

Electrical Safety Program Requirements

MSC-RD-11827

Revision 4

Effective Date: October 11, 2012

Topic: Worker Protection

Approved for Public Release;
Further Dissemination Unlimited

Electrical Safety Program Requirements

1.0 PURPOSE AND SCOPE

This document establishes the Mission Support Contract (MSC) Electrical Safety Program (ESP), in accordance with NFPA 70 and NFPA 70E and establishes the minimum requirements for safe electrical system design and installation and for safe electrical work practices and electrical safety training for employees. Compliance with requirements listed in this document will help to ensure an electrically safe workplace free from unplanned exposure to electrical hazards for all employees and contractors and will minimize the risk to Site equipment and facilities from the hazards of electricity.

This Level 2 Requirements Document (RD) is applicable to MSC Team employees subject to the occupational safety and health requirements enforceable under Federal Register 10 CFR Part 851 Worker Safety and Health Program; Final Rule. This document does *not* apply to installations or work involving automotive, watercraft, and similar equipment or installations under the exclusive control of Electrical Utilities (EU) for the purpose of metering, transmission, and distribution of electrical energy.

NOTE 1: *EU complies with the National Electric Safety Code (NESC) and Title 29 Code of Federal Regulations (CFR), Part 1910, Subpart R (29 CFR 1910.269), Electric power generation, transmission, and distribution. While EU is not subject to the requirements of this document, they do participate in the ESP by providing technical advice on matters relating to EU systems. Other Hanford contractors also participate in the ESP on a voluntary basis.*

NOTE 2: *Definitions of terms specific to this document are in the National Fire Protection Association (NFPA) and CFR source documents listed in Section 5.0.*

NOTE 3: *Job titles used in this document may be generic and are intended to depict the function even though some may vary from official job titles.*

NOTE 4: *All records generated via the use of this document are to be managed in accordance with MSC-PRO-10588, Records Management Processes.*

2.0 Roles and Responsibilities

2.1 Director of Mission Assurance

1. To administer the ESP, the Director of MA:

- Appoints an Electrical Safety Program Coordinator (ESPC).
- Establishes two technical boards as the core of the ESP, the Hanford Electrical Codes Board (HECB) and the Hanford Workplace Electrical Safety Board (HWESB).
- Appoints functional Authorities Having Jurisdiction (AHJ) for the HECB and the HWESB. These AHJs also chair their respective boards.
- Appoints secretaries for the HECB and the HWESB.

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NOTE: *The AHJ acts on behalf of DOE, to interpret and enforce NFPA 70E, Standard for Electrical Safety in the Workplace, and Occupation Safety and Health Act (OSHA) electrical work practices requirements for the MSC.*

2. To Coordinate the ESP, the ESPC:

- Administers the ESP for the MSC to ensure consistent application of electrical safety requirements at all MSC projects and facilities.
- Coordinates electrical safety activities and initiatives with DOE and other Hanford contractors.
- Ensures MSC electrical incidents are investigated and trended.
- Ensures that meeting minutes, interpretations, lessons learned and other information related to electrical safety is effectively communicated to ESP Points of Contact (POC).
- Periodically reviews the effectiveness of the ESP and provides recommendations to management.
- Maintains a Hanford Local Area Network (HLAN) Intranet ESP web site for electrical safety information, including meeting minutes, safety bulletins, compliance guides, and contact information for ESP POCs and Designated National Electrical Code (NEC) Inspectors.

2.2 Engineering

- Establishes the Hanford Electrical Code Board.
- Employs Designated NEC Inspector(s).
- Ensures that NEC inspectors meet qualifications established by the HECB.
- Designated NEC Inspectors track, trend, and report the status of NEC inspections when requested by the HECB Chair/AHJ.

2.3 Hanford Electrical Codes Board (HECB)

NOTE: *Chairperson is the functional AHJ on behalf of DOE to interpret and enforce the NEC on the Hanford Site.*

- Provides technical support and advice to the AHJ.
- Establishes qualifications for NEC Inspectors.
- HECB Chairperson authorizes Designated NEC Inspectors to perform electrical inspections.
- Provides all Hanford projects, facilities, and contractors the opportunity to be represented by designated POCs.
- Holds periodic meetings to provide open forums for discussion of issues presented by NEC Inspectors, ESP POCs, and other stakeholders.

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- Advises the AHJ on any disputes not resolved by the NEC Inspectors.

2.4 Designated NEC Inspectors

- Act as field representatives of the AHJ to administer and enforce the NEC.
- Maintain qualifications for NEC Inspectors established by the HECB.
- Issue Electrical Installation Permits (EIPs).
- 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 EIP holder.
- Present disputed NEC inspection reports and issues to the HECB for resolution.

2.5 Hanford Workplace Electrical Safety Board (HWESB)

NOTE: *Chairperson is the functional AHJ, on behalf of DOE, to interpret and enforce NFPA 70E, Standard for Electrical Safety in the Workplace, and Occupation Safety and Health Act (OSHA) electrical work practices requirements for the MSC.*

- Provides technical support and advice to the AHJ.
- Provides all Hanford projects, facilities, and contractors the opportunity to be represented by designated POCs.
- Holds periodic meetings to provide open forums for discussion of issues presented by POCs and other stakeholders.
- Acts as first arbiter of disputes not resolved at project/contractor level.

2.6 Project Managers (Facility Manager / Engineering Manager / etc.)

- Ensure that all employees receive electrical safety training commensurate with their exposure to electrical hazards in accordance with NFPA 70E.
- Ensure that engineers and designers who work on designs and maintenance of electrical equipment are qualified, by training and/or experience, to provide safe electrical systems and equipment designs.
- Designate ESP POCs to interface between facility workers and the ESP technical boards.

NOTE: *Electrical safety POCs participating on the HECB should be knowledgeable of electrical system design, installation, and corresponding codes and requirements, particularly the NEC. Electrical safety POCs participating on the HWESB should be knowledgeable of safe electrical work practices and corresponding codes and requirements, particularly OSHA and NFPA 70E*

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- Ensure that POCs are empowered and held accountable to fulfill their appointed roles.
NOTE: Roles and responsibilities for HWESB and HECB POCs are listed in the HWESB HECB Charter. Expectations for POCs are available on the ESP web site.
- Ensure that an electrical safety POC from the appropriate technical board is invited to attend electrical safety related critiques and participate in investigations and critiques of electrical safety-related incidents at their Project.
- Ensure that electrical safety-related incidents at other Projects/Facilities are reviewed for applicability at their own Project.
- Ensure that required EIPs are obtained for all electrical system installations and modifications.
- Ensure that NEC inspections are scheduled at appropriate intervals during electrical construction and modification work.
- Ensure that installations in violation of the NEC are corrected.
- Ensure that unsafe electrical systems and equipment that present an imminent hazard to personnel are de-energized and removed from service until repaired or replaced, unless de-energizing would introduce additional or increased hazards.
- Verify compliance with ESP requirements through periodic independent and self assessments.

2.7 ESP Points of Contact

- HWESB POCs understand and fulfill their appointed roles as listed in the HWESB Charter.
- All POCs maintain working knowledge of appropriate electrical safety codes, standards, and procedures.
- Attend periodic meetings of the HECB and/or HWESB.
- Research agenda topics in preparation for HECB and HWESB meeting discussions.
- Maintain lines of communications between Project management, workers, and the ESP.
- Ensure that electrical safety questions, concerns, and requests for interpretations are brought to the appropriate technical board for discussion and resolution.
- Distribute meeting minutes and other electrical safety information throughout represented project or contractor facilities. Provide printed copies to personnel who may not routinely use electronic e-mail.
- Communicate regularly with craft workers, supervisors, safety professionals, and management regarding electrical safety issues and concerns.
- Assist management and safety personnel with electrical safety questions, assessments, incident investigations, critiques, and other electrical safety issues.

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2.8 Manager/Supervisor

NOTE: Contractors and their subcontractors who install electrical equipment and supporting equipment (such as light poles, power poles, etc.) are to use appropriate technical standards, and approved instruction, procedures. Also, the work instruction or procedure (work package-sic-Electrical Utilities Site Visit Form BC-6003-941) should ensure that workers are adequately trained and qualified to be capable of performing the assigned work.

- Ensure that safe work practices described in NFPA 70E are used by workers under their direction, including non-electrical workers who use portable electric tools and equipment to perform construction, repair, maintenance, remodeling, and similar activities.
- Ensure that employees performing electrical work or using portable electric tools and equipment are qualified, by training and/or experience, to safely perform their assigned tasks. Ensure that documentation supporting worker qualifications is available upon request.

2.9 Buyer's Technical Representative

See MSC-PRO-192, *Buyer's Technical Representative Assignment and Duties*.

3.0 REQUIREMENTS

3.1 Admin and Programmatic Requirements

NOTE: For the tables in this section under the requirement "type" column and "V" means verbatim, "I" means interpreted.

#	REQUIREMENT	TYPE V or I	SOURCE
1.	Mission Support Alliance (MSA) MA shall establish and administer the ESP.	I	NFPA 70E-2009, Article 110.7
2.	The Director of MA shall appoint an Electrical Safety Program Coordinator to administer the ESP.	I	NFPA 70E-2009, Article 110.7
3.	The ESP shall establish the HECB, to serve as a forum for discussion and resolution of issues related to code compliant electrical system design and installation.	I	NFPA 70-2008, Annex H, §80.15
4.	The ESP shall establish the HWESB, to serve as a forum for discussion and resolution of issues related to safe electrical work practices.	I	NFPA 70E-2009, Article 110.7
5.	Each MSC Project shall appoint at least one POC to attend meetings of the HECB.	I	NFPA 70E-2009, Article 110.7

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6.	Each MSC Project shall appoint at least one POC to attend meetings of the HWESB. Projects with electrical workers shall appoint at least one additional POC, who shall be a bargaining unit (BU) worker, resulting in one exempt and one BU POC representing the project.	I	NFPA 70E-2009, Article 110.7
7.	Each MSC Project shall verify compliance with ESP requirements through periodic independent or self-assessments. Such assessments shall not be required to be strictly electrical safety assessments and may be incorporated into other facility safety assessments. Assessments shall be processed in accordance with MSC-PRO-052, <i>Corrective Action Management</i> .	I	NFPA 70E-2009, Article 110.7
8.	The AHJ shall have the authority to perform routine interpretations of electrical design, installation, and worker safety regulations and standards required by the MSC contract.	I	NFPA 70-2008, Annex H, §80.13; RL Letter, DOE-RL-01-ESD-004
9.	The name(s) of the appointed AHJ for interpretation and application of NFPA 70 and NFPA 70E shall be submitted to DOE-RL for information on an annual basis, or as necessary (when AHJ resigns, retires, is reassigned, etc.). The selected individual(s) shall serve as member(s) of the HECB and the HWESB.	I	RL Letter, DOE-RL-01-ESD-004 RRD #005 D3
10.	Appeals of HECB and HWESB interpretations and waivers to electrical design, installation, and worker safety regulations and standards shall be submitted to DOE-RL, the final AHJ for the Hanford site.	I	RL Letter, DOE-RL-01-ESD-004

3.2 General Requirements

1.	NFPA 70 and NFPA 70E shall be used in conjunction with, and shall be considered part of, this RD to establish the working-level requirements for safe electrical designs and work practices. EXCEPTION: <i>DOE-0336, Hanford Site Lockout/Tagout, provides requirements for lockout/tagout and shall take precedence over similar requirements in NFPA 70E if there is a conflict.</i>	I	10 CFR 851.23(a)(15)
2.	All electrical shocks (other than obvious static) shall be reported to supervision immediately. Shock victims shall be evaluated at a Hanford occupational medicine provider aid station if during normal work hours, or by the Hanford Fire Department if after hours.	V	RRD #005 D22

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3.	Whenever outside servicing personnel (subcontractors, vendors, etc.) are to be engaged in activities covered by the scope and application of this RD and NFPA 70E, the MSC Team representative and the outside employer(s) shall inform each other of existing hazards, personal protective equipment/clothing requirements, safe work practice procedures, and emergency/evacuation procedures applicable to the work to be performed. This coordination shall include a meeting led by the MSC and supporting documentation.	I	NFPA 70E-2009, Article 110.5); DOE-0336; RRD #005 D31 & D32
4.	All MSC employees shall attend electrical safety training commensurate with their exposure to electrical hazards. Minimum electrical safety training shall include the following: <ul style="list-style-type: none"> • All employees take Hanford General Employee Training (HGET). • Employees who face a higher than normal risk of exposure to electrical hazards take courses listed in the Training Selection Tool that pertain to their job assignments. • Refresher training shall be provided at intervals not to exceed three years. 	I	NFPA 70E-2009, Article 110.6; 29 CFR 1910.332; RRD #005 D29
5.	Electrical workers shall attend Basic Medic First Aid training, Course 170500, or maintain equivalent First Aid and CPR certification. Refresher training shall be provided at intervals not to exceed two years. NOTE: <i>Actions to provide first aid or CPR are strictly voluntary and are not a requirement for electrical workers unless otherwise assigned by their management. In the event that an employee not in the Blood Borne Pathogen Program renders voluntary medical aid, MSC can provide appropriate medical assistance if the employee sustains a blood borne pathogen exposure as a result of their voluntary act.</i>	I	NFPA 70E-2009, Article 110.6
6.	First-line managers, field work supervisors (FWS), and persons-in-charge (PICs) shall have at least the same level of electrical safety training as the workers they supervise if those workers face exposure to electrical hazards.	I	29 CFR 1910.332, Table S-4; RRD #005 D30

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3.3 Safe Electrical Design and Installation Requirements

1.	<p>All new electrical installations and modifications to existing electrical installations shall require an EIP, available from any Designated NEC Inspector (See ESP web site for a list of Designated NEC Inspectors).</p> <p>NOTE: <i>EIPs are not required for installation or replacement of electric utilization equipment approved for connection to suitable permanently installed receptacles; like-for-like or equivalent replacement of circuit breakers, snap switches, fuses, lamps and lamp sockets, lighting fixture ballasts, heating elements, contactors, relays, timers, starters, similar control components, motors, receptacles, worn cords, and other minor repair and maintenance work; tightening electrical connections; and the process of testing, servicing, or repairing electric equipment.</i></p>	I	NFPA 70-2008, Annex H
2.	<p>All new electrical installations and modifications to existing electrical installations shall comply with requirements of the NEC. All electrical work requiring an EIP is subject to inspection to verify NEC compliance.</p>	I	NFPA 70-2008, Annex H
3.	<p>All NEC inspections shall be performed by Designated NEC Inspectors who have the following qualifications established by the AHJ and who have been authorized by the AHJ to perform such inspections:</p> <ul style="list-style-type: none"> • Not less than four years experience as a journeyman electrician installing and maintaining electrical equipment, or • Two years electrical training in a college of electrical engineering of recognized standing and four years continuous practical electrical experience in installation work, or • 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, and • Passed a nationally recognized test for general electrical inspectors and plan review inspector. These tests will be certified by the International Association of Electrical Inspectors (IAEI) or the International Code Council (ICC). 	I	NFPA 70-2008, Annex H

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4.	<p>Facilities installing new electrical equipment or modifying existing electrical systems shall be allowed to perform such work using an annual inspection permit. A person knowledgeable and experienced in electrical installation practices and NEC requirements, usually the system engineer or the design authority, shall inspect such work before the installation or modification is energized. All work performed with an annual permit shall be subject to final inspection and approval by a Designated NEC Inspector.</p> <p>NOTE: <i>The annual inspection permit may be dated to cover up to one year, usually October 1 through September 30. The permit lists the scope of modifications and additions covered, which may be segregated by building or some other logical means. The facility contacts an NEC Inspector periodically to schedule inspections of work performed under each annual permit.</i></p>	I	NFPA 70-2008, Annex H
5.	<p>All inspections of new electrical installations and modifications to existing electrical installations (including interim inspections by a knowledgeable person as allowed with an annual inspection permit) shall be documented on an EIP. Documentation by plant personnel of inspections performed as part of an annual permit shall be kept on file at the facility and made available to the NEC inspector when requested. Documentation shall include, as appropriate:</p> <ul style="list-style-type: none"> • Violations found, including the NEC reference. • Approval to cover concealed work. • Approval to energize the installation. 	I	NFPA 70-2008, Annex H
6.	<p>All electrical equipment installed or used on the Hanford Site must be approved by the AHJ for the National Electrical Code. Electrical equipment is approved, and therefore acceptable for use, under the following conditions:</p> <ol style="list-style-type: none"> a. If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by an OSHA-recognized nationally recognized testing laboratory (NRTL) as indicated by a NRTL label applied by the manufacturer; or b. If it has been labeled by a NRTL representative following a NRTL field evaluation; or 	I	29 CFR 1910.303, (a); 29 CFR 1910.399; 29 CFR 1926.403, (a); NFPA 70-2008, Article 110.2

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	<p>c. With respect to an installation or equipment that does not comply with a or b, and for which written justification for that non-compliance is provided to the AHJ prior to installation and energization, it may be approved if it is inspected or tested, using the Non-NRTL Electrical Equipment AHJ Approval Report checklist, by a Technical Representative designated by the AHJ.</p> <p>NOTE 1: <i>Condition a or b in §3.3.6 is the required method of approval for procurement and installation of new equipment. Condition c is reserved for use in unique situations, special needs, or for "as found" legacy equipment that does not satisfy NRTL requirements.</i></p> <p>NOTE 2: <i>Electrical equipment includes material, fittings, devices, appliances, luminaries (fixtures), apparatus, and the like used as a part of, or in connection with, an electrical installation.</i></p> <p>NOTE 3: <i>If you suspect that a piece of electrical equipment should have an NRTL label, and you cannot find one, report that to your manager or supervisor, who should then contact the AHJ.</i></p> <p>NOTE 4: <i>See Nationally Recognized Testing Laboratories (NRTLs) for a list of OSHA-recognized NRTLs.</i></p>		
7.	<p>All electrical installations, systems, wiring, and connected utilization equipment shall be maintained in a safe condition free from recognized hazards that are likely to harm employees. Unsafe electrical systems and equipment that present an imminent hazard to personnel shall be de-energized and removed from service until repaired or replaced, unless de-energizing would introduce additional or increased hazards.</p>	I	<p>NFPA 70-2008, Annex H;</p> <p>29 CFR 1910.301, (a);</p> <p>29 CFR 1926.400, (a);</p>

3.4 Safe Electrical Work Practices Requirements

The following requirements do not apply to Class 2 Power-limited circuits as defined in NFPA 70 section 725 or calculated Class 2 on tables NFPA 70 11a – 11b. For purposes of PPE, AC or DC voltages <50 volts shall be exempted but current capabilities should be calculated for heat generation capacity.

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1.	<p>An electrically safe work condition shall be achieved and verified using the sequence described in NFPA 70E-2009, Article 120.1, in conjunction with DOE-0336, <i>Hanford Site Lockout/Tagout</i>.</p> <p>NOTE 1: <i>Where there is no accessible exposed point to take voltage measurements, planning considerations shall include alternate methods of verifying a safe work condition.</i></p> <p>NOTE 2: <i>If personal protective grounding is being installed as part of an electrically safe work condition, it shall be considered live work and appropriate hazard analyses, protective clothing, and other PPE shall be used until grounds are applied.</i></p> <p>NOTE 3: <i>Whenever it cannot be predicted with absolute certainty that breaking or re-establishing the continuity of the neutral circuit conductor would not expose a worker to energized electrical conductors or circuit parts, the tasks shall be considered energized work and the safe work practices for working on or near energized electrical conductors or circuit parts shall be used.</i></p> <p>NOTE 4: <i>Class 2 Power-limited circuits as defined in NFPA 70 section 725 or calculated Class 2 on tables NFPA 70 11a – 11b are not considered electrical or fire hazards. Class 2 power supplies, listed low voltage lighting systems, and similar sources are examples of circuits or systems that are not considered an electrical hazard.</i></p>	I	NFPA 70E-2009, Article 120.1
2.	<p>Non-contact proximity voltage testers, and solenoid type e.g., “wiggly,” shall not be used to verify an electrically safe work condition for purposes of hazardous energy control.</p>	I	RRD #005 D8
3.	<p>All test instruments shall be designed, rated, and approved for their intended use, and visually inspected for external damage before being used on any shift. Damaged or defective equipment shall not be used.</p> <p>All multimeters used to test electrical energy will be identified with a mark indicating listing with a Nationally Recognized Testing Laboratory. The standard multimeter will be Category III or above power rated. 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.</p>	I	NFPA 70E-2009, Article 110.9); RRD #005 D9, D10

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4.	<p>Work performed inside the flash protection boundary or the limited approach boundary of exposed energized electrical conductors or circuit parts shall be justified by Project management in accordance with NFPA 70E-2009, Article 130.1. Justification and authorization shall be documented in a controlled work package, job ticket, job hazard analysis (JHA), or permit that has been approved by management.</p>	I	<p>NFPA 70E-2009, Article 130.1; 29 CFR 1910.333, (a)(1); RRD #005 D17</p>
5.	<p>Work performed inside the flash protection boundary or the limited approach boundary of exposed energized electrical conductors or circuit parts such as voltage testing, including safe condition checks, or troubleshooting <u>that can only be performed with the circuit energized</u> does not require written justification provided appropriate safe work practices, protective clothing, and other PPE are used.</p> <p>NOTE 1: <i>Safe condition checks for absence of electrical energy do not require written justification. However, they are considered live work and require appropriate hazard analyses to determine safe work practices and PPE suitable for conditions of the task.</i></p> <p>NOTE 2: <i>Testing and troubleshooting are limited to those actions necessary to measure voltage or current and to verify the operability of equipment without repairing or replacing components.</i></p>	I	<p>NFPA 70E-2009, Article 130.1; 29 CFR 1910.333, (a)(1); RRD #005 D18</p>
6.	<p>A shock hazard analysis and a flash hazard analysis shall be completed and documented to identify hazards and determine appropriate safe work practices, protective clothing, and other PPE to be used before any person approaches exposed energized electrical conductors or circuit parts within the limited approach boundary or the flash protection boundary.</p> <p>NOTE 1: <i>The Automated Job Hazard Analysis (AJHA) tool may be used to document a shock hazard analysis and a flash hazard analysis. Refer to MSC-PRO-079, Job Hazard Analysis.</i></p> <p>NOTE 2: <i>If the flash hazard analysis indicates that arc incident energy will exceed 40 cal/cm², the work shall not be performed unless an electrically safe work condition has been established. No protective equipment exists that can protect the worker from the arc flash that will be produced by an arcing fault of that magnitude.</i></p>	I	<p>NFPA 70E-2009, Articles 110.8, 130.2, 130.3; RRD #005 D20</p>

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7.	The PPE requirements of NFPA 70E, Article 130.7 and associated tables and hazard/risk categories (HRC) shall be permitted in lieu of the detailed flash hazard analysis.	I	NFPA 70E-2009, Article 130.3
8.	<p>At least two qualified workers shall be assigned to any work inside the flash protection boundary or the restricted approach boundary of exposed parts operating at more than 300 volts phase-to-phase or phase-to-ground. Work, independent of voltage, that presents a significant shock or arc flash hazard shall be evaluated by supervision and craft workers to determine the minimum number of workers needed to ensure employee protection. The final decision on minimum number of workers should be made by safety management or the AHJ.</p> <p>NOTE: <i>For simple safe condition checks the second worker may not need to be qualified to perform electrical work, but must be qualified and trained in the operation of electrical equipment (to deenergize, if necessary) and in methods of release of victims from contact with exposed energized conductors or circuit parts.</i></p>	I	<p>NFPA 70E-2009, Articles 110.7(F), (FPN 1);</p> <p>10 CFR 851.21(a)</p> <p>RRD #005 D21</p>
9.	All workers are to be provided and shall use protective clothing and PPE appropriate for potential shock, or arc flash hazards to which they may be exposed. PPE and protective clothing shall be maintained in a safe, reliable condition and shall be visually inspected before each use.	V	RRD #005 D19
10.	Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn where they present an electrical contact hazard with exposed live parts, or within a flash protection boundary.	V	RRD #005 D25
11.	Rubber insulating gloves suitable for the voltage shall be used when working inside the restricted approach boundary if exposed energized electrical conductors or circuit parts present a potential shock hazard.	I	<p>NFPA 70E-2009, Articles 130.2, 130.7 (C)(6)(a);</p> <p>29 CFR 1910.335(a) ;</p> <p>RRD #005 D23</p>
12.	<p>Employees shall wear flame resistant (FR) clothing wherever there is potential exposure to an electric arc flash above the threshold incident-energy level for a second degree burn, 1.2 cal/cm². Non-FR clothing shall not be worn over FR clothing inside a flash protection boundary.</p> <p>NOTE: <i>Refer to NFPA 70E-2009, Article 130.7 for more information on electrical PPE and protective clothing.</i></p>	V	<p>NFPA 70E-2009, Article 130.7</p> <p>NFPA 70E-2009, 130.7(C)(12)(b)</p> <p>RRD #005 D24</p>

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13.	Workers who operate 480 volts or above circuit breakers, electrical disconnect switches, and similar switch gear equipment with doors closed and all covers in place shall wear, as a minimum, non-melting long pants and long-sleeved shirt, safety glasses, hearing protection, and leather or insulating gloves unless a documented analysis indicates there is no exposure to arc flash hazards.	I	NFPA 70E-2009, Table 130.7; RRD #005 D26
14.	A job hazard analysis shall be completed for work requiring cutting, drilling, or otherwise penetrating deeper than two inches into or through walls, floors, or other surfaces that may contain hidden electrical obstructions.	I	NFPA 70E-2009, Article 110.7; RRD #005 D27
15.	Where work is being performed on de-energized equipment that is adjacent to “look alike” energized equipment, Safety Signs and Barricades shall be employed to alert employees as to what equipment is inside and or outside the scope of the work instructions. Where barricades are not practical, an attendant and information placards shall be utilized. The “look alike” alerting methods selected for a particular task shall be discussed during the pre-job briefing (Reference NFPA 70E 130.7 (E)) NFPA 70E-2009, Article 130.7 (E) (4).	V	NFPA 70E-2009, Article 130.7 (E)(4)
16.	A job hazard analysis shall be completed for work requiring excavation greater than 12 inches deep in areas that may contain buried electrical systems. NOTE: Refer to DOE-0344 , Hanford Site Excavating, Trenching, and Shoring.	I	10 CFR 851.2(a); RRD #005 D28
17.	All work near overhead transmission and distribution lines, other than by Electrical Utilities (EU) personnel, including use or movement of vehicular and mechanical equipment, shall be performed in accordance with NFPA 70E-2009, Article 130.5. NOTE 1: EU should be notified at least 48 hours before work that may affect or that is within the limited approach boundary of EU conductors and equipment, or if movement of vehicular or mechanical equipment over 14 feet high is planned. NOTE 2: Such work includes, but is not limited to, work near overhead conductors, work inside EU underground vaults, and requests for outages requiring EU support. NOTE 3: Refer to “Electrical” in the Hanford Yellow Pages of the PopFon directory to contact the EU dispatcher or EU work management personnel.	I	NFPA 70E-2009, Article 130.5; RRD #005 D5,D6, D7

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	<p>NOTE 4: Refer to NFPA 70E-2009, Article 130.2(C); and Table 130.2(C) for minimum approach distances.</p> <p>NOTE 5: Refer to DOE-RL-92-36, Hanford Site Hoisting and Rigging Manual, 14.4.7, "Operating Cranes Near Energized Transmitters or Electrical Power Lines" and MSC-RD-28954, Equipment Operation near Overhead Lines for additional requirements.</p>		
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3.5 Temporary Power and Portable Equipment

1.	<p>All portable electric equipment, including extension cord sets, shall be approved and suitable for the intended use, and visually inspected for external damage before being used on any shift. Damaged or defective equipment shall not be used. All electrical equipment shall be used within their rated capacity.</p> <p>EXCEPTION: Cord-and-plug-connected equipment and extension cord sets that remain connected once they are put in place and are not exposed to damage shall not be required to be visually inspected until they are relocated.</p>	I	<p>NFPA 70E-2009, Article 110.9; RRD #005 D11</p>
2.	<p>Ground-fault circuit interrupter (GFCI) protection for personnel shall be provided for all temporary wiring installations. This requirement applies only to temporary wiring installation used to supply temporary power to equipment used by personnel during construction, repair, maintenance, remodeling, and similar activities. This applies to portable tools and equipment connected to 125-volt, single-phase, 15-, 20-, and 30- amp receptacle outlets.</p> <p>NOTE: Portable electric tools and equipment used indoor and connected to permanent 15 or 20 amp receptacles do not need GFCI protection.</p> <p>EXCEPTION 1: Receptacle outlets used solely for temporary lighting that provides the only lighting for safe egress during construction, repair, maintenance, remodeling, and similar activities shall not be provided with or connected to ground-fault circuit interrupters.</p> <p>EXCEPTION 2: Where conditions of maintenance and supervision ensure that only qualified personnel are involved, an Assured Equipment Grounding Conductor Program (AEGCP) shall be permitted for those receptacle outlets used to supply equipment that would create a greater hazard if power was</p>	I	<p>NFPA 70-2008, Article 590.6; RRD #005 D12</p>

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	interrupted or having a design that is not compatible with GFCI protection.		
3.	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. In job locations where employees are likely to contact or be drenched with water or conductive liquids, GFCI protection for personnel shall also be used.	V	NFPA 70E-2009, Article 110.9; RRD #005 D14
4.	A documented Assured Equipment Grounding Conductor Program (AEGCP) shall be used when temporary wiring methods or extension cord sets are used to supply portable electric tools and equipment that are used for construction, repair, maintenance, remodeling, and similar activities if a greater hazard would be created if power was interrupted, or if the receptacle outlets or the tools and equipment are of a design that is not compatible with GFCI protection, such as 480-volt equipment.	I	NFPA 70-2008, Article 590.6; RRD #005 D13
5.	Temporary receptacles other than 125-volt, single-phase, 15-, 20-, and 30-ampere receptacles, and portable electric tools and equipment, when used for construction, repair, maintenance, remodeling, and similar activities, shall have either GFCI protection or a documented AEGCP.	I	NFPA 70-2008, Article 590.6; RRD #005 D15
6.	<p>GFCI Testing:</p> <ul style="list-style-type: none"> • Permanently installed and energized GFCI receptacles and circuit breakers shall be tested monthly (or as instructed by the manufacturer's instructions). • Portable GFCI devices shall be tested before each use. • Deviations to testing requirements shall be approved by the AHJ. <p>See Appendix A for testing requirements and sample testing program.</p>	I	NFPA 70E-2009, Article 110.9; RRD #005 D16
7.	<p>Relocatable power taps and transient voltage surge suppressors shall be connected only to permanently installed branch circuit receptacles. They shall not be series connected (daisy chained) to other power taps, surge suppressors or extension cords, and shall be used within their rated capacity.</p> <p>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.</p>	I	29 CFR 1910.303, (b)(2)

Electrical Safety Program Requirements

4.0 FORMS

BC-6003-941, Electrical Utilities Site Visit

5.0 RECORD IDENTIFICATION

All records are generated, processed, and maintained in accordance with MSC-PRO-10588, *Records Management Processes*.

Records Capture Table

Name of Document	Submittal Responsibility	Retention Responsibility
Meeting minutes including documentation of meetings with outside servicing personnel to address Hanford's Electrical program and NFPA 70E, interpretations of electrical, safety-related regulatory and consensus standards, and compliance guides, lessons learned, and other information related to electrical safety.	MA	MA
NEC designated Inspector qualifications and field inspection reports, worker qualification documents.	QA	QA
ESP self-assessments, non-NRTL Electrical Equipment AHJ Approval Report checklist, AEGCP test results, and GCFI test results.	Facility Managers	MA
Training records	Training	Training

6.0 REFERENCES

6.1 Source References

Federal Register 10 CFR Part 851 Worker Safety and Health Program; Final Rule

Title 29, Code of Federal Regulations, Part 1910 Subpart S (29 CFR 1910.301 - .399), *Electrical*

Title 29, Code of Federal Regulations, Part 1926 Subpart K (29 CFR 1926.400 - .449), *Electrical*

RRD #005 (Rev.3), Richland Requirements Document, Worker Safety

[DOE-0336](#), *Hanford Site Lockout/Tagout*

National Electric Safety Code

NFPA 70, National Fire Protection Association, *National Electrical Code*

NFPA 70E, National Fire Protection Association, *Standard for Electrical Safety in the Workplace*

NFPA 70-2008, Annex H

Electrical Safety Program Requirements

RL Letter, DOE-RL-01-ESD-004, *Contract No. DE-AC06-96RL13200 – PHMC Hanford Electrical Safety Program*, from Sally A. Sieracki, CO, to R.D. Hanson, President FH, dated October 10, 2000

RL Correspondence No. 1004150 A, DOE RL: 11-OOD-0006, Contract No. DE-AC06-09RL14728 – SUPPLEMENTAL CONTRACTOR REQUIREMENTS DOCUMENT (SCRD) 0422.1 (SUPP REV. 0), *Conduct of Operations*.

6.2 Working References

Title 29, Code of Federal Regulations, Part 1910 Subpart R (29 CFR 1910.269) *Electric power generation, transmission, and distribution*

DOE-HDBK-1092-2004, DOE Handbook, *Electrical Safety*

[DOE-0344](#), *Hanford Site Excavating, Trenching, and Shoring*
[DOE-RL-92-36](#), *Hanford Site Hoisting and Rigging Manual*

[MSC-PRO-052](#), *Corrective Action Management*
[MSC-PRO-079](#), *Job Hazard Analysis*
[MSC-RD-192](#), *Buyer's Technical Representative Assignment and Duties*
[MSC-RD-28954](#), *Equipment Operation near Overhead Electrical Lines*
[MSC-PRO-10588](#), *Records Management Processes*

Electrical Safety Program Requirements

Appendix A **Ground Fault Circuit Interrupter Testing Program Requirements**

NOTE: *This appendix is intended to clarify MSC requirements, based on the NFPA 70E Standard for Electrical Safety in the Workplace, regarding the acceptable testing of permanently installed 120V Ground Fault Circuit Interrupters (GFCIs). Compliance with these requirements will ensure the existence of an effective program and safety of personnel.*

- GFCI receptacles and GFCI circuit breakers permanently installed in or on occupied trailers, facilities and in-service temporary or permanent power stations shall be tested in accordance with the manufacturer's instructions.¹ Those not being tested monthly (due to inaccessibility, presence of a greater hazard, status of facility occupation, etc...) must be documented and this document shall be maintained available for review by the NFPA 70E Authority Having Jurisdiction. The documentation must address the location of the GFCI, why it cannot be tested and how the facility will control / prevent its use. These GFCIs must be tested satisfactorily prior to use or alternate methods to provide GFCI protection of personnel must be provided (i.e., currently tested portable GFCI device).
- Portable in-line GFCI devices are to be used to provide personnel protection when connecting portable hand tools to extension cord sets that are supplied from 125-volt single-phase 15, 20, and 30 ampere receptacles where currently-tested GFCI devices do not exist or are not being tested.
- A method to clearly communicate to potential users the current testing status of permanently installed GFCI devices shall be implemented.
- Facility Management shall ensure all personnel are knowledgeable of the facility GFCI use and testing policy. The personnel are to be familiar with how to respond to a tripped GFCI device according to the facility policy. The facility GFCI policy shall describe the process for identifying failed GFCI devices and the method to ensure timely repair or replacement of the failed device.

¹ Standard for Electrical Safety in the Workplace NFPA 70E 2009 Edition, Article 110.9 (C)

Electrical Safety Program Requirements

The following is a **Sample GFCI Test Procedure** that can be used in a work management system:

Precautions/Limitations:

Ensure power interruptions will cause no adverse effects to Safety Related equipment before performing this test. Health Physics shall be notified when working on radiological monitoring equipment. Operations must be notified when working on operations monitoring equipment.

If a faulty GFCI device is discovered during the performance of this test, replace the GFCI using the facility's Lock Out Tag Out (LOTO) requirements or take the GFCI out of service by installing a facility information tag or equivalent. Document action in the Notes column of the attached table, for data base entry or a follow-up work order.

Coordinate with Operations to ensure that power can be expeditiously restored to circuits affected by this test procedure in the event a supply breaker should trip while testing a GFCI. Also note that a GFCI receptacle may supply power to other receptacles.

Documented GFCI test results shall be made readily accessible as proof of test completion.

GFCI Receptacle/Breaker Testing Sequence

1. Visually inspect the GFCI for defects and broken parts. (Do not remove the GFCI receptacle for this inspection.)
2. Verify, fill-in or correct any new or missing device information on the Monthly GFCI Data Sheet.

NOTE: *The GFCI may be found in the tripped condition. This alone does not reflect unacceptable performance, though it is cause for suspicion as to the condition.*

NOTE: *The use of the (GFCI) internal tester and use of a load or test meter to verify power interruption is the preferred method of testing a GFCI device. External testers may give misleading or erroneous results and, in some cases, may be hazardous.*

3. Press the reset button and insert load or test meter to assure normal GFCI operation.²
4. Press test button on the GFCI.
5. Verify no circuit voltage using load or test meter.
6. Press the reset button on the GFCI.
7. Verify circuit voltage restored using load or test meter.
8. Record as satisfactory in Test Results column on Data Sheets and install inspection sticker or unsatisfactory and initiate corrective / protective actions.

² GFCIs – A Small Investment, a Big Lifesaver. UL Recommends Regular Testing of GFCIs
<http://www.ul.com/consumers/groundfault.html>

