

FACILITY ELECTRICAL POWER SYSTEMS

- 1. REASON FOR ISSUE:** This Veterans Health Administration (VHA) directive establishes policy regarding the installation, operation, testing, and maintenance of Facility Electrical Power Systems at VA medical facilities and affiliate sites.
- 2. SUMMARY OF MAJOR CHANGES:** Major changes include updates to references (Paragraph 11) and responsibilities (Paragraph 5).
- 3. RELATED ISSUES:** VHA Directive 7701, Comprehensive Occupational Safety and Health Program, dated May 5, 2017.
- 4. RESPONSIBLE OFFICE:** The Office of Capital Asset Management, Engineering and Support (OCAMES) (10NA5E), is responsible for the of this directive. Questions can be submitted to the Healthcare Environment and Facilities Program SharePoint site at: <https://vaww.vha.vaco.portal.va.gov/sites/DUSHOM/10NA/10NA5/HealthcareEngineering/waiver/Pages/Waiver%20Requests.aspx>. **NOTE:** *This is an internal VA Web site that is not available to the public.*
- 5. RESCISSIONS:** VHA Directive 1028, Electrical Power Distribution System, dated July 25, 2014, is rescinded.
- 6. RECERTIFICATION:** This VHA directive is scheduled for recertification on or before the last working day of February 2025. This VHA directive will continue to serve as national VHA policy until it is recertified or rescinded.

**BY THE DIRECTION OF THE UNDER
SECRETARY FOR HEALTH:**

/s/ Renee Oshinski
Deputy Under Secretary for Health
for Operations and Management

NOTE: *All references herein to VA and VHA documents incorporate by reference subsequent VA and VHA documents on the same or similar subject matter.*

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FACILITY ELECTRICAL POWER SYSTEMS

1. PURPOSE

This Veterans Health Administration (VHA) directive provides policy regarding the installation, operation, testing, and maintenance of Facility Electrical Power Systems at Department of Veterans Affairs (VA) medical facilities. **AUTHORITY:** Executive Order 12196, dated February 26, 1980; Title 38 United States Code (U.S.C.) 7301(b); 40 U.S.C. 3312.

2. BACKGROUND

a. VHA and The Joint Commission have adopted the National Fire Protection Association (NFPA) codes and standards including the National Electrical Code (NFPA 70), Recommended Practice for Electrical Equipment Maintenance (NFPA 70B), Standard for Electrical Safety in the Workplace (NFPA 70E), Health Care Facilities Code (NFPA 99), Life Safety Code (NFPA 101) and Standard for Emergency and Standby Power Systems (NFPA 110) as the basis for the requirements of the design, installation, operation, testing, and maintenance of the Electrical Power System at VA medical facilities and affiliate sites. **NOTE:** *VHA adopts national codes and standards upon issuance; in some cases, The Joint Commission may be using older editions of such standards which may cause discrepancies.*

b. The Joint Commission's Environment of Care (EC) standards require written Utility Management Plans. The Utility Management Plans must ensure reliability, control risks, reduce failures, and train users and operators of the Facility Electrical Power System. Non-compliance with this directive could lead to accreditation issues with The Joint Commission, impact patient care and increase the risk of harm to patients in critical care areas such as the Intensive Care Unit and Operating Rooms.

c. Working on energized electrical equipment is inherently dangerous to patients, staff, visitors, and VA property. Such actions, if unplanned or poorly executed, can result in disruption of operations, injuries, loss of life and loss of property. Occupational Safety and Health Requirements (OSHA) Title 29 Code of Federal Regulations (CFR) Part 1910 Subpart J, The Control of Hazardous Energy (lockout/tagout) (1910.147); Part 1910 Subpart S, Electrical (1910.301-1910.399); and Safety and Health Regulations for Construction Part 1926 Subpart K, Electrical (1926.400-1926.449) apply to work on this equipment.

3. DEFINITIONS

a. **Electric Power Production and Distribution Network.** The Electric Power Production and Distribution Network consists of power production, distribution, and utilization equipment and facilities, such as electric utility systems that deliver electric power to the connected loads, that are external to and not controlled by an interactive system.

b. **Emergency Power Supply.** The Emergency Power Supply (EPS) is the source of electric power of the required capacity and quality for an emergency power supply system (EPSS).

c. **Emergency Power Supply System.** The Emergency Power Supply System (EPSS) as defined in NFPA 110 is a complete functioning EPS system coupled to a system of conductors, disconnecting means and overcurrent protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals of the transfer equipment needed for the system to operate as a safe and reliable source of electric power. Within health care facilities, the EPSS may be part of the Essential Electrical System (EES) (when serving loads allowed to be on the EES) or may be part of a standby power system when serving non-health care related loads.

d. **Essential Electrical System.** The Essential Electrical System (EES) as defined in NFPA 99, Health Care Facilities Code, is a system comprised of alternate sources of power and all connected distribution systems and ancillary equipment, designed to ensure continuity of electrical power to designated areas and functions of a health care facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.

e. **Facility Electrical Power Systems.** The Facility Electrical Power System includes the Premises Wiring and the portion of the Electrical Power Production and Distribution Network (both as defined in NFPA 70) owned by VHA.

f. **Mission Critical VA Medical Facilities.** Mission critical VA medical facilities are those VA medical facilities and affiliate sites that are required to continue operation during a natural or manmade extreme event or a national emergency. **NOTE:** Refer to *Physical Security Design Manual (PSDM)*, latest edition, for the definition and list of Mission Critical facility types. The PSDM is available on the CFM Technical Information Library (TIL): <https://www.cfm.va.gov/til/criteria.asp>.

g. **Premises Wiring.** Premises Wiring consists of interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed. This includes (a) wiring from the service point or power source to the outlets or (b) wiring from and including the power source to the outlets where there is no service point. Such wiring does not include wiring internal to appliances, luminaires, motors, controllers, motor control centers, and similar equipment.

h. **Qualified Persons.** Qualified persons, as defined in NFPA 70, Article 100, are those that have demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and received safety training to identify the hazards and reduce the associated risk. Training must be classroom, on-the-job or a combination of the two. The type and extent of training must be proportionate to the risk to the employee.

i. **Utility Management Plan.** The Utility Management Plan is a written plan which includes processes for selection, maintenance, and training that are designed to promote safe and effective use of utility systems while minimizing risks to patients and staff. The Utility Systems Management Plan applies to hospital functions at each designated VA medical facility subject to inspection by The Joint Commission.

j. **Wet Procedure Location.** Wet Procedure Locations are the areas in a patient care space where a procedure is performed that is normally subject to wet conditions while patients are present, including standing fluids on the floor or drenching of the work area, either of which condition is intimate to the patient or staff.

4. POLICY

It is VHA policy that the Facility Electrical Power System must operate in a safe, reliable, and efficient manner, recognizing its importance and potential danger; and in compliance with The Joint Commission, OSHA, and NFPA electrical standards.

5. RESPONSIBILITIES

a. **Under Secretary for Health.** The Under Secretary for Health is responsible for ensuring overall compliance with this directive.

b. **Deputy Under Secretary for Health for Operations and Management.** The Deputy Under Secretary of Health for Operations and Management is the Authority Having Jurisdiction (AHJ) as it pertains to this directive and is responsible for:

(1) Communicating the contents of this directive to each of the Veterans Integrated Services Networks (VISNs).

(2) Ensuring that each VISN Director has the resources required to support the execution of this directive in all the VA medical facilities within the VISN.

(3) Confirming that each VISN has and utilizes on an ongoing basis a means for ensuring the terms of this directive are fulfilled in all the VA medical facilities of the VISN. The annual survey of compliance, Annual Workplace Evaluations (AWE) and Joint Commissions can comprise the basis for ensuring compliance.

(4) Approving variances or equivalencies to this directive. For example, approval of an alternative simulation if the utility connection cannot be opened during a test of the EES. See paragraph 8.j(4)(b).

c. **Office of Capital Asset Management Engineering and Support Director.** The Office of Capital Asset Management Engineering and Support (OCAMES) Director is responsible for:

(1) Providing technical subject matter expertise regarding this directive, VA criteria, and related national codes and standards.

(2) Responding to questions from the field regarding technical issues and conducting site assessments related to this directive when requested or when otherwise determined to be required.

(3) Reviewing requests for deviations or variances from this directive, VA criteria, and national codes and standards and making recommendations to the Deputy Under Secretary for Health for Operations and Management to approve or not approve such requests.

(4) Reporting on results of annual survey of compliance with this directive as requested by VA leadership.

d. **Veterans Integrated Service Network Director.** The VISN Director is responsible for:

NOTE: For the purpose of this directive as it applies to non-medical facilities within VHA, the National Consolidated Mail Out Pharmacy (CMOP) Director or equal position is considered equivalent to the VISN Director and therefore responsible for the following:

(1) Ensuring the installation, operation, testing, and maintenance of Facility Electrical Power Systems meet or exceed The Joint Commission, NFPA, and other applicable requirements.

(2) Confirming that all work on the Facility Electrical Power Systems complies with OSHA and NFPA standards.

(3) Reviewing and providing concurrence or non-concurrence on VA medical facility requests for deviation from this directive, VA criteria, or national standards and codes. Requests approved by the VISN Director must be submitted to the Deputy Under Secretary for Health for Operations and Management or designee for approval as the AHJ.

(4) Ensuring that appropriate resources are provided to each VA medical facility in order to ensure compliance with this directive. To ensure each VA medical facility in the VISN is in compliance with this directive, the VISN Director:

(a) Delegates review and interpretation of Facility Electrical Power System documentation to a qualified member of the VISN staff, including tracking of status reports regarding the installation, operation, testing, and maintenance of Facility Electrical Power Systems within the network.

(b) Ensuring each VA medical facility within each VISN completes a status verification survey once a year on or before May 1 using the survey tool found on the VHA Center for Engineering and Occupational Safety and Health (CEOSH) Web site electrical page under VA Policy and Guidance at:

http://vaww.ceosh.med.va.gov/01HE/Pages/ST_electrical_distribution.shtml#VAPolicy_Guidance. ***NOTE:*** This is an internal VA Web site that is not available to the public.

e. **Veterans Integrated Service Network Staff.** VISN staff designated by the VISN Director are responsible for reviewing and interpreting electrical power system documentation, including tracking of status reports regarding the installation, operation, testing, and maintenance of Facility Electrical Power Systems within the network. Such staff should review any requests for deviation from this and other standards on behalf of, and make recommendations to, the VISN Director.

f. **VA Medical Facility Director.** The VA medical facility Director is accountable to the respective regional or national Director (e.g., VISN or CMOP Director). The VA medical facility Director is responsible for:

NOTE: For the purpose of this directive as it applies to non-medical facilities within VHA, positions equivalent to the VA medical facility Director at affiliate sites are responsible for the following:

(1) Ensuring that the design, installation, operation, testing, and maintenance of Facility Electrical Power Systems meet or exceed The Joint Commission, NFPA, VA and other applicable requirements, and that all work on this system complies with OSHA, NFPA, and VA standards.

(2) Reviewing and providing concurrence or non-concurrence on deviations from VA and national standards requested by VA medical facility staff (typically requested by Engineering or Facilities Management). Approved deviation requests must be forwarded to the VISN Director for further review and concurrence.

(3) Approving a Utility Systems Management Plan developed by Engineering or other appropriate office which meets, or exceeds The Joint Commission, OSHA, and NFPA requirements and is approved by the VA medical facility Director or designee. See paragraph 8.k.(1).

(4) Approving exceptions for when electrical equipment that typically must be secured can remain unsecured.

(5) Allocating the appropriate resources (funds, training, equipment and qualified personnel) to achieve compliance.

(6) Authorizing only qualified staff at the VA medical facility and qualified electrical contract professionals to execute any design, installation, operation, testing, and maintenance of the Facility Electrical Power System in accordance with The Joint Commission and NFPA requirements and that all work on these systems is compliant with OSHA standards.

(7) Approving a management system, developed and implemented by Engineering and Safety staff, to ensure that work on energized equipment does not take place without the VA medical facility Director's prior knowledge and written approval; ensuring this information is disseminated to VA medical facility Service Line Chiefs.

(8) Ensuring that electrical hazards (including arc flash and shock) are analyzed and identified per NFPA and OSHA requirements (see paragraph 7 for additional information on analysis requirements).

(9) Ensuring that appropriate actions are taken to correct deficiencies found in the Facility Electrical Power System.

(10) Overseeing the development and implementation of written procedures which prepare the VA medical facility for a planned electrical outage and ensuring that such procedures are communicated and disseminated to Service Line Chiefs.

(11) Ensuring a testing plan for Ground Fault Circuit Interrupters (GFCI) by which each GFCI is in place. Where there are not enough staff to keep up with the volume of GFCI that need to be tested, the VA medical facility Director may approve testing at less frequent intervals in this circumstance. (See paragraph 8.j.(7).)

(12) Certifying the survey which is a report of status indicating VA medical facilities are in compliance with the required maintenance and testing of the Facility Electrical Power System. See http://vaww.ceosh.med.va.gov/01HE/Pages/ST_electrical_distribution.shtml#VAPolicyGuidance. **NOTE:** *This is an internal VA Web site that is not available to the public.*

(13) Delegating, in writing, authority for the VA medical facility Chief Engineer to approve an energized electrical work plan for non-patient care Branch Circuits (see paragraph 8.h.(5)(b)).

(14) Ensuring that transformers and other electrical equipment, including all related components, are inspected, tested, and maintained every 36 months. (See paragraph 8.j.(5-6).)

g. VA Medical Facility Chief Engineer. The VA medical facility Chief Engineer is responsible for:

(1) Ensuring the design, installation, operation, testing, and maintenance of Facility Electrical Power Systems meets or exceeds The Joint Commission, NFPA, VA and other applicable requirements and that all work on this system complies with OSHA, NFPA, and VA standards, as delegated from the VA medical facility Director. Ensures information related to electrical system maintenance, testing and operation is communicated to Service Line Chiefs.

(2) Developing concurrence/non-concurrence documentation for any deviations from VA and national standards. This includes obtaining VA medical facility Director concurrence/non-concurrence for such deviance/variation requests, ensuring approved deviance requests are forwarded to the VISN for further review and concurrence and notifying OCAMES of pending deviance/variation requests.

(3) Approving an energized electrical work plan for Branch Circuits when delegated from the VA medical facility Director or CMOP Director (see paragraph 8.h.(5)(a) for

work plan information), and completing a risk assessment that indicates energized electrical work will not affect patient care and the work qualifies for one of the three NFPA 70E/OSHA exceptions (see paragraph 8.h.(3)(a-c) for exception information).

(4) Assigning a person as overwatch when energized work is being performed.

(5) Conducting a risk assessment when a planned electrical outage cannot be accomplished to determine if the work qualifies as meeting one of the three exceptions in NFPA 70E and OSHA which allow energized work (see paragraph 8.h.(3)(a-c) for additional information on the exceptions).

(6) Certifying the annual survey which is a report of status indicating that the VA medical facility is in compliance with this directive. The survey can be found here: http://vaww.ceosh.med.va.gov/01HE/Pages/ST_electrical_distribution.shtml#VAPolicy_Guidance. **NOTE:** *This is an internal VA Web site that is not available to the public.*

h. **Service Line Chiefs.** Service Line Chiefs located at the VA medical facility or other affiliate sites are responsible for:

(1) Communicating regularly with the VA medical facility Director in order to receive the plans and any additional information pertaining to planned electrical outages and planned work on electrical equipment.

(2) Working closely with the VA medical facility Chief Engineer to ensure information related to electrical system maintenance, testing and operation is communicated.

i. **VA Medical Facility Engineering Staff.** Engineering staff located at the VA medical facility or affiliate sites are responsible for:

(1) Designing, installing, operating, testing, and maintaining of Facility Electrical Power Systems to meet or exceed The Joint Commission, NFPA, VA and other applicable requirements and to perform all work on this system so as to comply with OSHA, NFPA, and VA standards.

(2) Developing and conducting a peer review of a specific energized work plan before initiating work. (See paragraph 8.h.(4)(c).)

(3) Developing a Utility Systems Management Plan which meets or exceeds The Joint Commission, OSHA, and NFPA requirements.

6. APPLICABILITY OF THIS DIRECTIVE

a. The Facility Electrical Power System includes the Premises Wiring and that portion of the Electrical Power Production and Distribution Network (both as defined in NFPA 70) owned by VHA. This directive applies:

(1) To work on all VA medical facilities and affiliate sites owned, operated, or maintained by VHA.

(2) To work performed by any type of funding to include, but not be limited to, major construction, minor construction, non-recurring maintenance (NRM), Clinical Specific Initiatives (CSI), energy projects (e.g., Energy Savings Performance Contract (ESPCs), Research-funded, Office of Information and Technology projects, donated VA medical facilities (i.e., Fisher Houses, Public-Private Partnerships) and general maintenance, repair and replacement funded by VA medical facilities funds (i.e., applies regardless of funding source).

(3) To all facets of work on the Facility Electrical Power System to include, but not limited to, design, installation, construction, testing, and maintenance.

(4) To all work, including that performed by VA contractors as well as that performed by VA in-house (hired labor) personnel.

b. This directive does not apply to those leased VA medical facilities in which the installation, construction, testing, and maintenance of the Facility Electrical Power System is completely the responsibility of the lessor. Leased VA medical facilities must at a minimum comply with all local, State, and national codes and standards subject to review and oversight by VA personnel.

c. This directive does not apply to the equipment plugged into the Facility Electrical System. Such equipment is covered by other standards, for example, the use of Relocatable Power Taps in accordance with NFPA 99, *Health Care Facilities Code*, Chapter 10.2.

7. SAFETY

The VA medical facility or affiliate site analyses and identifies electrical hazards, arc flash, and shock. The analysis, identification, and notification include the following:

a. **Shock Hazard Analysis.** The shock hazard analysis determines the voltage(s) to which personnel will be exposed, the boundary requirements, and the personal protective equipment (PPE) necessary to minimize the possibility of electrical shock to personnel.

b. **Arc Flash Hazard Analysis.** An arc flash hazard analysis determines the arc flash protection boundary and the PPE required for employee protection within the arc flash protection boundary. **NOTE:** *Regularly updating the preceding analyses, labeling and reports to ensure accuracy and reflect current VA medical facility conditions, including additions, upgrades and other changes that occurred following completion of the previous analyses. Arc Flash risk assessment must be reviewed at least every 5 years and updated as changes mandate. The shock hazard and arc flash hazard analyses, along with any subsequent system labeling or output reports, must comply with the requirements outlined in NFPA 70E and Institute of Electrical and Electronics Engineers (IEEE) Standard 1584.*

c. **Labelling Low Incident Energy Devices.** Electrical devices or equipment, such as disconnect switches and small electrical enclosures may be assumed to have negligible arc flash risk if energized by circuits meeting the appropriate exception(s) put forth in the current edition of IEEE 1584.

(1) Labels shall include verbiage such as “Exempt from Arc Flash Risk Assessment IAW IEEE 1584,” the voltage and the corresponding PPE for the shock hazard (e.g., Class 00 Gloves).

(2) Electrical devices, equipment and appurtenances within the specifications for the IEEE 1584 exclusion and for which the amperage and voltage are apparent based on physical appearance; arc-flash warning labels are not required. Examples of devices not requiring labels include 110v-receptacles, light switches, grounding points, thermostats, and light fixtures.

d. **Securing Electrical Equipment.** Electrical equipment must be secured to ensure access is limited to qualified persons. For example, electrical panels located in corridors or other public areas are to be locked, rooms housing electrical equipment must be locked. Exceptions, where the electrical equipment must remain unsecured, must be approved by the VA medical facility Director or designee. Designated personnel requiring access to the equipment must be trained on the specific tasks required in order to be considered a “Qualified Person” for the purpose of the specific task. See paragraph 3.(h) for additional information.

8. IMPLEMENTATION

a. Proactive planning for replacement, upgrades, and modernization of the Facility Electrical Power System must be part of the VA medical facility master plan. Respective projects must be incorporated into the Strategic Capital Investment Program (SCIP) or other project prioritization and funding process as appropriate.

b. The Facility Electrical Power System, including system modifications, additions and upgrades, must be designed by licensed professional engineer(s) (i.e., electrical engineer or architectural engineer with electrical system emphasis). **NOTE:** *Replacement, repair, or other minor work that is by its nature does not require design work can be performed by the qualified person without a design professional.*

c. Design for upgrades, modifications, additions, installation and new construction must be in accordance with all applicable national codes and standards, to include but not limited to those listed in paragraph 2 of this directive and in accordance with applicable VA guide specifications, design guides, and design manuals as found in the Office of Construction and Facilities Management Technical Information Library (TIL) located at: <http://www.cfm.va.gov/TIL/>.

(1) Modifications, additions, installations and new construction designed by a professional engineer must include selective coordination calculations for parts of the system affected, time current curves, and arc flash hazard analysis (to include arc flash hazard warning labels for new or affected equipment).

(2) Coordination requirements unique to VA medical facilities and affiliate sites found in NFPA 70, Art 517 and in NFPA 99, Chapter 6 must be followed.

d. Written procedures are established by the VA medical facility Director to prepare the VA medical facility for a planned electrical outage. The procedures must account for the worst case of risk to patients, staff, visitors, and VA property.

e. The Facility Electrical Power System is supplied from the Utility Power Company (UPC). A second source independent from the UPC, a second utility service feed, must be provided for Mission Critical VA medical facilities and affiliate sites, unless technically or economically not feasible (an example of an alternative would be 100 percent generator backup power). This second independent source should be derived from a separate substation, if feasible. Variances or alternatives to this requirement must be submitted to OCAMES for approval by the Deputy Under Secretary for Health for Operations and Management. **NOTE:** *Onsite power generation (e.g., CHP, PV) does not preclude the need for electrical service from an UPC.*

f. **Isolated Power Systems.** NFPA 99, Health Care Facilities Code, requires that operating rooms be considered Wet Procedure Locations unless risk assessments approved by the AHJ demonstrate otherwise. Wet Procedure Locations require special protection against shock; the VA standard for such special protection against shock are isolated power systems which must comply with NFPA 99, VA Electrical Design Manual and VA specifications for Isolated Power Systems. **NOTE:** *These requirements for isolated power systems supersede VHA Directive 2008-011, Electrical Safety Policy for Patient Care Equipment, dated March 10, 2008.*

g. **Emergency Power and Essential Electrical Systems.**

(1) Where required by NFPA 70, NFPA 99, or NFPA 101, emergency power must be provided in the form of diesel generators. Where required only for life safety or egress, such emergency power shall comply with Article 700 of the National Electrical Code (NFPA 70) and with the Life Safety Code. Where emergency power is required for VA medical facilities and affiliate sites, an EES in compliance with the National Electrical Code Article 517 Part III and with NFPA 99 must be provided. The VA medical facility EES must include the following:

(a) An alternate source of power and ancillary equipment.

(b) A minimum of two independent sources of power: a normal source generally supplying electrical power to the entire Facility Electrical Power System, and one or more alternate sources for use when the normal source of power is interrupted. The alternate source must be one or more emergency diesel generator(s) located on the VA medical facility or affiliate site property.

(c) Separate Life Safety, Critical and Equipment branches. Exact configuration must comply with requirements for Type 1 or Type 2 EES, as appropriate.

(2) The EES may also be used to fulfill requirements for Life Safety and egress (rather than requiring a separate system solely for life safety and egress). **NOTE:** *When the alternate source requirements are sufficiently small, a stored energy (battery) supplied source, in accordance with NFPA 111, may be considered.*

(3) Full campus stand by emergency power must be considered and provided when feasible. The VA Physical Security Design Manual establishes 100 percent backup of mission critical loads as the standard.

(4) All in-service generators regardless of whether for EES, egress and life safety or standby must meet requirements of NFPA 110 for installation, testing, and maintenance.

(a) Trailer-mounted or other mobile generators connected to a VA medical facility must be tested in accordance with NFPA 110.

(b) Mobile generators, not presently connected to a VA medical facility load, are not required to meet monthly testing requirements, but require initial installation testing and commissioning prior to use by the engineering team.

h. De-energized and Energized Work.

(1) All electrical work is executed with all proximate energized circuits de-energized as the standard. The process for establishing and verifying an electrically safe work condition as described in NFPA 70E must be followed to ensure electrical equipment is de-energized. It is the intent of this directive to make planned electrical system shutdowns for maintenance or repair the standard operating procedure, not the exception.

(2) Until all steps of establishing and verifying an electrically safe work condition have been successfully completed, the electrical circuit, devices, and equipment must be assumed to be energized and all corresponding precautions must remain in place. This must include continued wear of appropriate personal PPE.

(3) When a planned electrical outage cannot be accomplished, a risk assessment must be conducted in accordance with NFPA 70E by the Chief Engineer to determine if the work qualifies as meeting one of the three exceptions in NFPA 70E and OSHA which allow energized work:

(a) Infeasibility.

(b) Greater hazard or risk.

(c) Work at less than 50 volts.

(4) If, based on the risk assessment, work on energized electrical system components cannot be avoided, the following requirements are required for performing such energized work:

(a) Full and proper PPE is available and worn by the qualified persons performing the work. PPE includes, but is not limited to, appropriate clothing, eye protection, face protection, hearing protection, gloves, certified and tested insulating material to cover exposed energized electrical components, and certified and tested insulated tools.

NOTE: Refer to the NFPA 70E, for selection and wear of the appropriate PPE.

(b) Qualified persons (e.g., electricians) are provided with the appropriate PPE, including arc-rated (AR) clothing. The appropriate PPE is to be determined in accordance with requirements of NFPA 70E which include assessment of the voltage, incident energy, and PPE category.

(c) Before initiating work, a specific written energized work plan is developed and a peer review of the plan documented by those completing the work within the engineering team. The written work plan must include:

1. Procedures to be used on and near the energized electrical equipment, barriers to be installed, specific PPE to be used, safety equipment to be provided, contingency plan if the work is not completed, identify the “point of no return” after which the work must be completed, and exit paths to be accessed.

2. Energized work is only to be accomplished by qualified persons as defined in NFPA 70E (see paragraph 3).

3. An Energized Electrical Work Permit must be obtained by those performing the work from the appropriate Office (typically within Engineering or Safety service). The Energized Electrical Work Permit must include Elements of Work Permit identified in NFPA 70E.

(5) Any energized electrical work must have the prior knowledge and approval of the VA medical facility Director.

(a) The Chief Engineer may approve an energized electrical work plan for Branch Circuits (i.e., those circuits and components thereof from the final overcurrent protecting devices to the outlets) that do not serve patient care areas (including but not limited to operating rooms, surgery/procedure rooms, critical care, intensive care, inpatient rooms, dialysis units, isolation rooms, catheterization laboratories, Emergency Rooms, or sterile processing areas).

(b) Such authority must be delegated to the Chief Engineer from the VA medical facility Director in writing, and a risk assessment must be completed which indicates the work will not affect patient care and that the work qualifies for one of the three NFPA 70E/OSHA exceptions allowing for energized work.

(6) Energized work must not be performed alone; that is, in addition to the qualified person performing the energized work, a person must be assigned as overwatch by the Chief Engineer (or designee). The overwatch must be a qualified person for the duties assigned.

(7) Specific limited electrical work (e.g., testing, troubleshooting, voltage measuring, thermography, inspection) may be performed without an energized work permit, if it meets and is performed in accordance with NFPA 70E article on Exemptions to Work Permit. Only the tasks specifically identified can be allowed under these exemptions and then only if performed by a qualified person who is provided with and uses safe work practices and PPE per NFPA 70E.

(8) Even when an electrical device does not have an arc-flash hazard warning label, work must, with limited exceptions allowed by NFPA 70E, only be done when that device is de-energized and an electrically safe work condition is achieved. If energized work is required, proper PPE and tools must be used as even in the absence of arc-flash hazard, other electrical hazards such as shock and burns may still be encountered.

i. Installation and Construction.

(1) All installation of electrical power system, equipment and components thereof, regardless if part of a project, construction, renovation, alteration, equipment installation, maintenance, repair or any other comparable effort, must be in accordance with this directive, national Codes and Standards (to include but not limited to, those listed in paragraph 2), VA guide specifications, and any applicable VA medical facility standard operating procedures.

(a) Existing electrical equipment, including conduits and conductors, must be removed when replaced or otherwise no longer in service. Equipment, particularly conduits and conductors should not be abandoned in place.

(b) In addition to the requirements above, installation on leased (non-U.S. Government property) must also comply with local and State codes. If conflicts arise, the most stringent codes and requirements must be used.

(2) All installation of Facility Electrical Power Systems, equipment, and components thereof must be performed by licensed journeyman or master electricians. VA in-house staff with equivalent experience and training, but without license, will be considered qualified in this regard (for work on Government property). All apprentice or unlicensed electricians will be deemed unqualified persons unless they are working under the immediate supervision of a licensed journeyman, master electrician or otherwise qualified VA electrician.

(a) In addition to the requirements above, VA electricians working on non-U.S. Government property (e.g., leased property) must also be licensed in accordance with local and State licensure requirements.

(b) Modifications, additions, installations, and new construction designed by a professional engineer must include selective coordination calculations for parts of the system affected, time current curves, and arc flash hazard analysis (to include arc flash hazard warning labels for new or affected equipment).

(c) Inspection and acceptance by VA staff of electrical construction or installation work requires that VA staff have the level of training of a licensed engineer or electrician. If VA staff do not have these qualifications, then VA staff must have the work inspected by an Architect-Engineer (AE) with a professional electrical engineering license or by a licensed electrician.

j. **Testing and Maintenance.**

(1) Where there are two sources of power supplies (two utility service feeds) coming from the UPC, a test of the VA-owned tie-circuit breaker or transfer switch for such system is conducted by engineering staff every 36 months. This test is to be coordinated with the UPC in advance; as a minimum the UPC is to be notified if the test impacts utility loads.

(2) The EPSS (whether EES, emergency or standby power systems), including all related components, such as Automatic Transfer Switches and emergency generators, must be inspected weekly by engineering staff, per NFPA 110. The EPSS, including all related components, is exercised under load at least monthly, for a minimum of 30 minutes, in accordance with the requirements of The Joint Commission, NFPA 99, and NFPA 110. **NOTE:** *The Joint Commission requires that the test be conducted under dynamic load and that the 30 minutes should not begin until the generator has reached operating temperature conditions. Mobile generators, not presently connected to a VA medical facility load, are not required to meet monthly testing requirements, but would require initial installation testing and commissioning prior to use.*

(a) NFPA 99 requires that Type 1 and Type 2 EES provide power to the life safety and critical branches within 10 seconds after interruption of power. Monthly tests results must document the transfer times for restoration of power.

(b) While this document is to be provided in hard copy, electronic metering and recording of transfer times is acceptable and should be given consideration.

(3) If the monthly EPSS tests cannot exercise the generators at 30 percent load or acceptable stack exhaust temperature, an annual test must be conducted using supplemental load banks. Such test must meet applicable requirements of NFPA 99, NFPA 110, and The Joint Commission.

(4) A test of the Essential Electrical System (or other Level 1 EPSS, as defined in NFPA 110) that lasts for 4 hours continuously must be planned and executed every 36 months, in accordance with the requirements of NFPA 99 and NFPA 110. This test must meet The Joint Commission requirements to be under load of at least 30 percent of the nameplate load. Locations at high altitude where generator capacity is to be derated, 30 percent of the derated generator capacity should be used (versus 30 percent of the nameplate value). **NOTE:** *The Joint Commission requires a 4-hour generator test under load (dynamic or static) that is at least 30 percent of the nameplate rating of the generator once every 36 months. If a VA medical facility's generator requires an annual load bank to comply with EC.02.05.07 EP 5, it will also require a*

load bank every 36 months for 4 hours to comply with EC.02.05.07 EP 8. It is important to note the annual load bank only exceeds 30 percent for 1.5 hours.

(a) This test must meet two objectives:

1. EES/EPSS Response. A thorough test of the EES/EPSS initiated by a loss of utility normal power.

2. Facility Staff Response. A thorough test of the VA medical facility staff's ability to operate while restricted only to the EES/EPSS. Clinical staff in all patient care areas must regularly participate in power failure drills when scheduled to coincide with testing requirements to include the use of back up equipment (manual monitoring). Additional simulation-based drills for power failure events for staff in critical care areas such as the ICU and the operating room are recommended, particularly in cases of high staff turnover.

(b) This test requires coordination with the local UPC. The main electrical switch, owned by the local UPC that serves the VA medical facility, must be opened to create a total electrical power outage. This switch is to remain opened for a minimum of 4 hours continuously. During this time, the VA medical facility's engineering staff must test, inspect, and record the operation of the EES/EPSS including all related components. If the utility connection cannot be opened, approval of any alternative simulation must be approved by OCAMES or by the Deputy Under Secretary for Health for Operations and Management.

1. Deficiencies found in the EES/EPSS must be recorded promptly and corrected in a timely manner.

2. This test may be incorporated into the VA medical facility-wide disaster drills required by The Joint Commission. Moreover, an unscheduled VA medical facility power outage of at least 4 hours continuous duration may be documented and considered the equivalent of the EES/EPSS test, providing that all requirements listed in paragraph 8.j.(4) are otherwise met.

3. Testing, maintenance, and exercising of the EES/EPSS, including all related components, must be executed to meet the requirements of NFPA 99 and NFPA 110, whichever is more stringent.

4. All risks to the patients, staff, visitors, and VA property is mitigated with proper planning prior to any test of the EES/EPSS and with safe execution during the test period. Individual VA medical facilities and affiliate sites with a significant rate of key staff turnover, absence of key staff during the most recent test, significant incidents during the most recent test, significant modifications to the Facility Electrical Power System, significant modifications or seasonal variation to the electrical loads, may consider more frequent testing of the EES/EPSS.

(5) Transformers, including all related components, are inspected, tested, and maintained every 36 months. The following is a minimum list of items to be inspected, tested, and maintained:

1. Transformers must be cleaned exteriorly, inspected for signs of overheating with infra-red thermal detecting equipment, and inspected for any damage to the housing, connection points, or insulation.

2. Liquid cooled transformers must have the cooling liquid tested and replaced, when tests indicate that the liquid no longer meets manufacturer's specification. The liquid must be re-filled to meet the manufacturer's specification.

3. Dry type transformers must be thoroughly cleaned exteriorly and inspected for overheating with infra-red thermal detecting equipment.

(6) Electrical equipment (including, but not limited to switchgears, switchboards, distribution panels, motor control centers, and all related components) is inspected, tested, maintained, or calibrated every 36 months, and all work must be documented.

NOTE: *The National Electrical Testing Association (NETA) provides guidance which is considered best practice for the maintenance of electrical equipment; these practices should be followed to the extent possible.*

(a) Use lint-free rags to clean conductors, contact points between the circuit breakers and main buss bars, buss bars and interior of the electrical equipment. Use a vacuum cleaner to remove large debris; compressed air is not to be used for this purpose. Visually inspect for signs of overheating, misaligned contacts, damaged insulation, or loose lugs.

(b) Lubricate all moving parts with manufacturer's approved lubricants.

(c) Test and exercise circuit breakers located in switchgears, switchboard, and distribution panels to ensure operation under overload, and short circuit conditions.

NOTE: *All molded case circuit breakers (including frames size 225 amps or less) must be tested to determine if contacts open and reclose when breaker is manually tripped and restored. All panels are to be tested including emergency panels. If no failures are encountered and the test is fully documented, the interval between molded case breaker testing may be up to but not to exceed 36 months between successive tests.*

(d) Test ground fault protection devices for proper function if they are installed in the Facility Electrical Power System.

(e) Inspect and tighten ground connections. Test ground resistance for the entire facility grounding system. Any method of ground resistance must be considered acceptable if it can verify continuity and quantify the impedance to ground, to include but not limited to fall-of-potential, induced frequency and clamp on testing. If initial tests

indicate a problem or concern (e.g., ground resistance greater than 25 ohms), a more detailed test must be performed using fall-of-potential or 3-point test. Where installed, the lightning protection system must be inspected and tested for continuity to ground, ground resistance and certification in accordance with Underwriters Laboratory (UL) standard 96A.

(f) Identify the hot spots in the electrical equipment by using infra-red thermal detecting equipment. Tighten problem connections to meet equipment manufacturers' specification using a torque wrench or other approved devices.

(g) Calibrate and maintain adjustable protective relays.

(h) Test all control systems equipment for proper operation after maintenance is performed and before placing them back in normal service.

(7) Ground Fault Circuit Interrupters (GFCI). Code and standards require that GFCIs (receptacles or overcurrent protective devices (e.g., circuit breakers)) be tested per manufacturer's instruction. Testing of such should be performed accordingly. However, if the sheer volume of GFCIs present an unreasonable burden for testing to the frequency recommended by the manufacturer (which is typically monthly), the VA medical facility Director may approve a testing plan by which each GFCI is tested at less frequent intervals; in no case will each GFCI have a documented test less than once per year.

(a) Testing results must be documented in the Engineering Office and be available for inspection.

(b) Self-Testing GFCI Receptacles are considered an acceptable form of periodic testing for the purpose of this directive, *as allowed by the manufacturer*. Documentation that the receptacles are self-testing must be maintained and available for inspection.

NOTE: Paragraph 8.j.(5) thru (6) are typically done by qualified electrical contract professionals who specialize in electrical testing. For the Statement of Work, go to the Web site at: http://vawww.ceosh.med.va.gov/sow_ElectPowDistSysTesting.Doc. This is an internal VA Web site that is not available to the public.

k. Administration and Documentation.

(1) A Utility Systems Management Plan is developed by the engineering staff which meets, or exceeds The Joint Commission, OSHA, and NFPA requirements and is approved by the VA medical facility Director or designee.

(2) All work related to the inspection, testing, maintenance, and calibration is documented, and filed appropriately and engineering staff ensures copies are sent to the respective VISN upon completion.

(a) As a minimum, a report of status indicating VA medical facilities and affiliate sites are in compliance with the required maintenance and testing of the Facility Electrical

Power System, outlined in paragraph 8.j., is submitted once a year on or before May 1. This report must be submitted using the survey tool found on the VHA Center for Engineering and Occupational Safety and Health (CEOSH) Web site Electrical page under VA Policy and Guidance at:

http://vaww.ceosh.med.va.gov/01HE/Pages/ST_electrical_distribution.shtml#VAPolicyGuidance. **NOTE:** *This is an internal VA Web site that is not available to the public.*

(b) Compliance is assessed once a year by each VA medical facility completing the web-based survey referenced in 5.f.(12) no later than May 1. This survey requires certification by the facility Chief Engineer and the VA medical facility Director.

9. TRAINING

a. The following training is required by NFPA 70E for those employees exposed to electrical hazards, including shock and arc flash. Such employees include electricians and possibly other trades depending on their duties. Examples include but are not limited to HVAC technicians, Utility System Repair Operators and those supervising such trades. A brief description of the training requirements appears below. Refer to NFPA 70E for additional information about the required training. See details on the various training requirements by topic under the Designated VHA Employees tab on the following site: <https://myees.lrn.va.gov/Learn/Mandatory%20Training.aspx>. **NOTE:** *This is an internal VA Web site that is not available to the public.*

(1) **Electrical Safety Training.** This training will be provided to employees exposed to an electrical hazard when the risk associated with that hazard is not reduced to a safe level by the applicable electrical installation requirements. Retraining in safety-related work practices and applicable changes to NFPA 70E must be performed at intervals not to exceed 3 years. When supervision indicates remedial training is required, when duties change or tasks performed less than once per year are required, and when new technology or equipment necessitate new work practices.

(2) **Lock Out Tag Out.** Employees involved or affected by Lockout/Tagout (LOTO) procedures will receive initial training in LOTO procedures and their responsibilities in the execution of such procedures. Retraining must occur when LOTO procedures are revised, when supervision indicates remedial training is warranted for an employee and at intervals not to exceed 3 years.

(3) **Emergency Response Training.** Employees exposed to shock hazards and those responsible for the safe release of victims from contact with energized electrical conductors or circuit parts will be trained in methods of safe release. Refresher training on contact release must occur once a year for those personnel. Employees responsible for responding to medical emergencies must be trained in first aid, emergency response resuscitation (including CPR and AED) and training must occur at a frequency that satisfies the requirements of the certifying body.

b. **User Specific Training.** VA medical facility personnel required to access and perform limited operations on the Facility Electrical System must be trained on those

specific tasks in order to be qualified to perform the tasks in accordance with NFPA 70E and OSHA standards. Examples might include resetting a circuit breaker on a panelboard or flipping a switch. Personnel with such limited tasks do not require the full training identified in Paragraph 9.a. above. The requirements and responsibility of such training will be determined and assigned by the functional user within the local facility.

c. **Documentation of Training.** Training must be documented for each individual desired to be qualified person. Documentation for each qualified person must be readily available for inspection and review.

10. RECORDS MANAGEMENT

All records regardless of format (e.g., paper, electronic, electronic systems) created in this directive shall be managed per the National Archives and Records Administration (NARA) approved records schedules found in VA Records Control Schedule 10-1. Questions regarding any aspect of records management should be addressed to the appropriate Records Manager or Records Liaison.

11. REFERENCES

- a. Executive Order 12196, dated February 26, 1980.
- b. 38 U.S.C. 7301(b).
- c. 40 U.S.C. 3312.
- d. VHA Directive 2008-011, *Electrical Safety Policy For Patient Care Equipment*, dated March 10, 2008.
- e. NFPA 70, National Electrical Code, Latest Edition.
- f. NFPA 70B, Recommended Practice for Electrical Equipment Maintenance, Latest Edition.
- g. NFPA 70E, Standard for Electrical Safety in the Workplace, Latest Edition.
- h. NFPA 99, Health Care Facilities Code, Latest Edition.
- i. NFPA 101, Life Safety Code, Latest Edition.
- j. NFPA 110, Standard for Emergency and Standby Power Systems, Latest Edition
- k. NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems, Latest Edition.
- l. The Joint Commission Accreditation Manual for Hospitals, Latest Edition.
- m. OSHA - Occupational Safety and Health Requirements Part 1910 Subpart J - The control of hazardous energy (lockout/tagout) (1910.147).

n. OSHA - Occupational Safety and Health Requirements Part 1910 Subpart S - Electrical (1910.301 - 1910.399).

o. OSHA - Safety and Health Regulations for Construction Part 1926 Subpart K - Electrical (1926.400 - 1926.449).

p. CEOSH. The General Safety Guidebook, Latest Edition at: <http://vaww.ceosh.med.va.gov/01HP/pages/guidebooks.shtml>. **NOTE:** *This is an internal VA Web-site that is not available to the public.*

q. Institute of Electrical and Electronics Engineers (IEEE) Std 1584 Guide for Performing Arc-Flash Hazard Calculations, latest edition as incorporated into NFPA 70E.

r. National Electrical Testing Association Maintenance Testing Specifications (via CEOSH Website: http://vaww.ceosh.med.va.gov/01CS/Pages/ASSE_Membership_Warning.shtml). **NOTE:** *This is an internal VA Web site that is not available to the public.*

s. Statement of Work: Maintenance and Testing of the Electrical Power Distribution System. Contracting Tools on the CEOSH Web site at: http://vaww.ceosh.med.va.gov/01HE/Pages/ST_electrical_distribution.shtml#Contracting. **NOTE:** *This is an internal VA Web site that is not available to the public.*

t. UL 96A, Standard for Lightning Protection. http://vaww.ceosh.med.va.gov/01HE/02HE_Standards/03HE_UL/UL_96A.pdf. **NOTE:** *This is an internal VA Web site that is not available to the public.*

u. VA Physical Design Manual (latest edition): https://www.index.va.gov/search/va/va_search.jsp?ST=1&QT=&EW=Physical+Security+Design+Manual&AT=&ET=&SQ=www.cfm.va.gov%2Ftil&FF=&RPP=10&DB=8&DB=2&DB=4&DB=6&DB=1&DB=7&DB=3&DB=5&DB=9&DB=10&DB=11.