the worker, to determine if medical evaluation is necessary.*

4.0 **ELECTRICAL SAFETY TRAINING AND QUALIFICATIONS**

4.1 **General Training Requirements**

Personnel shall be trained and qualified to a level of proficiency consistent with their assigned tasks.

Consistent training is critical to successful implementation of the Program; it is recommended that training be provided by the Volpentest HAMMER Federal Training Center (HAMMER); however, contractors may provide their own training. All training shall meet the minimum requirements of the *Hanford Site Electrical Safety Program (HSESP) Course Descriptions, Objectives, and Training Requirements* (available on the HSESP website) and be reviewed and approved by the HSESP Committee.

Individual training equivalencies, waivers, and extensions shall be approved and documented by the appropriate Hanford Site contractor responsible training manager.
Training and/or retraining shall be commensurate with 10 CFR 851 and DOE O 414.1:

1. Workers who face a risk of exposure to electrical hazards shall have electrical safety training commensurate to their assigned duties. The degree of training provided shall be determined by the risk to the employee.

2. Documentation of training shall be available to supervisors/managers.

3. Initial NFPA 70E training shall include a hands-on element(s) to reinforce learning objectives.

4. Courses shall be made available for Continuing Education Units (CEU) that are certified by the State of Washington.

5. Personnel shall be instructed on the proper use and maintenance of PPE prior to use.

4.2 General Employees

General employees shall receive electrical training (initial and refresher) through completion of the Electrical Safety module of Hanford General Employee Training (HGET).

4.3 Non-Electrical Workers

1. Non-electrical workers are employees who face a higher than normal risk of exposure to electrical hazards. This includes workers who operate electrical hand tools, such as drills and grinders, and who may operate electrical disconnects or circuit breakers.

2. All non-electrical workers shall:
   a. Attend an Electrical Safety for Non-Electrical Workers course.
   b. Receive refresher training on Electrical Safety for Non-Electrical Workers course every 36 months.

3. All non-electrical workers who operate electrical disconnects or circuit breakers shall:
   a. Attend a Breaker Operation Electrical Safety course.
   b. Receive refresher training on Breaker Operation Electrical Safety every 36 months.

4.4 Qualified Instrument Specialists

1. It is the responsibility of the Qualified Instrument Specialist’s employer to document and ensure that all Qualified Instrument Specialists are trained and qualified for their assigned task(s). Qualified Instrument Specialists shall meet at least one of the following criteria:
   a. Be an established instrument specialist working on the Hanford Site before the date of Program implementation, February 2013.
b. Completion of an apprenticeship program
   - Employee provides verification of successfully completing a minimum of 8,100 hours in a recognized apprentice program and a minimum of three years of industry experience

c. Equivalent military experience
   - Employee provides verification of documented military training and/or experience comparable to the non-military requirements applicable to the job responsibilities

d. Equivalent industry experience
   - Employee provides verification of having worked in an industry for a minimum of five years with related responsibilities/job requirements

e. Completion of a technical school and equivalent industry experience
   - Employee provides verification of successful completion of a minimum of two years at a recognized technical school and a minimum of three years of industry experience with related responsibilities/job requirements

f. Management observation and evaluation
   - Management has conducted observations and evaluations and determined the employee, based on experience, training, and/or education, is qualified to perform job responsibilities

2. Qualified Instrument Specialists shall attend the following training:
   a. First Aid/CPR/AED training, at intervals not to exceed two years. Training certification shall be verified at least annually.
   b. NFPA-70E, *Standard for Electrical Safety in the Workplace*. Qualified Instrument Specialists shall have refresher training to updated regulations and electrical safety criteria, at intervals not to exceed three years.
   c. *Hanford Site Electrical Safety Program Training* course

3. Qualified Instrument Specialists shall be familiar with the proper use of the special precautionary techniques, PPE (including arc flash, insulating, and shielding materials), and insulated tools and test equipment. A person may be considered qualified with respect to certain equipment and methods, but unqualified for others.

4. Qualified Instrument Specialists who are permitted to work within the Limited Approach Boundary (LAB)/Arc Flash Protection Boundary (AFPB) of exposed energized electrical conductors and circuit parts operating at 50 volts or more shall, at a minimum, be 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 electrical 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 Appendix A, *Limited Approach Boundaries for Overhead Lines*, NFPA 70E Table 130.2(C), and the corresponding voltages to which the Qualified Instrument Specialists will be exposed
d. The decision-making process necessary to determine the degree and extent of the hazard, PPE, and job planning necessary to perform the task safely
e. Selecting an appropriate voltage detector, verifying the absence of voltage, interpreting the indications provided by the device, and understanding the limitations of each specific voltage detector that may be used

5. An Instrument Specialist, who is undergoing on-the-job training under the direct oversight of a Qualified Instrument Specialist, and who has demonstrated an ability to perform duties safely at his or her level of training, shall be considered qualified for the performance of those duties.

6. A vendor under the direct oversight of a Qualified Instrument Specialist shall be considered qualified for the performance of their contracted duties.

### 4.5 Qualified Instrument Specialist Supervisor

1. Qualified Instrument Specialist Supervisor includes, but is not limited to, first-line managers, field work supervisors, and persons in charge (PICs); they shall have at least the same level of electrical safety training as the workers they supervise.

2. Qualified Instrument Specialist Supervisors shall attend the following training:
   a. First Aid/CPR/AED training, at intervals not to exceed two years. Training certification shall be verified at least annually.
   b. NFPA 70E, *Standard for Electrical Safety in the Workplace*. Qualified Instrument Specialist Supervisors shall have refresher training to updated regulations and electrical safety criteria, at intervals not to exceed three years.
   c. *Hanford Site Electrical Safety Program Training* course.

3. Qualified Instrument Specialist Supervisors shall have the following confirmed by the company’s NFPA 70/NFPA 70E Authority Having Jurisdiction(s) (AHJ) or designee to have the:
   a. Ability to distinguish exposed energized electrical conductors and/or circuit parts from other parts of electric equipment.
   b. Ability to recognize electrical shock hazards, arc flash hazards, and appropriate controls.
   c. Familiarity with the proper use of the special precautionary techniques, PPE (including arc flash, insulating, and shielding materials), and insulated tools and test equipment.
d. Ability to explain the approach distances specified in NFPA 70E, Table 130.2(C) and the corresponding voltages to which the Qualified Instrument Specialist will be exposed.

4. Qualified Instrument Specialist Supervisors shall also meet the company specific qualification requirements (e.g., Field Work Supervisor, PIC).

4.6 Qualified Electrical Worker

1. The responsible company shall document and ensure that all Qualified Electrical Workers are trained and qualified. Qualified Electrical Workers shall have, at a minimum, a general journeyman electrician State license or they shall meet one of the following criteria:
   a. Be an established electrician working on the Hanford Site before the date of Program implementation, February 2013.
   b. Completed 8,000 documented hours of electrical on-the-job training under the supervision of a journeyman electrician in light industrial, industrial, commercial, or construction and a minimum of 2,150 hours classroom training.
   c. Electrical experience (e.g., military, other State) may be substituted for a portion of the 8,000 documented hours and 2,150 hours of classroom training requirements.

2. Qualified Electrical Workers shall attend the following training:
   a. First Aid/CPR/AED training, at intervals not to exceed two years. Training certification shall be verified at least annually.
   b. NFPA 70E, Standard for Electrical Safety in the Workplace. Qualified Electrical Workers shall have refresher training to updated regulations and electrical safety criteria, at intervals not to exceed three years.
   c. Hanford Site Electrical Safety Program Training course.

3. Qualified Electrical Workers shall maintain qualifications through continuing education:
   a. 24 hours per three-year cycle:
      • at least eight (8) hours of NFPA 70;
      • four (4) hours on currently adopted Revised Code of Washington (RCW) 19.28 and related Washington Administrative Codes (WAC); and
      • twelve (12) hours of additional State approved continuing education courses

4. Qualified Electrical Workers shall be familiar with the proper use of the special precautionary techniques, PPE (including arc flash, insulating, and shielding materials), and insulated tools and test equipment. A person may be considered
qualified with respect to certain equipment and methods but unqualified for others.

5. Qualified Electrical Workers who are permitted to work within the LAB/AFPB of exposed energized electrical conductors and circuit parts operating at 50 volts or more shall, at a minimum, be 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 electrical 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 Appendix A, Limited Approach Boundary for Overhead Electrical Lines, NFPA 70E Table 130.2(C), and the corresponding voltages to which the Qualified Electrical Worker will be exposed
   d. The decision-making process necessary to determine the degree and extent of the hazard, PPE, and job planning necessary to perform the task safely
   e. Selecting an appropriate voltage detector, verifying the absence of voltage, interpreting the indications provided by the device, and understanding the limitations of each specific voltage detector that may be used

6. An electrical worker, who is undergoing on-the-job training under the direct oversight of a Qualified Electrical Worker, and who has demonstrated an ability to perform duties safely at his or her level of training, shall be considered qualified for the performance of those duties.

7. A vendor under the direct oversight of a Qualified Electrical Worker shall be considered qualified for the performance of their contracted duties.

4.7 Qualified Electrical Supervisor

1. Qualified Electrical Supervisor includes, but is not limited to, first-line electrical managers, electrical field work supervisors, and electrical persons in charge (PIC); they shall have at least the same level of electrical safety training as the workers they supervise.

2. Qualified Electrical Supervisors shall attend the following training:
   a. First Aid/CPR/AED training, at intervals not to exceed two years. Training certification shall be verified at least annually.
   b. NFPA 70E, Standards for Electrical Safety in the Workplace. Qualified Electrical Supervisor shall have refresher training to updated regulations and electrical safety criteria, at intervals not to exceed three years.
   c. Hanford Site Electrical Safety Program Training course.

3. A Qualified Electrical Supervisor supervises/directs Qualified Electrical Workers conducting the technical aspects of electrical work. They shall have skills and
knowledge related to the construction and operation of electrical equipment and installations.

4. Qualified Electrical Supervisors shall have the following confirmed by the company’s NFPA 70/NFPA 70E Authority Having Jurisdiction(s) (AHJ) or designee to have the:
   
a. Ability to distinguish exposed energized electrical conductors and/or circuit parts from other parts of electric equipment.

b. Knowledge in the selection of appropriate voltage detector, verifying the absence of voltage, interpreting the indications provided by the device, and understanding the limitations of each specific voltage detector that may be used.

c. Ability to recognize electrical shock hazards, arc flash hazards, and appropriate controls.

d. Working knowledge of the National Electrical Code (NEC), and maintained through continuing education.

e. Knowledge in the proper use of the special precautionary techniques, PPE (including arc flash, insulating, and shielding materials), and insulated tools.

f. Knowledge of the approach distances specified in NFPA 70E, Section 130 and the corresponding voltages to which the Qualified Electrical Worker will be exposed.

5. Qualified Electrical Supervisors are not Qualified Electrical Workers unless they meet the requirements of Section 4.6, Qualified Electrical Worker.

6. Qualified Electrical Supervisors shall also meet company-specific qualification requirements (e.g., Field Work Supervisor, PIC).

7. Qualified Electrical Supervisors shall be qualified to supervise the work on the equipment and methods being used.

4.8 NEC Inspectors

1. NEC inspections shall be performed by designated NEC Inspectors who have been authorized by the AHJ to perform such inspections.

2. NEC Inspectors shall pass a nationally recognized test for general electrical inspectors and plan review inspectors. The International Association of Electrical Inspectors (IAEI) or the International Code Council (ICC) shall certify these tests.

3. NEC Inspectors shall have at least one of the following:
   
a. No less than four years experience as a journeyman electrician installing and maintaining electrical equipment.

b. Two years electrical training in a college of electrical engineering of recognized standing and four years continuous practical electrical experience in installation work.
c. Four years of electrical training in a college of electrical engineering of recognized standing and two years continuous practical electrical experience in electrical installation work.

d. Approval and designation from the AHJ based upon years of experience in the electrical field.

4. NEC Inspectors shall complete NFPA 70E, *Standards for Electrical Safety*, with refresher training at intervals not to exceed 36 months.

5. NEC Inspectors shall remain cognizant of the latest status of the NEC via continued training and education.

4.9 Spotters

1. A spotter is the assigned person(s) whose sole responsibility is to provide a warning or stop signal during vehicle or equipment operation prior to violation of proximity restrictions or predetermined distance limitations to structures or hazards such as power and communication lines, overhead obstructions, buildings, telephone poles, or ground penetrations. (Some operations require the use of a qualified signalman/flagman as a spotter.)

2. Spotters shall attend training courses that are appropriate for the hazards involved in equipment operations near power lines and energized electrical equipment.

4.10 Mobile Crane Operators and Crew Members

Training for crane operators and crew members will be in accordance with DOE-RL-92-36, the *Hanford Site Hoisting and Rigging Manual (HSHRM)*.

4.11 Battery Training

Personnel, who install, maintain, or otherwise work directly with batteries that present a chemical or electrical hazard (battery or battery banks operating over 50 volts or stored capacity exceeding 1 kWh) shall complete Battery Safety Training.

4.12 Capacitor Training

Personnel who install, maintain, remove, or dispose of capacitors or capacitor banks rated greater than 200µF in circuits greater than 100V shall complete Capacitor Safety Training.

5.0 PROGRAM REQUIREMENTS

5.1 Electrical Equipment Listing, Labeling, and Approval Requirements

1. All electrical equipment installed or used on the Hanford Site shall be approved by the contractor specific NFPA 70 AHJ.

   a. Electrical equipment shall be approved and acceptable for use if it has been accepted, certified, listed, labeled, or otherwise determined to be safe by an
OSHA Nationally Recognized Testing Laboratory (NRTL) (as indicated by an NRTL label applied by the manufacturer).

b. If 5.1.1.a is not met, and there is an Underwriters Laboratories (UL) standard for the piece of equipment, it shall be field evaluated and labeled by an OSHA recognized NRTL representative.

c. For equipment that does not comply with 5.1.1.a or 5.1.1.b, inspection and/or testing shall be completed using the Hanford Site Non-NRTL Labeled Electrical Equipment AHJ Approval Form (A-6005-705), Hanford Site Non-NRTL Labeled Electrical Equipment Evaluation (A-6005-706) when required by the AHJ, and labeled using the AHJ Approval for Non-NRTL Equipment (BL-6004-154). For an image of the required tag, see Appendix B, Authority Having Jurisdiction (AHJ) Approval for Non-Nationally Recognized Testing Laboratory (NRTL) Equipment Label.

EXCEPTION: Equipment connected to the load side of a Class 2 or 3 power supply when it has been determined that listed equipment for the intended use is not available, does not require AHJ approval prior to use.

EXCEPTION: Non-NRTL certified equipment that operates at less than 50 volts (such as cable assemblies, instruments, security systems, low voltage lighting, communication systems, etc.) may be approved by the AHJ using an informal method, if it is determined that an NRTL certified alternative is not readily available to meet the application.

NOTE 1: Condition 5.1.1.c is reserved for use in unique situations or for special needs that do not satisfy NRTL requirements.

NOTE 2: Legacy equipment (in use prior to September 2003) and Non-NRTL equipment in use prior to the implementation of this Program (February 2013) may remain in service and does not require reevaluation, so long as it has not been modified, found to be defective or damaged, and does not present a hazard to the workers.

NOTE 3: See the OSHA website (http://www.osha.gov/dts/otpca/nrtl/index.html) for a list of OSHA recognized NRLTs.

NOTE 4: Equipment of the same manufacturer and model number that has been previously evaluated by an NRTL may be approved by the AHJ using the 5.1.1.c option.

2. Equipment shall be suitable for its intended purpose and used in accordance with the manufacturer’s instructions and any instructions or requirements of the NRTL listing or labeling.
3. All electrical multi-meters, including the external test leads, used on electrical equipment that operates at 50 volts or more shall be approved per Section 5.1.1. The standard multi-meter will be rated Category III or higher. Category II or less rated test instruments shall be permitted only when no instrument with a higher rating is available for the purpose and it can be assured the instrument will not be used outside the limits of its category rating.

5.2 Electrical Safe Work Practices

1. A hazard/risk evaluation, including both an arc flash and a shock hazard analysis shall be performed and documented for all work containing electrical hazard(s) in accordance with NFPA 70E and this Program. This analysis shall be documented on the Electrical Hazard Evaluation (EHE) Form (A-6005-738) or Energized Electrical Work Permit (A-6005-704).

2. All electrical equipment, circuit conductors, and circuit parts shall be considered energized until placed in an electrically safe work condition in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

3. Where there is not an accessible exposed point to take contact voltage measurements to determine the absence of voltage at work locations, planning considerations shall include approval of alternate methods of verification (e.g., proximity probes, non-contact probes, circuit tracers, current sensing probes).

4. Personnel may perform or supervise electrical work only to the level for which they have been trained and qualified in accordance with Section 4.0, Electrical Safety Training and Qualifications.

5. Appropriate signs, tags, barricades, or an attendant shall be used to warn and protect employees from hazards that may cause injury due to electric shock or arc flash. If the attendant is required to be within the LAB, they shall be a Qualified Electrical Worker or a Qualified Instrument Specialist with appropriate PPE. If the attendant is required to be within the AFPB, they shall be a Qualified Electrical Worker with appropriate PPE.

6. Where work is performed on equipment that is de-energized and placed in an electrically safe work condition in a work area where look-alike equipment (other energized equipment that is similar in size, shape, and construction) exists, one of the alerting methods listed below shall be employed to prevent the employee from entering look-alike equipment:
   a. Safety signs and tags
   b. Barricades (used to establish a safe work boundary)
   c. Attendant(s)

7. Insulated tools and equipment shall be used, stored, maintained, and tested according to the manufacturer’s instructions or industry standards.

8. Non-conductive ladders (i.e., fiberglass, wood) are to be used for electrical work or near electrical installations.
9. Electrical PPE and other protective equipment shall meet the requirements of Section 5.17, *Electrical PPE*.

10. All test instruments shall be designed, rated, and approved for their intended use, and visually inspected for external damage before each use. Damaged or defective equipment shall not be used.

### 5.3 Ground Fault Circuit Interrupters (GFCIs)

1. GFCIs are for personnel protection to limit the severity of a shock to a non-injury level (less than 4 to 6 milliamps to ground). GFCIs do not eliminate shock.

2. GFCI protection for personnel shall be used when portable electric tools and equipment are used with temporary wiring methods including extension cord sets. This applies to portable tools and equipment connected to 125-volt single-phase 15, 20, or 30 amp receptacle outlets. (See Appendix D, *Acceptable and Unacceptable Combinations of Extension Cords and Power Strips*).

3. All 125-volt single-phase 15, 20, or 30 amp receptacle outlets not part of the permanent wiring shall be provided with GFCI protection.

**EXCEPTION:** Surge protection devices and re-locatable power taps used indoors and supplying office equipment (i.e. computers, monitors, printers) do not require GFCI protection.

4. Cord(s) sets powered by other than 125-volt, single-phase, 15, 20, and 30 amp receptacles, not part of the permanent wiring, shall have either GFCI protection or be tested in accordance with the Assured Equipment Grounding Conductor Program (AEGCP), Section 5.4, *Assured Equipment Grounding*.

5. GFCI protection devices are not required where GFCI operation could interrupt power to critical systems (e.g., air monitoring equipment, egress lighting) and the requirements of Section 5.4, *Assured Equipment Grounding*, shall be met.

6. Portable electric equipment used in highly conductive work locations (such as those inundated with water or other conductive liquids) or in job locations where employees are likely to contact water or conductive liquids shall be approved for those locations and GFCI protection for personnel shall also be used.

7. Permanently installed GFCI protection devices shall be tested in accordance with the manufacturer’s instructions.

8. GFCI receptacles shall not be used unless they have been tested within the past month.

9. GFCI receptacles located in areas that are not accessible, unoccupied facilities under long-term surveillance or undergoing deactivation/demolition, or that would create a greater hazard, shall be tested per 5.3.7 prior to use.

10. Portable GFCIs shall be tested prior to use.

11. Portable GFCIs should be located closest to the source, although equipment configuration may require locating the GFCI device closer to the worker.
12. 125-volt GFCI receptacles/in-line GFCI devices that trip during use may be reset one time. If the GFCI trips a second time, do not reset it. Contact management.

**NOTE:** *For the purposes of this program a portable GFCI is a factory assembled, listed, in-line device with a cord and attachment plug.*

5.4 Assured Equipment Grounding

1. All cord sets (including cords hardwired on one end) shall be provided GFCI protection or maintained through the AEGCP.

**EXCEPTION:** *This requirement does not apply to re-locatable power taps (RPTs) or surge protection devices (SPDs) when they are used in accordance with Section 5.6, Use of Extension Cords and Multiple Outlet Power Strips.*

2. Where a GFCI cannot be used (due to design or a power interruption[s] creating a greater hazard) for temporary wiring methods or extension cord sets providing power to supply portable electric tools and equipment that are used for construction, repair, maintenance, remodeling, and similar activities, a documented AEGCP shall be maintained and implemented through a work control document. The following requirements shall be met:

   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. Testing shall be performed:

      i. Before first use on site or if the inspection is not current

      ii. When there is evidence of damage

      iii. Before equipment is returned to service following any repairs

      iv. Before equipment is used after any incident which may be reasonably suspected to have caused damage (e.g., when a cord set is run over)

      v. Quarterly: cords shall not be used unless they have been inspected for the current quarter; inspections for the next quarter can occur during the last month of the current quarter

         1. Quarterly inspection tags (G605911) (See Appendix C, *Quarterly Inspection Tag*, for an image of the required tag) shall be applied to the cord near the attachment plug in a visible location.

   d. Quarterly testing may be exempted by the NFPA 70 AHJ, in unoccupied areas, if testing will present a greater hazard to personnel (e.g., High Radiation Area, High Contamination Area, Confined Space).
e. If testing could potentially cause equipment damage due to freezing temperatures, quarterly testing may be deferred by the NFPA 70 AHJ, until temperatures allow.

5.5 Cord-and-Plug-Connected Equipment and Flexible Cord Sets for Maintenance, Construction, and Demolition Activities

1. General Use
   a. Cord-and-plug-connected equipment and flexible cord sets shall be maintained in a safe working condition.
   b. The attachment cord connected to the equipment shall be protected from accidental damage at all times.
   c. Damaged or defective equipment shall be immediately removed from service, marked as out-of-service, and not used until a qualified worker performs repairs and necessary tests to render the equipment safe, or the equipment is discarded. Management shall be notified when equipment is removed from service.

2. User Inspection
   Cord-and-plug-connected equipment and flexible cord sets used for maintenance, construction, and demolition activities shall be visually inspected prior to each use for external damage to ensure there are no:
   a. Breaks or cracks exposing energized conductors and circuit parts.
   b. Missing cover plates.
   c. Missing, loose, altered, or damaged cord, blades, or pins/prongs, etc.

   EXCEPTION: Cord-and-plug-connected equipment and flexible cord sets (extension cords) that remain connected once put in place and are not exposed to damage are not required to be visually inspected until they are relocated.

5.6 Use of Extension Cords and Multiple Outlet Power Strips

1. To meet the requirements for use, manufactured extension cords and multi-tap adapters (splitters) shall:
   a. Be inspected for damage prior to use. Damaged equipment shall not be used.
   b. Be listed or labeled by an OSHA-recognized NRTL.
   c. Be used in accordance with manufacturer listing and labeling. If the manufacturer listing and labeling is unavailable or the total cord capacity is unknown, consult a Qualified Electrical Worker or an electrical engineer.
   d. Not be used as a permanent substitute for the fixed wiring of a structure.
   e. Have a current rating that is greater than the connected load. The minimum size shall be 14/3 American Wire Gauge (AWG). It is recommended for longer cords (100 feet or greater) that a minimum size of 12/3 AWG be used.
f. Not be connected in series (daisy-chained), unless specifically designed and approved for this use (See Appendix D, *Acceptable and Unacceptable Combinations of Extension Cords and Power Strips*).

g. Be unplugged and properly stored when not in use.

h. Not create a tripping hazard.

i. Be protected from damage; sharp corners and projections shall be avoided. Where passing through doorways or other pinch points, there shall be substantial protection provided to avoid damage. Fire doors shall not be blocked open without the Fire Marshal’s approval.

2. Extension cords may be field-assembled by a Qualified Electrical Worker provided that:
   a. Each component is compatible with the other components and is NRTL-listed for the purpose.
   b. A Qualified Electrical Worker verifies correct wiring of the extension cord and continuity of the grounding conductor before it is used.
   c. The extension cord is durably marked to indicate the organization responsible for its assembly, the maximum allowable load in amps and watts, and whether or not it is suitable for outdoor use. See Appendix H, *Field-Assembled Extension Cord Label*, for sample label.

3. Extension cords shall contain an equipment grounding conductor.

4. Extension cords must not be fastened in place in a manner that may damage the cords or restrict their movement.

5. Extension cords used outdoors shall be rated and labeled as suitable for outdoor use.

6. An extension cord may be plugged into a portable GFCI protective device that is listed and labeled for its intended use and less than six feet in length.

7. Multi-tap adapters and portable GFCI protective devices are allowed to be used with extension cord sets, if allowed by company policy, as long as they are used within their rating and listed by an OSHA recognized NRTL.

8. Multiple outlet power strips, such as SPDs (surge protection devices) and RPTs (re-locatable power taps) may not be used outdoors or at construction sites or similar locations unless specifically listed and labeled for such use.

**NOTE:** If there is any uncertainty about the proper use or application of SPDs or RPTs, contact a Qualified Electrical Worker or an Electrical SME.

**WARNING:** All SPDs manufactured prior to 1996 shall be taken out of service and disposed of.
9. Multiple outlet power strips shall be connected only to permanently installed branch circuit receptacles. They shall not be connected (daisy-chained) to other power taps, surge suppressors, or to extension cords.

**EXCEPTION:** Multiple outlet power strips may be connected to a single extension cord temporarily for testing, training, demonstrations, and similar purposes. This temporary configuration may not extend beyond one shift.

10. Electrical loads such as space heaters, heat generating devices (e.g., coffee pots), and appliances shall not be connected to an RPT.

**NOTE:** SPDs should only be used for electronic equipment such as computers and telecommunication devices.

5.7 **Work Involving Electrical Hazards**

All electrical hazards to which an employee may be exposed shall be put into an electrically safe work condition (except where energized work can be justified) in accordance with DOE-0336, *Hanford Site Lockout/Tagout Procedure*. Electrical equipment that has exposed energized parts ≥50V, or where there is an increased risk of injury from an exposure to an arc flash hazard, or equipment that operates at less than 50 volts where the capacity of the source and any overcurrent protection between the energy source and the worker are considered and it is determined that there will be increased exposure to electrical burns or to explosion due to electric arcs, may only be accessed under the following conditions:

1. **Perform Work with an Energized Electrical Work Permit**

   When working within the LAB or the AFPB of energized electrical conductors or circuit parts that are not placed in an electrically safe work condition (e.g., for the reasons of increased or additional hazards or infeasibility, per NFPA 70E), justification and authorization shall be documented on an approved Energized Electrical Work Permit (EEWP) (A-6005-704) and shall require senior management authorization. The EEWP shall be included in the work document (e.g., work package, technical procedure).

2. **Perform Work with Exemptions to an EEWP**

   The following exempted work requires a completed Electrical Hazard Evaluation (A-6005-738) prior to starting work.

   a. An EEWP shall not be required when a Qualified Electrical Worker or Qualified Instrument Specialist is working within the LAB of energized electrical conductors or circuit parts, or the AFPB, and is performing the following tasks:
      i. Testing
      ii. Troubleshooting
      iii. Calibration/adjustment
      iv. Voltage and current measurement
v. Safe condition/safe-to-work checks
vi. Working on Class 2 circuits
vii. Removing/replacing electrical device covers and enclosure covers
viii. Racking in/out circuit breakers in accordance with industry standard practice(s)
ix. Lockout/tagout activities, re-setting overload devices, removing/installing fuses, similar activities in electrical enclosures that cannot be de-energized and when the restricted approach boundary will not be crossed

b. An EEWP shall not be required when a Qualified Electrical Worker is installing temporary protective measures such as:
   • Voltage rated protective shields/barriers
   • Voltage rated rubber insulating equipment
   • Voltage rated plastic guard equipment
   • Physical or mechanical barriers outside of the restricted approach boundary

   Use of temporary protective measures to prevent inadvertent contact with energized conductors or circuit parts shall have documentation of installation and removal. It is acceptable to allow temporary barriers to remain in place for the duration of the task with verification of adequacy by a Qualified Electrical Worker each day when work is being performed.

c. An EEWP shall not be required when crossing the LAB only for visual inspection by a Qualified Electrical Worker, a Qualified Instrument Specialist, or an unqualified person escorted by a Qualified Electrical Worker or a Qualified Instrument Specialist, and the Restricted Approach Boundary will not be crossed.

d. An EEWP shall not be required when crossing the AFPB only for visual inspection by a Qualified Electrical Worker, or an unqualified person escorted by a Qualified Electrical Worker.

e. An EEWP shall not be required when working on equipment that operates at less than 50 volts where the capacity of the source and any overcurrent protection between the energy source and the worker are considered and it is determined that there will be increased exposure to electrical burns or to explosion due to electric arcs. This analysis shall be documented on the Electrical Hazard Evaluation (A-6005-738).
5.8 Working within the Limited Approach Boundary or Arc Flash Protection Boundary

1. Work within the LAB or the AFPB shall be performed using appropriate PPE. The workers shall be provided an electrical hazards brief by a Qualified Electrical or Instrument Specialist Supervisor.

EXCEPTION: The contractor AHJ may provide exceptions for Hanford Patrol, Hanford Fire Department, and Security Technicians/Specialists to enter the LAB, for systems under their exclusive control, based on specialized training and a hazard analysis that identifies the hazards involved and the associated controls.

2. A shock hazard analysis shall be completed and documented on the Electrical Hazard Evaluation (A-6005-738) to determine the voltage (AC and DC) to which personnel will be exposed, boundary requirements, and the PPE necessary to minimize the possibility of electric shock to personnel.

3. For all three-phase equipment under the jurisdiction of the NEC, an arc flash hazard analysis shall be completed and documented to determine the AFPB and the PPE that personnel within the AFPB shall use. This analysis shall be documented on the Electrical Hazard Evaluation (A-6005-738).

EXCEPTION: A-6005-738 is not required when an EEWP is completed per Section 5.7.

EXCEPTION: An arc flash hazard analysis shall not be required where all of the following conditions exist:

1. The circuit is rated 240 volts or less
2. One transformer (or equivalent) or generator supplies the circuit
3. The transformer or generator supplying the circuit is rated less than 125kVA

Three approved methods for performing an arc flash hazard analysis are described below:

a. Incident Energy Analysis (preferred method)

This analysis involves a specific calculation where power system parameters, including utility system, cable, and transformer impedance are used to determine available three-phase fault currents on portions of the power system. From this data, arcing fault currents can be calculated, and based on clearing times of protective devices, incident energy (in cal/cm²) is calculated at the working distance. PPE shall be selected based on the incident energy calculations.

b. If an Incident Energy Analysis has not been performed, then NFPA 70E, Table 130.7(C)(9) may be used to determine the Hazard/Risk category based on the specific task. When using the table method, ensure all the following limiting conditions are met:
i. The specific task associated with the work scope is listed in the table

ii. The available fault current at the specific work location does not exceed the values indicated in the notes following the table

iii. The clearing time for the protective device that isolates the fault does not exceed the values indicated in the notes following the table

c. If clearing times and/or available fault current cannot be determined, the arc flash hazard analysis shall be prepared under engineering supervision, based on assumed values.

4. If an incident energy analysis has been performed, and an arc flash hazard exists, the equipment likely to be worked on while energized shall be field marked with a label containing the available incident energy prior to work being performed. The equipment marking shall contain, at a minimum, the following information:

   • AFPB
   • Working distance
   • Incident energy at the working distance
   • Nominal system voltage
   • Calculation number and date
   • Fault location (bus name)
   • Protective device name that clears fault

Where the calculated incident energy is 40 cal/cm² or below, the label shall be an orange “WARNING” label; where the calculated incident energy exceeds 40 cal/cm², the label shall be a red “DANGER” label. See Appendix E, Incident Energy Labels, for sample labels.

When calculated incident energy exceeds 40 cal/cm², and de-energizing is not feasible, alternate work methods and controls shall be documented and authorized by senior management.

5. If an incident energy analysis has not been performed, and an arc flash hazard exists, the equipment likely to be worked on while energized shall be field marked with a label containing a reference to NFPA 70E, Table 130.7(C)(9) for PPE determination prior to work being performed. See Appendix E, Incident Energy Labels, for a sample label.

6. Unqualified persons who are not escorted by a Qualified Electrical Worker or a Qualified Instrument Specialist shall not be permitted to enter areas that are required to be accessible to Qualified Electrical Workers or Qualified Instrument Specialists only, unless the electrical conductors and equipment involved are in an electrically safe work condition.
7. Where there is a specific need for an unqualified person(s) to cross the LAB, a Qualified Electrical Worker or a Qualified Instrument Specialist shall advise the unqualified person of the possible hazards, and continuously escort the unqualified person(s) while inside the LAB. Under no circumstance shall the escorted unqualified person(s) be permitted to cross the Restricted Approach Boundary.

8. Under no circumstances shall an unqualified person(s) or a Qualified Instrument Specialist be permitted to cross the AFPB without PPE and being escorted by a Qualified Electrical Worker(s).

9. At least two Qualified Electrical Workers shall be assigned to any work occurring inside the AFPB or the Restricted Approach Boundary of exposed parts operating at more than 300 volts phase-to-phase or phase-to-ground.

10. A Qualified Electrical Worker/Qualified Instrument Specialist has the right to request an evaluation to determine if additional Qualified Electrical Worker(s)/Qualified Instrument Specialist(s) are needed when performing a task that presents a shock hazard or arc flash hazard to ensure employee protection.

11. Conductive articles of jewelry and clothing (e.g. watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn where they present an electrical contact hazard with exposed energized conductors or circuit parts.

5.9 Over Current Protective Devices

5.9.1 Operating Circuit Breakers

1. An employee who operates a circuit breaker shall be authorized by their facility management and have knowledge in the safe operation of the equipment and the hazards involved (See Section 4.3.3 for required training for non-electrical workers and Section 5.17.9 for required PPE).

2. Protective device operation shall be simulated for emergency preparedness drills.

3. During an actual emergency situation in which continued ventilation could be hazardous, and in other possible emergencies, equipment shall be shut down by the most expedient means available. It is likely that the hazards from continued intake of possibly contaminated air would be a greater hazard than that associated with operating the circuit breaker. Steps should be taken to protect the person operating the circuit breaker, such as standing to the side and looking away when the breaker is switched off, but concern for eye protection and non-melting clothing should not delay emergency actions. Recovery actions that include equipment restart shall follow established building/facility procedures and policies.
5.9.2 Reclosing (Re-Energizing) Circuits After Protective Device Operation

After a circuit is de-energized by an over current protective device (e.g., tripped circuit breaker, blown fuse), the circuit shall not be manually re-energized until it has been determined by a Qualified Electrical Worker(s) that the equipment and circuit can be re-energized safely.

NOTE 1: Over current protective devices may be, but are not limited to, fuses, circuit breakers, and overloads.

NOTE 2: See Section 5.3, Ground Fault Circuit Interrupters (GFCIs), for resetting tripped GFCI receptacles/in-line GFCI devices.

5.10 Planning Work Activities or Planning Equipment Moves that have the Potential to be Within 20 Feet of Overhead Lines

NOTE: For the purposes of this procedure, trucks, rollers, dozers, graders, and scrapers, etc., are considered in transit at all times as long as the combined height of the equipment and load [or worker] are less than 14 feet.

1. If the following activity will be near overhead lines, plan and conduct the activity as indicated in a, b, c, d, or e below:
   a. Mobile equipment in transit: See Appendix I, Mobile Equipment In Transit That Has the Potential to be Within 20 feet of Overhead Lines, for planning guidance and Section 5.10.2 through 5.10.8 for additional requirements.
   b. Mobile crane in transit: See Appendix J, Mobile Crane In Transit That Has the Potential to be Within 20 feet of Overhead Lines, for planning guidance and Section 5.10.2 through 5.10.8 for additional requirements.
   c. Mobile equipment (e.g., excavator, aerial lift, backhoe) performing work: See Appendix K, Mobile Equipment Performing Work With the Potential to be Within 20 feet of Overhead Lines, for planning guidance and Section 5.11.1.2 and 5.11.1.3 for additional requirements.
   d. Mobile crane performing work: See Appendix L, Mobile Crane Performing Work With the Potential to be Within 20 feet of Overhead Lines, for planning guidance and Section 5.12 for additional requirements.
   e. Personnel performing work involving ladders, scaffolds, painting equipment, irrigation pipe, poles, tools, or similar equipment. See Section 5.11.1.4 for additional requirements.

2. If movement/transport of vehicular or mechanical equipment over 14 feet high on Hanford roads is planned, the use of a Hanford Site Oversize/Overweight Permit (A-6003-609) is required.

3. In this section the term “in transit” refers to mobile equipment (e.g., excavator, aerial lift, backhoe), or a crane, that is moving under its own power or being transported by trailer, without load, and the structure is lowered to its lowest practical stowed position prior to movement. Any mobile equipment, or a crane,
not in this configuration is considered to be performing work. Controls shall be implemented to ensure the mobile equipment, or crane, is configured in the lowest practical stowed position prior to movement.

Moving a forklift truck is considered “mobile equipment in transit” and requires the clearance between the top of the mast or the load, whichever is higher, and overhead lines to be maintained in accordance with Appendix A. Forklift trucks must be operated such that the vehicle is not moved with the forks raised to encroach on the “In Transit LAB.”

4. A truck (e.g., dump truck, garbage truck, Environmental Restoration Disposal Facility [ERDF] truck) is considered in transit when moving under its own power with the structure lowered to its lowest stowed position. If the truck is carrying a load, the combined height of the mobile equipment and load shall be less than or equal to 14 feet. When loading and unloading trucks an audible alarm or a spotter shall be used to verify that the bed is fully lowered prior to movement.

5. For mobile equipment, crane, or truck in transit, see Appendix A for the Equipment in Transit Limited Approach Boundary (LAB) or the Cranes in Transit LAB. If insulated barriers, rated for the voltages involved, are installed and they are not part of an attachment to the mobile equipment, crane, or truck, the Equipment in Transit LAB or the Cranes in Transit LAB shall be permitted to be reduced to the design working dimensions of the insulating barrier.

6. If the mobile equipment, crane, or truck in transit will encroach upon the Equipment in Transit LAB or the Cranes in Transit LAB found in Appendix A, the following controls shall be met.

   a. In addition to the barrier controls listed in Sections 5.11.1.2.2, Mandatory Barrier Control, and 5.11.1.2.3, Secondary Barrier Controls, an EU representative shall be present. EU may require the following:

   i. Block or disengage electrical system protective devices that automatically re-energize the circuit after a fault

   ii. Install nonconductive barricades to restrict access to the area

   iii. Only allow essential personnel in the area; all ground personnel are discouraged from touching the equipment

7. While a crane is in transit without load and the boom and boom-support system is lowered, the Cranes in Transit LAB, as listed in Appendix A, must not be encroached upon. When planning transit of a crane, the effect of speed and terrain on the boom and the crane movement shall be considered. If any part of the crane, while in transit on a construction worksite, will get closer than 20 feet to a power line, a dedicated spotter who is in continuous contact with the driver/operator shall be used. A construction worksite, as defined by 10 CFR 851.3, Definitions, is the area within the limits necessary to perform the work described in the construction, procurement, or authorization document. It includes
the facility being constructed or renovated along with all necessary staging and storage areas as well as adjacent areas subject to project hazards.

8. When planning equipment or crane transits that have the potential to be within 20 feet of overhead lines, contact Electrical Utilities (EU), or the owner of the line, to determine the line voltage and the line height, unless this information was recorded from a previous EU contact, and conditions at the job site have not changed. Use Appendix A, *Limited Approach Boundaries for Overhead Lines*, to determine the limited approach boundaries once line voltage has been verified.

9. Mobile equipment or cranes performing work near overhead lines shall be considered to have the potential to come within the Equipment Performing Work LAB or the Cranes Performing Work LAB if the area 360 degrees around the equipment, up to the equipment’s maximum charted working radius, including load, intersects the Equipment Performing Work LAB or the Cranes Performing Work LAB.

10. EU involvement shall also be included in the following:

   i. Consultation, preferably a minimum of 48 hours prior to the start of work, to determine effective controls, standby support, and outage support when planning work that may affect EU equipment or facilities;

   ii. Consultation, as necessary, when planning work that may affect facility owned overhead electrical lines over 600 volts;

   iii. When any combination of equipment, ladders, tools, personnel, etc., may come within the Equipment Performing Work LAB of an energized overhead line;

   iv. When any combination of the crane’s equipment, load line, load, or fully extended boom length may come within a crane’s Prohibited Zone or No Work Zone (as shown in Appendix F, *Operating Cranes near Energized Overhead Lines*).

11. Work that has the potential to come within the Equipment Performing Work LAB or the Cranes Performing Work LAB of overhead lines shall require the following personnel, as applicable, to be involved in a planning meeting to establish control measures for the protection of personnel: facility electrical maintenance, engineering organization, equipment operators, spotters, supervisors directly involved in the work, and EU.

12. During planning for work that has the potential to come within the Equipment Performing Work LAB or the Crane Performing Work LAB of overhead lines, and whenever related equipment or worksite conditions change, the following activities require a site visit:
i. Equipment operation (e.g., back/track hoe, aerial lift, dump truck, vacuum excavator) requires completion of Electrical Utilities Site Visit Form (BC-6003-941).

ii. Other work activities that may encroach upon the Equipment Performing Work LAB (e.g., ladder, scaffold, painting equipment) requires completion of Electrical Utilities Site Visit Form (BC-6003-941).

iii. Crane operation requires completion of Electrical Utilities Mobile Crane Site Visit Form (BC-6005-774).

13. Call EU Dispatch (509) 373-2321 prior to the start of work and upon completion of the work each day, when work has the potential to come within the Equipment Performing Work LAB or the Cranes Performing Work LAB of overhead lines.

14. The work location and all paths of travel shall be walked down to identify potential electrical hazards.

15. Crane Operations shall not rely on conductor insulation for personal protection.

16. When traveling at night, or in conditions of poor visibility, the following additional requirements shall be met:
   i. The power lines are illuminated or another means of identifying the location of the lines is used.
   ii. A safe path of travel is identified and used.

17. All overhead lines shall be considered energized until appropriate hazardous energy control measures are implemented.

18. De-energizing and grounding lines is the preferred condition for work activities or equipment moves near overhead lines, since the hazard of injury or death due to electrocution will be removed. Overhead lines shall be de-energized when work is planned to be performed within the Equipment Performing Work LAB or the Cranes Performing Work LAB or when work activities/equipment have the potential to enter the Equipment Performing Work LAB or the Cranes Performing Work LAB unless it is determined after a documented evaluation, that de-energizing is infeasible or creates a greater hazard. If de-energizing overhead lines introduces additional/increased hazards, or is infeasible the responsible senior manager (as designated by the specific contractor) shall provide documented justification for performing the work energized. Maintain this evaluation documentation with the Work Control Document.

19. If energized overhead lines are to be de-energized, arrangements shall be made with the person or organization that operates or owns the overhead lines to de-energize them. The owner of the overhead lines or a designated representative of EU shall be on the site to verify that the overhead lines are no longer energized in accordance with applicable Lockout/Tagout requirements.

20. If work will be performed within the Equipment Performing Work LAB or the Cranes Performing Work LAB of energized overhead lines under the exclusive
control of EU, it is the responsibility of the organization performing the work to follow Section 5.11.1.3, *Mobile Equipment Working Inside the Equipment Performing Work LAB of Energized Overhead Lines* or follow Section 5.12.3, *Overhead Lines Energized, Crane within the Prohibited Zone or No Work Zone*, or contact EU to:

i. De-energize the overhead lines and tag (hold-off).

ii. Work with the Controlling Organization to lock out the overhead lines by over locking the utility’s hold-off tag (or equivalent) in accordance with DOE-0336, *Hanford Site Lockout/Tagout Procedure*.

21. If mobile equipment or crane operations have the potential to enter the Equipment Performing Work LAB or the Cranes Performing Work LAB of energized overhead lines under the exclusive control of EU, it is the responsibility of the organization performing the work to follow Section 5.11.1.2, *Mobile Equipment Working Outside the Equipment Performing Work LAB of Energized Overhead Lines with the Potential to Enter the Equipment Performing Work LAB* or follow Section 5.12.2, *Overhead Lines Energized, Crane Operating Less than the Erected/Fully Extended Boom Length Away (has the Physical Capability to Enter the Prohibited Zone or No Work Zone)* or contact EU to:

i. De-energize the overhead lines and tag (hold-off).

ii. Work with the Controlling Organization to lock out the overhead lines by over locking the utility’s hold-off tag (or equivalent) in accordance with DOE-0336, *Hanford Site Lockout/Tagout Procedure*.

**WARNING:** Synthetic materials such as ropes or slings may be contaminated by moisture, dirt, etc., and may become conductive and not provide shock protection as intended.

22. When working near transmitter/communication towers with a crane, where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter must be de-energized or the following precautions must be taken: the equipment must be provided with an electrical ground; and if tag lines are used, they must be non-conductive. Contractors must rely on information obtained from EU and from the communications utility regarding the required separation to avoid any induced charge when planning this type of work.

23. If arrangements are made to use protective measures, such as guarding, isolating, or insulating, these precautions shall prevent each employee from contacting overhead lines directly with any part of his or her body, or indirectly through conductive materials, tools, or equipment.

24. For a crane having the potential to encroach upon the Cranes Performing Work LAB of high voltage power lines (115 kV and higher), EU or the utility owner shall determine during the site visit, the grounding requirements necessary to eliminate the potential hazards associated with electrostatic charge or induced
voltage. Workers shall be advised of potential shock hazards. Contractors must rely on information obtained from EU regarding the required separation to avoid any induced charge when planning this type of work.

25. For work that is performed within the vicinity of high voltage power lines (115 kV and higher), workers shall be advised of potential shock hazards where an electrostatic charge or induced voltage may build up on conductive and nonconductive equipment and personnel. The associated job planning for this work shall ensure adequate controls are in place to protect workers from secondary injury (e.g., falls, contusions) in the event primary controls fail. Contractors must rely on information obtained from EU regarding the required separation to avoid any induced charge when planning this type of work.

5.11 Performing Work within 20 Feet of Overhead Lines

5.11.1 Mobile Equipment (Excluding Cranes) or Personnel Working near Energized Overhead Lines

If insulated barriers, rated for the voltages involved, are installed and they are not part of an attachment to the vehicle, the Equipment Performing Work LAB is permitted to be reduced to the design working dimensions of the insulating barrier.

5.11.1.1 Working near Communication Lines

Where any mobile equipment structure will be elevated near communication lines, they shall be operated to avoid contact.

5.11.1.2 Mobile Equipment with the Potential to Enter the Equipment Performing Work LAB

5.11.1.2.1 General

1. Where any mobile equipment structure will be elevated near energized overhead lines, they shall be operated so that the Equipment Performing Work LAB of Appendix A is not encroached upon.

2. Contractors are required to utilize the mandatory barrier control below and at least one of the secondary barrier controls listed below.

3. In the event that the mobile equipment becomes electrified, the operator shall make an attempt to immediately move the equipment away, if possible, without compromising their safety.

5.11.1.2.2 Mandatory Barrier Control

Trained Operators and Spotters shall be used and shall meet the following requirements:
1. Operators of mobile equipment and spotters who work near energized overhead lines shall be trained to visually determine when equipment is nearing the Equipment Performing Work LAB for overhead lines and to establish and maintain effective communications between the operator and spotter.

2. The spotter shall be in place prior to movement of the mobile equipment and be positioned to effectively gauge the Equipment Performing Work LAB.

3. The spotter shall have no duties other than being a spotter for a single specific operation.

4. Spotters shall have direct communication with the equipment operator. The method of communication must take into account potentially high noise levels common with heavy equipment operation.

5. Spotters shall be easily identifiable by the equipment operators.

5.11.1.2.3 Secondary Barrier Controls

At a minimum, one of the following secondary barrier controls shall be used in addition to a trained spotter:

1. Install physical barriers to prevent encroachment into the Equipment Performing Work LAB.

2. Use stakes/cones or painted lines to provide constant reminders to operators and spotters of the proximity to energized overhead lines.

3. Use materials to enhance visibility of energized overhead lines for spotters.

4. Signs shall be posted to indicate overhead line height to warn of energized overhead lines and enable the spotter to accurately determine the Equipment Performing Work LAB.

5. Have EU personnel raise or relocate energized overhead lines to reduce the possibility of an inadvertent contact.

5.11.1.3 Mobile Equipment Working Inside the Equipment Performing Work LAB of Energized Overhead Lines

1. In addition to the barrier controls listed in Sections 5.11.1.2.2, Mandatory Barrier Control, and 5.11.1.2.3, Secondary Barrier
Controls, an EU representative shall be on site while work is being performed. EU may require the following:

a. Block or disengage electrical system protective devices that automatically re-energize the circuit after a fault.

b. Install nonconductive barricades to restrict access to the work area.

c. Only allow essential personnel within the work area; all ground personnel are discouraged from touching the equipment.

5.11.1.4 Personnel with the Physical Capability to Enter the Equipment Performing Work LAB

**WARNING:** Conductive articles of jewelry and clothing (e.g., watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn where they present an electrical contact hazard with energized overhead lines.

1. If the work being performed presents a hazard of contact with uninsulated energized overhead lines, outdoor premise wiring, overhead communication lines, or crossing the Equipment Performing Work LAB of energized overhead lines, then all energized overhead lines to which an employee may be exposed shall be put into an electrically safe work condition in accordance with DOE-0336, *Hanford Site Lockout/Tagout Procedure*, or other safe to work measures employed by EU. Examples of this type of work include, but are not limited to, work involving ladders, scaffolds, painting equipment, irrigation pipe, poles, or reach tools.

2. For overhead lines (600 volts or less) EU or a Qualified Electrical Worker may determine that de-energization is not required as long as the work scope does not involve contact with the line. Protective sleeves may be installed to protect the worker from inadvertent contact.

3. When personnel are performing work within the Equipment Performing Work LAB of energized overhead lines one of the following shall apply:
   - Qualified Electrical Workers are performing work near aerial lines 600 volts or less using appropriate PPE
• Unqualified workers are performing work near aerial lines 600 volts or less, they will be escorted by Qualified Electrical Workers and all will wear the appropriate PPE

• Unqualified workers are performing work near aerial lines owned by EU, they will be escorted by EU and all will wear the appropriate PPE

4. A shock hazard analysis shall be completed and documented on the EHE (A-6005-738) to determine the voltage to which personnel will be exposed, boundary requirements, and the PPE necessary in order to minimize the possibility of electric shock to personnel.

5. Unqualified persons shall not be permitted to enter the Equipment Performing Work LAB, areas that are required to be accessible to only Qualified Electrical Workers or EU, unless the electric conductors and equipment involved are in an electrically safe work condition, in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure, or other safe to work measures are employed by EU.

6. A Qualified Electrical Supervisor shall be required to conduct an electrical hazards brief when the EHE (A-6005-738) is used.

5.12 Mobile Cranes Operating within 20 Feet of Overhead Lines

5.12.1 General

1. Where any cranes will be elevated near communication lines, they shall be operated to avoid contact.

2. Work shall be performed in a manner to prevent the possibility of a crane, load line, or load becoming a conductive path.

3. Cranes shall not be used to handle materials under or over energized overhead lines if any combination of boom, load, load line, or machine component can enter the Prohibited Zone or the No Work Zone (see Appendix F). The Prohibited Zone for cranes is the Cranes Performing Work LAB as defined in Appendix A.

4. Durable signs shall be installed at the crane operator’s station and on the outside of the crane to warn that electrocution or serious bodily injury may occur unless the Cranes Performing Work LAB, as specified in Appendix A, is maintained between the crane or the load being handled and energized overhead lines.

5. If cage-type boom guards, insulating links, or proximity warning devices are used on cranes, such devices shall not be a substitute for de-energizing and grounding the overhead lines, even if such devices are required by law or regulation. In view of the complex, invisible, and lethal nature of the
electrical hazard involved, and to lessen the potential of false security, instructions on the electrical hazard involved, operating conditions for the devices, limitations of such devices, and testing requirements prescribed by the device manufacturer, if used, shall be understood by the crane operator, crew, and load-handling personnel. The required Cranes Performing Work LAB to energized overhead lines, established in Appendix A shall be maintained regardless of any devices used on the crane.

6. In the event that the crane becomes electrified, the operator shall make an attempt to immediately move the equipment away, if possible, without compromising their safety.

7. Devices originally designed by the manufacturer for use as a safety device, operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must comply with the manufacturer’s procedures for use and conditions of use.

8. A mobile crane activity having the potential to encroach upon the Cranes Performing Work LAB of energized overhead lines shall be conducted in accordance with one of the following conditions:

   a. Overhead lines energized, crane operating less than the erected/fully extended boom length away (has the physical capability to enter the Prohibited Zone or No Work Zone) (See Section 5.12.2 and Appendix F)

   b. Overhead lines energized, crane within Prohibited Zone or No Work Zone (See Section 5.12.3)

   c. Crane in transit, no load, and boom lowered (See Section 5.10.5 through 5.10.7)

5.12.2 Overhead Lines Energized, Crane Operating Less than the Erected/Fully Extended Boom Length Away (has the Physical Capability to Enter the Prohibited Zone or No Work Zone)

The following steps shall be taken to minimize the hazard of electrocution or serious injury as a result of contact between the energized overhead lines and the crane, load line, or load.

1. The specified Cranes Performing Work LAB between the overhead lines and the crane, load line, and load shall be maintained at all times (see Appendix A).

   **WARNING:** Synthetic materials such as ropes or slings may be contaminated by moisture, dirt, etc., and may become conductive and not provide shock protection as intended.

2. Load control, when required, shall use non-conductive tag lines.
3. A spotter, who is a qualified signal person per DOE-RL-92-36, *Hanford Hoisting and Rigging Manual*, shall be used. The spotter shall be in constant contact with the crane operator and shall have the sole responsibility of verifying that the required Cranes Performing Work LAB is maintained and be positioned to effectively gauge the Cranes Performing Work LAB.

4. No one shall be permitted to approach or touch the crane or the load unless the signal person indicates it is safe to do so.

5. Operation of a boom and/or load above energized overhead lines is prohibited.

6. The horizontal and vertical conductor movement due to wind and temperature shall be added to the Cranes Performing Work LAB as specified in Appendix A. A qualified representative of the owner of the lines or a designated representative of EU shall be consulted for the specific distance to be added.

7. Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line or at the Cranes Performing Work LAB from Appendix A.

### 5.12.3 Overhead Lines Energized, Crane within the Prohibited Zone or No Work Zone

1. Before operating a mobile crane within the Prohibited Zone, a qualified person, together with a qualified representative of EU, shall visit the site to determine if this is the most feasible way to complete the operation and establish the new minimum required clearances to be maintained (less than the Cranes Performing Work LAB). The factors that must be considered in making this determination include, but are not limited to: conditions affecting atmospheric conductivity; time necessary to bring the equipment, load line, and load (including rigging and lifting accessories) to a complete stop; wind conditions; degree of sway in the power line; lighting conditions, and other conditions affecting the ability to prevent electrical contact. These operations shall be under the supervision of the qualified person and the qualified representative of EU. The Cranes Performing Work LAB may be reduced from Appendix A, provided that insulated barriers are used and are rated for the voltage of the overhead line that it will be used on. Apply the mandatory control listed in Section 5.11.1.2.2, *Mandatory Barrier Control*.

The following controls shall be required in addition to the mandatory control:
a. Insulated barriers shall not be a part of, or an attachment to, the crane and shall not allow contact between the energized overhead lines and the crane, load lines, or load.

b. The crane/load shall be grounded by EU or the utility owner.

c. Automatic re-closers shall be blocked or disabled.

d. Nonconductive barricades to restrict access to the crane work area shall be used.

e. Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line or at the new minimum required clearance distance (less than the Crane Performing Work LAB from Appendix A).

f. An insulating link/device shall be installed at a point between the end of the load line (or below) and the load.

g. Nonconductive rigging, if the rigging may be within the LAB (see Appendix A) during the operation.

h. If the crane is equipped with a device that automatically limits range of movement, it must be used and set to prevent any part of the equipment, load line, or load (including rigging and lifting accessories) from breaching the new minimum required clearance distance (less than the Crane Performing Work LAB from Appendix A).

i. Barricades forming a perimeter at least 10 feet away from the crane to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least 10 feet away, the barricade must be as far from the crane as feasible.

j. Workers other than the operator shall be prohibited from touching the load line above the insulating link/device and crane. Operators remotely operating the crane from the ground shall use either wireless controls that isolate the operator from the crane or insulating mats that insulate the operator from the ground.

k. Only personnel essential to the operation are permitted to be in the area of the crane and load.

l. Insulating line hose or cover-up shall be installed by the utility owner/operator except where such devices are unavailable for the line voltages involved.

m. The utility owner/operator (or registered professional engineer) and all employers of employees involved in the work must identify one person who will direct the implementation of the procedures. The person identified in accordance with this paragraph must direct the implementation of the procedures and must have the authority to stop
work at any time to ensure safety. In most cases this person will be the Designated Lead (DL/Lift Director), as defined in the DOE-RL-92-36, Hanford Hoisting and Rigging Manual.

**WARNING:** Synthetic materials such as ropes or slings may be contaminated by moisture, dirt, etc., and may become conductive and not provide shock protection as intended.

2. Load control, when required, shall use nonconductive tag lines.

3. A spotter, who is a qualified signal person per DOE-RL-92-36, *Hanford Hoisting and Rigging Manual*, shall be used. The spotters shall be in constant contact with the crane operator and shall have the sole responsibility of verifying that the new minimum required clearance (less than the Cranes Performing Work LAB) is maintained and be positioned to effectively gauge the new minimum required clearance distance. The spotter shall also be equipped with a visual aid to assist in identifying the new minimum required clearance distance. Examples of a visual aid include, but are not limited to: a line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter). This visual aid may be the same as that referred to in 5.12.3.1.e.

4. The person(s) responsible for the operation shall alert and warn the crane operator and all persons working around or near the crane about the hazard of electrocution or serious injury and instruct them on how to avoid the hazard.

5. All nonessential personnel shall be removed from the crane work area.

6. No one shall be permitted to approach or touch the crane or the load unless the spotter/signal person indicates that it is safe to do so.

### 5.12.4 Crane Assembly and Disassembly near Overhead Lines

Crane assembly or disassembly within 20 feet of overhead lines is classified as performing work, see Section 5.12.2, *Overhead Lines Energized, Crane Operating Less than the Erected/Fully Extended Boom Length Away (has the Physical Capability to Enter the Prohibited Zone or No Work Zone)*, for applicable controls. For additional assembly and disassembly requirements see DOE-RL-92-36, the *Hanford Site Hoisting and Rigging Manual*.

### 5.13 Drilling, Excavations, and Blind Penetrations

1. This section addresses performing drilling, saw cutting and other blind penetrations greater than 1.5 inches, and excavations into surfaces containing concealed electrical conduits and cables.
2. Excavations shall be performed per the requirements of DOE-0344, *Hanford Site Excavating, Trenching and Shoring Procedure*.

3. If the presence and location of electrical circuits or conductors cannot be accurately identified and completely de-energized, appropriate mitigating controls shall be used for penetrations greater than 1.5 inches. At a minimum:
   a. All applicable drawings and documentation shall be reviewed. The job site shall be inspected to the maximum extent possible to determine if obstructions are present before starting the job.
   b. A scan shall be performed if penetrating into concrete or masonry surfaces.
   c. Circuits or conductors shall be de-energized to the maximum extent possible and placed in an electrically safe work condition.
   d. A hazard analysis (e.g., Job Hazard Analysis [JHA], Automated Job Hazard Analysis [AJHA]) shall be completed for work requiring penetrations into or through walls, floors, or other surfaces that may contain concealed electrical systems.
   e. Workers performing blind penetrations shall use appropriate voltage rated gloves with protective outer leather gloves and nonconductive safety glasses with side shields.

4. When using water during drilling operations a GFCI shall be used (See Section 5.3, *Ground Fault Circuit Interrupters [GFCIs]*).

5.14 Generators

5.14.1 General Requirements

1. Portable and vehicle mounted generators shall be listed and labeled, or approved in accordance with Section 5.1, *Electrical Equipment Listing, Labeling, and Approval Requirements*.

2. Any connection or disconnection of cables at the generator output terminals, load side terminals of the generator output circuit breaker, or connections at the load end of the feeder require lockout/tagout in accordance with DOE-0336, *Hanford Site Lockout/Tagout Procedure*.

3. Cables shall be disconnected from the generator source output circuit breaker or output terminals when they are not terminated at the load end.

4. When portable or vehicle-mounted generators are used to supply electrical loads from a generator-supplied feeder, a grounding electrode conductor connection to an electrode in accordance with NFPA 70 Article 250 is required.

5. When manufacturer’s instructions or equipment labeling require supplemental grounding, those instructions shall be followed.
5.14.2 Portable Generators

1. Portable describes equipment that is easily carried by personnel from one location to another.

2. The frame of a portable generator is not required to be connected to a grounding electrode (unless required by the manufacturers instructions) for a system supplied by the generator under the following conditions:
   a. The generator supplies only equipment mounted on the generator, and/or GFCI protected cord-and-plug-connected equipment through receptacles mounted on the generator.
   b. The normally non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are connected to the generator frame.

5.14.3 Vehicle Mounted Generators

1. Vehicle-mounted generators include generators that are mounted on a powered vehicle and generators that are supported by a wheeled trailer (e.g., light plants).

2. The frame of a vehicle shall be connected to a grounding electrode for a system supplied by a generator located on the vehicle, unless all of the following conditions are met:
   a. Not required by the manufacturers’ instructions
   b. The frame of the generator is bonded to the vehicle frame.
   c. The generator supplies only equipment located on the vehicle and/or GFCI protected cord-and-plug-connected equipment through receptacles mounted on the vehicle.
   d. The normally non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are connected to the generator frame.


**EXCEPTION:** This does not apply to single-phase 120/240 volt generators that supply only cord-and-plug-connected equipment that is connected to the generator’s mounted receptacles.
5.15 Batteries or Battery Banks Operating at 50 Volts or More or having a Stored Capacity Exceeding 1 kWh

1. For the purpose of shock hazard analysis, DC voltages shall be considered equivalent to AC voltages referenced in NFPA 70E and appropriate voltage rated PPE shall be worn.

   **NOTE:** DC sources are not considered an arc flash hazard and an arc flash hazard analysis is not required.

2. When performing work on batteries where chemical exposures may exist, the following chemical resistant PPE shall be made available to employees;
   a. Goggles and face shield
   b. Gloves
   c. Protective apron
   d. Protective footwear

3. Portable or stationary water facilities shall be available for rinsing eyes and skin in accordance with American National Standards Institute (ANSI) Z358.1.

4. Do not use tools or conductive objects that may short circuit any battery components.

5. Before making or breaking connections within a group of cells, open the battery system disconnecting means to minimize the possibility of arcing.

5.16 Capacitors

This section applies to circuits greater than 100V with the associated capacitor or capacitor bank rating greater than 200µF.

1. For the purpose of shock hazard analysis, DC voltages shall be considered equivalent to AC voltages referenced in NFPA 70E and appropriate voltage rated PPE shall be worn.

2. Only Qualified Electrical Workers or Qualified Instrument Specialists trained in the proper handling and storage of power capacitors and hazard recognition shall be assigned the task of removing/servicing/installing such units.

3. Access to capacitor areas shall be restricted until all capacitors have been discharged, shorted, and grounded or verified to be less than 50 volts.

4. Any residual charge from capacitors shall be removed by shorting the terminals before servicing or removing.

5. Capacitors shall be discharged using an appropriately voltage rated shorting probe. If capacitors have been removed from the circuit or are being transported, the terminals shall be continuously short circuited using no smaller than a #14 AWG conductor.

6. Automatic discharge and grounding devices shall not be relied upon.
7. Shorting probes shall be inspected before each use.

8. Capacitor terminals shall be considered “charged” until the terminals are shorted or verified to be less than 50 volts.

5.17 Electrical Personal Protective Equipment (PPE)

1. Electrical PPE includes, but is not limited to, the equipment and clothing necessary to protect personnel performing electrical work from hazards involving electrical shock, arc flash, batteries, and any other electrical hazards that may be encountered.

   **NOTE:** PPE for non-electrical hazards (e.g., battery acid) shall also be considered.

2. Electrical PPE and other protective equipment that has an expired testing date or fails visual or functional inspection shall be removed from service.

3. PPE shall be:
   a. Maintained in a safe, reliable condition.
   b. Stored in a manner that protects against physical damage, moisture, dust, or other deteriorating agents.
   c. Visually inspected before each use.
   d. Periodically inspected or tested in accordance with manufacturer’s instructions and/or the applicable ANSI or American Society for Testing and Materials (ASTM) standard(s).

4. All personnel are to be provided, and shall use, PPE appropriate for potential shock or arc flash hazards to which they may be exposed. All parts of the body inside the AFPB shall be protected.

5. Personnel shall be instructed to the proper use and maintenance of PPE prior to use.

6. Voltage rated rubber-insulating equipment shall be marked with the issue date. The equipment shall not be used if the testing interval listed in the table below has expired. Equipment may be returned to service after satisfactory re-testing is complete.

7. Electrical PPE shall be subject to periodic electrical tests with the maximum test intervals as identified below:
<table>
<thead>
<tr>
<th>Rubber Insulating Equipment</th>
<th>Testing Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blankets</td>
<td>Before first issue; every 12 months thereafter</td>
</tr>
<tr>
<td>Covers</td>
<td>If insulating value is suspect</td>
</tr>
<tr>
<td>Gloves</td>
<td>Before first issue; every 6 months thereafter</td>
</tr>
<tr>
<td>Line hose</td>
<td>If insulating value is suspect</td>
</tr>
<tr>
<td>Sleeves</td>
<td>Before first issue; every 12 months thereafter</td>
</tr>
</tbody>
</table>

8. Voltage rated gloves, preferably with leather protectors, shall be used when there is a danger of injury from electric shock due to contact with energized electrical conductors or circuit parts.

   a. An inspection shall be performed prior to using gloves and immediately following any incident that is suspected of having caused damage.

      i. Check date on gloves to verify it is within periodicity.

      ii. Visually inspect for cracks, holes, tears, foreign substances, and other visible defects.

      iii. Perform air leakage test on gloves.

      iv. Gloves found with any defects that may affect its insulating properties shall be removed from service.

   b. Voltage rated insulating sleeves shall also be used when there is an additional danger of arm injury from electric shock due to contact with energized electrical conductors or circuit parts.

   c. Gloves exposed to chemicals, damaged, or requiring periodic testing, cleaning and sanitizing shall be returned to EU.

9. Personnel who operate circuit breakers, electrical disconnect switches, and similar switchgear equipment, up to 600 volts, with doors closed, all covers in place, and no other apparent arc flash hazard shall wear, at a minimum:

   - Hearing protection
   - Non-melting (untreated natural fiber) pants and long-sleeve shirt
   - Safety glasses (or equivalent)
   - Leather or insulating gloves
EXCEPTION: The above minimum PPE is not required if all of the following conditions exist:

a. The circuit is rated 240 volts or less.
b. One transformer (or equivalent) or generator supplies the circuit.
c. The transformer or generator supplying the circuit is rated less than 125kVA.

NOTE: If the requirements in Section 5.17.9 are met, then the Electrical Hazard Evaluation (A-6005-738) is not required.

Personnel shall wear appropriate layers of flame-resistant (FR) clothing wherever there is potential exposure to an arc flash above the threshold incident-energy level for a second-degree burn (1.2 cal/cm²).

EXCEPTION: Where the work to be performed inside the AFPB exposes the worker to multiple hazards, non-FR PPE shall be permitted under special permission by the AHJ.

5.18 National Electrical Code (NEC) Inspections

1. NEC Inspections are required for new electrical installations and modification of existing electrical installations to ensure compliance with the NEC.

   NOTE: NEC inspections are not required for modifications that remove electrical equipment.

2. NEC Inspections are not required for installation or replacement of electrical utilization equipment approved for connection to permanently installed receptacles with cord attachments, or for minor maintenance and repair work including like-for-like replacements, such as, but not limited to, switches, fuses, lamp sockets, receptacles, replacing worn cords, and tightening connections on a wiring device.

3. Electrical assemblies (e.g., UL 508A, Industrial Control Panels) that are listed and labeled by an NRTL are not required to be individually NEC inspected when being installed as a component of a system or facility that is subject to NEC inspection.

4. Electrical Installation Permits (EIPs) (A-6005-707) are required to be initiated prior to performing any electrical installations or modifications. EIPs are prepared to document the scope of the inspection, any corrections of deficiencies that were performed, and whether the work inspected is approved or not approved.

5. Block EIPs may be used to cover a specified boundary such as a managed building, facility, or area. Block EIPs shall be valid for no more than 12 months. The NEC Inspector shall evaluate the scope of work, and reserves the right to
deny the use of a Block Permit and require an individual Permit to cover the scope of work.

6. An NEC inspection is required to energize an electrical service. The NEC Inspector shall document the inspection and approval of the electrical service on the NEC Service Inspection Label (BL-6002-745) (See Appendix G, National Electrical Code [NEC] Inspection Labels) and shall attach the inspection label to the electrical service equipment.

7. An NEC inspection is required for non-service modifications. The NEC Inspector shall document the inspection and approval of an electrical modification. Attach the NEC Equipment Inspection Label (BL-6003-435) (See Appendix G, National Electrical Code [NEC] Inspection Labels) to electrical equipment as applicable.

8. NEC Inspectors shall notify the requestor of non-compliant conditions following the inspection.

9. NEC Inspectors shall approve corrections of deficiencies.

10. Code compliance issues that the requestor and the NEC Inspector cannot resolve satisfactorily shall be referred to the company AHJ.

11. Design organizations should consider consulting with an NEC Inspector during the design of new facilities or modification of existing facilities to assure compliance with NEC codes and to promote early identification of problems.

5.19 Program Assessments

The HSESP shall be assessed to help ensure that the principles and procedures of the Program are being followed. Program evaluations shall be conducted every 2 years at a minimum. Where the assessment determines that the principles and procedures of the Program are not being followed, contractors shall take actions to correct any observations or findings. Deficiencies and findings shall be documented in accordance with the contractors’ corrective action system.

Issues concerning the HSESP that are identified through assessments and surveillance reports shall be forwarded to the HSESP Committee.

6.0 RECORDKEEPING

Records and documentation generated by the Program shall be processed and maintained in accordance with appropriate contractor policies.

7.0 REFERENCES

10 CFR 851, “Worker Safety and Health Program.”


NFPA 70-2014, “National Electrical Code (NEC).”


DOE-0336, Hanford Site Lockout/Tagout Procedure.


DOE-0344, Hanford Site Excavating, Trenching, and Shoring Procedure.

American Society of Mechanical Engineers B30.5, “Mobile and Locomotive Cranes.”

American National Standards Institute (ANSI) Z358.1, Emergency Shower and Eye Wash Station Requirements.


Hanford Site Electrical Safety Program (HSESP) Course Descriptions, Objectives, and Training Requirements.


## APPENDIX A: LIMITED APPROACH BOUNDARIES FOR OVERHEAD LINES

<table>
<thead>
<tr>
<th></th>
<th>Equipment in Transit</th>
<th>Equipment Performing Work</th>
<th>Cranes in Transit</th>
<th>Cranes Performing Work&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication Wire</strong></td>
<td>Avoid contact</td>
<td>Avoid contact</td>
<td>Avoid contact</td>
<td>Avoid contact</td>
</tr>
<tr>
<td>50-750 V</td>
<td>4 feet</td>
<td>10 feet</td>
<td>4 feet</td>
<td>10 feet (See Section 5.12)</td>
</tr>
<tr>
<td>2.4-13.8 kV</td>
<td>4 feet</td>
<td>10 feet</td>
<td>6 feet</td>
<td>10 feet (See Section 5.12)</td>
</tr>
<tr>
<td>115 kV</td>
<td>6 feet, 2 inches</td>
<td>12 feet, 2 inches</td>
<td>10 feet</td>
<td>15 feet (See Section 5.12)</td>
</tr>
<tr>
<td>230 kV</td>
<td>10 feet</td>
<td>16 feet</td>
<td>10 feet</td>
<td>20 feet (See Section 5.12)</td>
</tr>
<tr>
<td>500 kV&lt;sup&gt;2&lt;/sup&gt;</td>
<td>19 feet</td>
<td>25 feet</td>
<td>19 feet</td>
<td>50 feet (See Section 5.12)</td>
</tr>
</tbody>
</table>

1. The limited approach boundary for cranes is the “Prohibited Zone” as defined in American Society of Mechanical Engineers (ASME) B30.5 and OSHA 1926.1400 Subpart CC, *Cranes and Derricks*.

2. The 500kV lines on the Hanford Site are owned by the Bonneville Power Administration (BPA). Any work near these lines requires prior contact with BPA.

**NOTE**: *All numbers are based on the most conservative requirements from the National Fire Protection Association (NFPA) 70E, Code of Federal Regulations, Title 29, Occupational Safety and Health Administration 29 CFR 1910.333 (c)(3)(iii)(A), and ASME B30.5 (for cranes).*
APPENDIX B: AUTHORITY HAVING JURISDICTION (AHJ) APPROVAL FOR NON-NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) EQUIPMENT LABEL

AHJ APPROVAL FOR NON-NRTL EQUIPMENT

AHJ Report No.: ______________________________
Manufacturer: ______________________________
Serial No.: ______________________________
Evaluated By: (print/sign) Date: ________________

BL-6004-154 (REV 2)
APPENDIX C: QUARTERLY INSPECTION TAG

Quarterly Inspection Tag G605911

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>January, February, March</td>
</tr>
<tr>
<td>Second</td>
<td>April, May, June</td>
</tr>
<tr>
<td>Third</td>
<td>July, August, September</td>
</tr>
<tr>
<td>Fourth</td>
<td>October, November, December</td>
</tr>
</tbody>
</table>
APPENDIX D: ACCEPTABLE AND UNACCEPTABLE COMBINATIONS OF EXTENSION CORDS AND POWER STRIPS

Acceptable Combinations of Extension Cords and Power Strips:

- **Portable GFCI** → **Extension cord** → **Hand Tool or Portable Equipment**
- **GFCI** → **Extension cord** → **Hand Tool or Portable Equipment**
- **Power Strip** → **For indoor use only** → **Hand Tool or Portable Equipment**
- **Plug—mold** → **Hard-wired** → **Extension cord** → **Portable GFCI** → **Hand Tool or Portable Equipment**

Unacceptable Combinations (Daisy-Chains) of Extension Cords and Power Strips:

- **GFCI** → **Extension cord** → **Extension cord** → **Hand Tool or Portable Equipment**
- **Power Strip** → **Extension cord** → **Power Strip** → **Hand Tool or Portable Equipment**
- **Power Strip** → **Extension cord** → **Hand Tool or Portable Equipment**
- **Extension cord** → **Power Strip** → **Hand Tool or Portable Equipment**
- **Plug—mold** → **Hard-wired** → **Extension cord** → **Extension cord**

**EXCEPTIONS:** A power strip may be connected to a single extension cord temporarily for testing, training, and similar purposes. This temporary configuration may not extend beyond one shift.

**NOTE:** GFCI devices are not required where GFCI operation could interrupt power to critical systems (i.e. air monitoring equipment, egress lighting).
### APPENDIX E: INCIDENT ENERGY LABELS

#### WARNING

<table>
<thead>
<tr>
<th>BUS FAULT</th>
<th>Flash Protection Boundary:</th>
<th>inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Working Distance:</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Incident Energy:</td>
<td>(incident energy) cal/cm^2</td>
</tr>
</tbody>
</table>

Calc No: (calculation number, rev, date)

Bus: (bus name)
Prot Device: (protective device name)

#### DANGER

<table>
<thead>
<tr>
<th>BUS FAULT</th>
<th>Flash Protection Boundary:</th>
<th>inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Working Distance:</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Incident Energy:</td>
<td>(incident energy) cal/cm^2</td>
</tr>
</tbody>
</table>

Calc No: (calculation number, rev, date)

Bus: (bus name)
Prot Device: (protective device name)

#### WARNING

<table>
<thead>
<tr>
<th>(voltage) Vac</th>
<th>Hazard Risk Category: Use NFPA 70E Table 130.7(C)(9) to Determine Hazard/Risk Category and PPE Based on Task</th>
</tr>
</thead>
</table>

Flash Hazard Boundary: 48 inches

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APPENDIX F: OPERATING CRANES NEAR ENERGIZED OVERHEAD LINES

Figure A

DANGER
Cranes Operating Near Energized Overhead Lines

Prohibited Zone
- Cranes Performing Work LAB as defined in Appendix A.

Boom, load or line shall not be positioned beyond this line.

No Work Zone

Figure B

PROHIBITED ZONE
APPENDIX G: NATIONAL ELECTRICAL CODE [NEC] INSPECTION LABELS

NEC EQUIPMENT INSPECTION

Authorization No. ____________________________

Certification of Approval of Electrical Equipment to be Energized.

Authorized Inspector Signature/Date

BL-6003-435 (REV 1)

NEC SERVICE INSPECTION

Authorization No. ____________________________

Certification of Approval of Electrical Service to be Energized.

Authorized Inspector Signature/Date

BL-6002-745 (REV 1)
## APPENDIX H: FIELD-ASSEMBLED EXTENSION CORD LABEL

<table>
<thead>
<tr>
<th>Company____________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max _____ Amps          Max _____ Watts</td>
</tr>
<tr>
<td>Suitable for outdoor use   [ ] Yes   [ ] No</td>
</tr>
</tbody>
</table>
APPENDIX I: MOBILE EQUIPMENT IN TRANSIT THAT HAS THE POTENTIAL TO BE WITHIN 20 FEET OF OVERHEAD LINES

![Flowchart Diagram]

- **Is the equipment a truck?**
  - **Yes**: Is the equipment less than or equal to 14 feet high? (Yes: Use 5.10.9, No: Use 5.10.19)
  - **No**: Equipment is not in transit. Continue planning per Section 5.10.2 (See Mobile Equipment Performing Work Flow chart).

- **Is the equipment (e.g., excavators, aerial lifts, back hoes) moving under its own power or being transported by trailer, without load and is the structure lowered to its lowest practical stowed position prior to movement?**
  - **Yes**: Obtain Hanford Site Oversize/Overweight Permit (A-6003-609)
  - **No**: Contact Electrical Utilities (EU) or the owner of the line to define line voltage and height for Equipment in Transit LAB determination, per Appendix A, as part of initial planning and whenever equipment or work site conditions change.

- **Will equipment in transit come within the Equipment in Transit LAB?**
  - **Yes**: Will lines be de-energized? Implement decision planning process, Section 5.10.18
  - **No**: Implement requirements of 5.10.19 – Mandatory and Secondary Barrier Controls ARE NOT required.

- **Is the truck (e.g., dump truck, garbage truck, Environmental Restoration Disposal Facility [ERDF] truck) moving under its own power with the structure lowered to its lowest stowed position, and is the combined height of the truck plus load less than or equal to 14 feet?**
  - **Yes**: Is the equipment in transit on a facility, work or construction site? (other than paved site roadways)
    - **Yes**: No. overhead electrical hazard requirements to implement – Mandatory and Secondary Barrier Controls are NOT required.
    - **No**: Implement requirements of 5.10.6 and 5.10.10 – Mandatory and Secondary Barrier Controls ARE required.
APPENDIX J: MOBILE CRANE IN TRANSIT THAT HAS THE POTENTIAL TO BE WITHIN 20 FEET OF OVERHEAD LINES

Mobile Crane In Transit That Has the Potential to be Within 20 Feet of Overhead Lines

- Is the crane moving under its own power or being transported by a trailer, without load, and is the structure lowered to its lowest practical stowed position prior to movement?
  - No
    - Crane is not in transit. Continue planning per Section 5.10 (See Mobile Cranes Performing Work flow chart).
  - Yes
    - Obtain Hanford Site Oversize /Overweight Permit (A-6003-609)
      - No
        - Is the crane less than or equal to 14 feet high?
          - Yes
            - Contact Electrical Utilities (EU) or the owner of the line to define line voltage and height for Cranes In Transit LAB determination, per Appendix A, as part of initial planning and whenever crane or work site conditions change.
          - No
            - Is the crane in transit on a facility, work, or construction site (other than site paved roadways)?
              - Yes
                - Obtain requirements of 5.10.18
              - No
                - Is the crane in transit on a construction site?
                  - Yes
                    - Implement requirements of 5.10.7
                  - No
                    - No overhead electrical hazard requirements to implement - Mandatory and Secondary Barrier Controls are NOT required.
    - Yes
      - Will lines be de-energized? Use decision planning process. Section 5.10.18
        - No
          - Implement requirements of 5.10.19 – Mandatory and Secondary Barrier Controls are NOT required.
        - Yes
          - Implement requirements of 5.10.6 and requirements of 5.10.10 – Mandatory and Secondary Barrier Controls ARE required.

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APPENDIX K: MOBILE EQUIPMENT PERFORMING WORK WITH THE POTENTIAL TO BE WITHIN 20 FEET OF OVERHEAD LINES

Mobile Equipment Performing Work With the Potential to be Within 20 Feet of Overhead Lines

Does the area 360 degrees around the equipment, up to the equipment’s charted maximum working radius to include load, come within 20 feet of overhead lines?

Yes

No

Contact Electrical Utilities (EU) or the owner of the line to determine line voltage and height for Equipment Performing Work LAB determination, per Appendix A, as part of initial planning and whenever equipment or work site conditions change.

Will the mobile equipment be performing work within the Equipment Performing Work LAB per Appendix A?

Yes

No

Will lines be de-energized? Implement decision planning process, Sections 5.10.18

No

Yes

Implement requirements of 5.10.10 thru 5.10.14 and 5.11.1.3 – Mandatory and Secondary Barrier Controls ARE required.

Yes

Implement requirements of 5.10.19 – Mandatory and Secondary Barrier Controls are NOT required.

No

Will area 360 degrees around equipment, up to the equipment’s maximum charted working radius, including load, be capable of reaching the Equipment Performing Work LAB per Appendix A?

Yes

Implement requirements of 5.10.10 thru 5.10.14 and 5.11.1.2 – Mandatory and Secondary Barrier Controls ARE required.

No

No overhead electrical hazard requirements to implement – Mandatory and Secondary Barrier Controls are NOT required.
APPENDIX L: MOBILE CRANE PERFORMING WORK WITH THE POTENTIAL TO BE WITHIN 20 FEET OF OVERHEAD LINES

Mobile Crane Performing Work With the Potential to be Within 20 Feet of Overhead Lines

Does the area 360 degrees around the crane, up to the crane’s maximum charted working radius, to include load, come within 20 feet of overhead lines or enter the No Work Zone (See Figure A in Appendix F)?

No

No overhead electrical hazard requirements to implement – Mandatory and Secondary Barrier Controls are NOT required.

Yes

Contact Electrical Utilities (EU) or the owner of the line to determine line voltage and height for Crane Performing Work LAB determination, per Appendix A, as part of initial planning and whenever crane or work site conditions change.

Will the mobile crane be performing work within the Crane Performing Work LAB per Appendix A or the No Work Zone per Appendix F?

No

No

No overhead electrical hazard requirements to implement – Mandatory and Secondary Barrier Controls are NOT required.

Yes

Will area 360 degrees around crane, up to the crane’s maximum charted working radius, including load, be capable of reaching the Crane Performing Work LAB per Appendix A?

Yes

Implement requirements of 5.10.10 thru 5.10.14 and 5.12.3 – Mandatory and Secondary Barrier Controls ARE required.

Implement requirements of 5.10.19 – Mandatory and Secondary Barrier Controls are NOT required.

No

Implement requirements of 5.10.10 thru 5.10.14 and 5.12.2 – Mandatory and Secondary Barrier Controls ARE required.

Will lines be de-energized? Use decision planning process, Sections 5.10.18

Yes

No

No

No overhead electrical hazard requirements to implement – Mandatory and Secondary Barrier Controls are NOT required.

Yes

No
## ATTACHMENT 1: DEFINITIONS & ACRONYMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arc Flash Hazard</strong></td>
<td>A dangerous condition associated with the possible release of energy caused by an electric arc (greater than or equal to 1.2 cal/cm² at the defined working distance, typically 18 inches).</td>
</tr>
<tr>
<td><strong>Arc Flash Protection Boundary</strong></td>
<td>When an arc flash hazard exists, an approach limit at a distance from a prospective arc source within which a person could receive a second degree burn if an electrical arc flash were to occur.</td>
</tr>
<tr>
<td><strong>Blind Penetration</strong></td>
<td>Activities including drilling, saw cutting greater than 1 ½ inches, and excavations into surfaces containing concealed electrical conduits and cables which may be accidentally contacted.</td>
</tr>
<tr>
<td><strong>Charted Working Radius</strong></td>
<td>For mobile equipment, the horizontal distance from the theoretical intersection of the axis of rotation and the vertical center of the hoist line(s).</td>
</tr>
<tr>
<td><strong>Cord Set (Extension Cord)</strong></td>
<td>An insulated, flexible electric wire fitted with a plug at one end and one or more outlets on the other, typically used to plug in devices whose cords are not long enough to reach a wall outlet.</td>
</tr>
<tr>
<td><strong>Electrical Hazard</strong></td>
<td>A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, or blast.</td>
</tr>
<tr>
<td><strong>Electrically Safe Work Condition</strong></td>
<td>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 ensure the absence of voltage (applicable safe condition checks and safe-to-work checks complete), and grounded if determined necessary.</td>
</tr>
</tbody>
</table>

**NOTE:** *Class 2 power supplies, listed low voltage lighting systems, and similar sources operating at less than 50 volts are examples of circuits or systems that are not considered an electrical hazard.*
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed (as applied to energized electrical conductors or circuit parts)</td>
<td>Capable of being inadvertently touched or approached nearer than a safe distance by a person; it is applied to electrical conductors or circuit parts that are not suitably guarded, isolated, or insulated.</td>
</tr>
<tr>
<td>Limited Approach Boundary (LAB)</td>
<td>An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.</td>
</tr>
<tr>
<td>Mobile Equipment Operation</td>
<td>Mobile equipment operation is outdoor work that potentially presents a hazard of contact with power lines, outdoor premise wiring, overhead communication lines, or crossing the Equipment in Transit or Equipment Performing Work LAB of energized overhead lines. Mobile equipment operation is work involving track hoes, excavators, dump trucks, elevating work platforms, and all other mobile equipment (this excludes cranes).</td>
</tr>
<tr>
<td>Modification</td>
<td>Making any physical change to the electrical equipment installation, not to include like-for-like replacement.</td>
</tr>
<tr>
<td>Multi-Tap Adapter</td>
<td>Typically a 3-outlet adapter used on the end of an extension cord.</td>
</tr>
<tr>
<td>Multiple Outlet Power Strips</td>
<td>Re-locatable Power Taps (RPTs) and Surge Protection Devices (SPDs).</td>
</tr>
<tr>
<td>Non-Electrical Workers</td>
<td>Employees who face a higher than normal risk of exposure to electrical hazards. This includes workers who operate electrical hand tools, such as drills and grinders, and who may operate electrical disconnect/breakers.</td>
</tr>
<tr>
<td>Overhead Line(s)</td>
<td>A wire, cable, or bundled conductors supported by messenger cables, with or without insulation, supported by insulators mounted on or hung from crossarms located near the tops of poles, towers, or other structures.</td>
</tr>
<tr>
<td><strong>Prohibited Zone</strong></td>
<td>The LAB for Cranes Performing Work as defined in Appendix A and shown in Appendix F.</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Qualified Person</strong></td>
<td>One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved.</td>
</tr>
<tr>
<td><strong>Vendor</strong></td>
<td>An offsite supplier of a product or service having specialized training and experience for a specific piece of equipment.</td>
</tr>
<tr>
<td><strong>Working Distance</strong></td>
<td>The dimension between the possible arc point and the head and body of the worker positioned in place to perform the assigned task. Typical working distances for different classes of electrical equipment are defined in IEEE-1584, Guide for Performing Arc Flash Hazard Calculations. For this program the working distance can be obtained by looking at the equipment’s incident energy analysis.</td>
</tr>
</tbody>
</table>
### ACRONYM LIST

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEGCP</td>
<td>Assured Equipment Grounding Conductor Program</td>
</tr>
<tr>
<td>AFPB</td>
<td>Arc Flash Protection Boundary</td>
</tr>
<tr>
<td>AHJ</td>
<td>Authority Having Jurisdiction</td>
</tr>
<tr>
<td>AJHA</td>
<td>Automated Job Hazard Analysis</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>AWG</td>
<td>American Wire Gauge</td>
</tr>
<tr>
<td>BPA</td>
<td>Bonneville Power Administration</td>
</tr>
<tr>
<td>CEU</td>
<td>Continuing Education Units</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>DOE</td>
<td>U.S. Department of Energy</td>
</tr>
<tr>
<td>DL</td>
<td>Designated Lead</td>
</tr>
<tr>
<td>EEWP</td>
<td>Energized Electrical Work Permit</td>
</tr>
<tr>
<td>EHE</td>
<td>Electrical Hazard Evaluation</td>
</tr>
<tr>
<td>EU</td>
<td>Electrical Utilities</td>
</tr>
<tr>
<td>EIP</td>
<td>Electrical Installation Permits</td>
</tr>
<tr>
<td>ERDF</td>
<td>Environmental Restoration Disposal Facility</td>
</tr>
<tr>
<td>FR</td>
<td>Flame-Resistant</td>
</tr>
<tr>
<td>FWS</td>
<td>Field Work Supervisor</td>
</tr>
<tr>
<td>GFCI</td>
<td>Ground Fault Circuit Interrupter</td>
</tr>
<tr>
<td>HAMMER</td>
<td>Volpentest HAMMER Federal Training Center</td>
</tr>
<tr>
<td>HECB</td>
<td>Hanford Electrical Codes Board</td>
</tr>
<tr>
<td>HGET</td>
<td>Hanford General Employee Training</td>
</tr>
<tr>
<td>HSESP</td>
<td>Hanford Site Electrical Safety Program</td>
</tr>
<tr>
<td>HWESB</td>
<td>Hanford Workplace Electrical Safety Board</td>
</tr>
<tr>
<td>IAEI</td>
<td>International Association of Electrical Inspectors</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>ICC</td>
<td>International Code Council</td>
</tr>
<tr>
<td>JHA</td>
<td>Job Hazard Analysis</td>
</tr>
<tr>
<td>LAB</td>
<td>Limited Approach Boundary</td>
</tr>
<tr>
<td>LOTO</td>
<td>Lockout/Tagout</td>
</tr>
<tr>
<td>MSC</td>
<td>Mission Support Contractor</td>
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<tr>
<td>NEC</td>
<td>National Electrical Code</td>
</tr>
<tr>
<td>NESC</td>
<td>National Electric Safety Code</td>
</tr>
<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>NRTL</td>
<td>Nationally Recognized Testing Laboratory</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>PIC</td>
<td>Person in Charge</td>
</tr>
<tr>
<td>POC</td>
<td>Point of Contact</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>RCW</td>
<td>Revised Code of Washington</td>
</tr>
<tr>
<td>RL</td>
<td>DOE Richland Operations Office</td>
</tr>
<tr>
<td>RPT</td>
<td>Re-locatable Power Tap</td>
</tr>
<tr>
<td>RRD</td>
<td>Richland Requirements Document</td>
</tr>
<tr>
<td>SME</td>
<td>Subject Matter Expert</td>
</tr>
<tr>
<td>SPD</td>
<td>Surge Protector Device</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories</td>
</tr>
<tr>
<td>WAC</td>
<td>Washington Administrative Code</td>
</tr>
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ATTACHMENT 2: HANFORD SITE ELECTRICAL SAFETY PROGRAM (HSESP) COMMITTEE CHARTER

The Hanford Site Electrical Safety Program (HSESP) Committee is established to serve as the group providing consensus direction for the consistent administration and implementation of the HSESP, herein called the Program. The participating contractors and organizations are responsible for appointing representatives to the committee.

The Department of Energy (DOE) Richland Operations Office (RL), DOE Office of River Protection (ORP), and affected Contractors acknowledge that a joint committee provides the best approach for implementing a consistent, effective, and compliant interpretation of requirements for the Program. The parties agree to cooperate in a teambuilding manner to ensure that the full intent of the Program is met and will be responsibly carried out by their respective organizations.

1.0 Mission

The mission of the HSESP Committee is to ensure consistent and standard application of the Program to promote and maintain a safe work environment. The Committee will achieve this consistent approach through sharing best practices, lessons learned, and taking advice and receiving input from the Hanford Workplace Electrical Safety Board (HWESB) and the Hanford Electrical Codes Board (HECB).

2.0 Committee Structure/Membership/Qualification

The Committee shall be comprised of two primary representatives each from the following prime contractors to the DOE at Hanford:

- Mission Support Contract (MSC)
- Plateau Remediation Contract (PRC)
- River Corridor Contract (RCC)
- Tank Operations Contract (TOC)

One representative shall be the contractor’s Technical Representative for the HSESP Program as determined by their contractor; the second representative shall be a Hanford Atomic Metal Trades Council (HAMTC) representative (as appointed by the HAMTC President or delegate).

In addition, one representative each from the following organizations shall be appointed to serve on the Committee:

- Central Washington Building and Construction Trades Council (CWB & CTC) (as approved by the Union President or delegate)
- HAMTC
- Electrical Utilities (EU)
These representatives comprise the consensus decision-making membership. An alternate member shall be identified to serve during any absence of a primary representative. The alternate shall have the same authority as the primary representative in their absence.

A representative from Volpentest HAMMER Training and Education Center, Training Department (HAMMER) shall attend meetings as an advisory member to address matters pertaining to training. A representative of the Hanford Hoisting and Rigging Committee shall be invited to participate at each meeting as an advisory member.

A Committee member’s length of duty may be indeterminate.

A chair and co-chair shall be elected by a simple majority of the voting membership of the Committee every two years. The chair and co-chair may be re-elected to their respective positions.

Meetings shall be open to others to observe and to give their organizations’ impact, perspectives, and technical advice for consideration of the Committee; however, participation in consensus decisions resides solely with the Committee members described herein. The Committee has the authority to develop sub-committees and invite ad hoc participants as needed.

Representatives of RL and ORP shall be invited to participate at each meeting as advisory members.

The MSC shall provide a recording secretary for the Committee. The recording secretary is a position that provides administrative support to the chairperson. A facilitator shall be provided by the MSC as requested by the Committee.

### 3.0 Functions of the HSESP Committee

The functions of the Committee shall be:

- Elect a chair and co-chair
- Assist the MSC with the maintenance of the written Program
- Communicate and submit Program changes to RL and ORP through the MSC
- Maintain the Committee charter and review annually
- Review and verify that training is consistent and appropriately covers the content of the Program
- Develop lines of inquiry for contractor use during independent assessments
- Evaluate trends in performance and recommend actions for improvement
- Review electrical safety related events, issues, and lessons learned as appropriate
• Share electrical events or trends across the DOE Complex; compare Hanford to other sites in the DOE Complex
• Ensure distribution of lessons learned as necessary
• Maintain communication with the contractor working level committees and collaborate to resolve worker level issues, concerns, or events in a way that maintains site-wide consistency
  o Since the core function of a Site-Wide Safety Program is “worker protection,” it is imperative to have a structure that fosters and encourages input and feedback from the working level. Affected contractors will convene/attend a working level committee to discuss issues, concerns, or events that occur in the area of electrical safety within their organizations. These working level committees shall include equal representation of bargaining unit (as appointed by the bargaining unit president or delegate) and non-bargaining unit employees and ensure good communication up through each group’s representative(s) on the HSESP Committee.
• Evaluate and recommend resolution for issues/disputes pertaining to the Program
  o Issues shall not include any actions regarding applicable Collective Bargaining Agreements
• Recommend topics/information for communication to the workforce
• Provide Program status to the Senior Management Team (SMT) and DOE management when requested
• Maintain a current website on electrical safety for site-wide use
• Review and approve compliance guides developed by the HWESB and HECB

4.0 Roles and Responsibilities

4.1 Chair Roles and Responsibilities
• Schedule and conduct meetings
• Facilitate meetings in an orderly fashion
• Limit disruptions
• Ensure meeting agendas are prepared
• Ensure meeting summaries are documented
• Function as a point of contact and spokesperson for the Committee
• Interface with other site-wide safety program committees as necessary
• Ensure an action item list is maintained and members complete their assignments in a timely manner
• Coordinate assignments of sub-committee(s)
• Communicate with the SMT as needed

4.2 Co-Chair Roles and Responsibilities

• Act as the Chair when the Chair is absent
• Perform roles and responsibilities as delegated by the Chair

4.3 Member Roles and Responsibilities

• Provide the chairperson with the identity of an alternate Committee member who is designated as the organizational representative
• Attend and participate in meetings when scheduled or notify their alternate when unable to attend
  o Alternates are responsible to attend and participate in meetings when the primary cannot attend
  o If the primary and alternate are both unable to attend, the Chair shall be notified
• Foster communication between the Committee and affected organizations relative to issue identification, interpretations, and consensus resolution
• Maintain lines of communications between management, workers, and the HSESP Committee
• Assist management and safety personnel with electrical safety questions, assessments, incident investigations, critiques, fact finding meetings, and other electrical safety issues
• Distribute meeting summaries and other electrical safety information throughout represented project or contractor facilities. Provide printed copies to personnel who may not routinely use e-mail
• Communicate regularly with craft workers, supervisors, safety professionals, and management regarding electrical safety issues, concerns, and lessons learned
• Ensure that electrical safety questions, concerns, and requests for interpretations are brought to the appropriate technical board for discussion and resolution
• Promotes and coordinates electrical safety initiatives within the company
• Maintain a safety and requirements focus when addressing issues; avoid facility, craft, job function, or contractor biases when participating in discussions.
• Maintain current knowledge of the requirements of the Program
• Maintain working knowledge of appropriate electrical safety codes, standards, and procedures
• Attend periodic meetings of the Hanford Electrical Code Board (HECB) and/or Hanford Workplace Electrical Safety Board (HWESB)
• Research agenda topics in preparation for HECB and HWESB meeting discussions
• Participate in issue discussions representing respective organization
• Bring up issues or speak in discussions only after being recognized by the chairperson
• Listen respectfully and refrain from interrupting others
• Refrain from disruptive side conversations

5.0 Meetings

The Committee shall:

• Meet regularly as necessary, but no less than quarterly, via scheduled meetings
• Hold special meetings to address urgent or emerging issues
• Record and retain meeting minutes and action items, and distribute to the membership, alternates, and DOE
• Document and maintain record copies of decisions

6.0 Meeting Agenda

• The chairperson shall ensure an agenda is prepared for each meeting, using input from the membership, and forward a copy to all members, alternates, and DOE in advance of the meeting time and date
• Action items shall be assigned and tracked

7.0 Quorum

The Committee shall be considered to have a quorum when all Committee members, or their alternates, are present. Failure to reach consensus will be cause for an issue to elevate into a secondary phase of discussion and comment.
8.0 Secondary Phase of Discussion and Issue Resolution

Matters not agreed upon by the Committee through the initial consensus process shall be elevated to the secondary phase of discussion. If consensus cannot be reached by the Committee, the issue may be elevated to the SMT and/or DOE. The SMT shall provide a status of their resolution process to the Committee at scheduled meetings.
John G. Lehew, III, President and Chief Executive Officer  
CH2M Hill Plateau Remediation Company

J. Frank Armijo, President and General Manager  
Mission Support Alliance, LLC

M.N. Brosheer, President  
Washington Closure Hanford LLC

O.G. Spencer, President and Project Manager  
Washington River Protection Solutions LLC

David P. Davis, President  
Central Washington Building and Construction Trades Council

David E. Molnaa, President  
Hanford Atomic Metal Trades Council