Department of Veterans Affairs **VHA DIRECTIVE 2006-056**
Veterans Health Administration
Washington, DC 20420 **October 16, 2006**

ELECTRICAL POWER DISTRIBUTION SYSTEM

1. PURPOSE: This Veterans Health Administration (VHA) Directive provides guidance on policy regarding the installation, operation, testing, and maintenance of the Electrical Power Distribution System at VHA facilities.

2. BACKGROUND

a. VHA and the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) have adopted the National Fire Protection Association (NFPA), National Electrical Code (NFPA 70), Recommended Practice for Electrical Equipment Maintenance (NFPA 70B), Standard for Electrical Safety Requirements for Employee Workplaces (NFPA 70E), Standard for Health Care Facilities (NFPA 99), and Life Safety Code (NFPA 101) as the basis for the requirements of the design, installation, operation, testing, and maintenance of the Electrical Power Distribution System at VHA facilities.

b. JCAHO's Environment of Care (EC) standards require written Utility Systems Operational Plans. The Electrical Utility System Operational Plan must assure reliability, control risks, reduce failures, and train users/operators of the Electrical Power Distribution System.

c. Occupational Safety and Health Requirements (OSHA) – Part 1910 Subpart J – The control of hazardous energy (lockout/tagout) (1910.147), Occupational Safety and Health Requirements Part 1910 Subpart S – Electrical (1910.301 – 1910.399), and Safety and Health Regulations for Construction Part 1926 Subpart K – Electrical (1926.400 – 1926.499) must apply.

d. Working on energized electrical equipment is inherently dangerous to patients, staff, visitors, and VHA property. Such actions, if unplanned or poorly executed, can result in disruption of operations, injuries, loss of life and/or property.

3. POLICY: It is VHA policy that the Electrical Power Distribution System must operate in a safe, reliable, and efficient manner, recognizing its importance and potential danger; and is in compliance with JCAHO, OSHA, and NFPA electrical standards.

4. ACTION

a. **Network Director.** The Network Director is responsible for ensuring that installation, operation, testing, and maintenance of the Electrical Power Distribution System meets or exceeds JCAHO and NFPA requirements, that all work on this system complies with OSHA standards, and that appropriate resources are provided to assure compliance.

THIS VHA DIRECTIVE EXPIRES OCTOBER 31, 2011

b. **Facility Director.** The facility Director is responsible for ensuring that:

(1) Only qualified senior staff at the facility and/or qualified electrical contract professionals are authorized to execute any design, installation, operation, testing, and maintenance of the Electrical Power Distribution System in accordance with JCAHO and NFPA requirements and that all work on these systems is compliant with OSHA standards.

(2) Appropriate actions are taken to correct deficiencies found in the Electrical Power Distribution System.

(3) A management system is developed and implemented so that work on energized equipment does not take place without the facility Director's prior knowledge and approval.

(4) All electrical work is executed with all proximate energized circuits de-energized. It is the intent of this directive to make planned electrical system shutdowns for maintenance/repair the standard operating procedure, not the exception.

(5) Written procedures are established to prepare the medical center for a planned electrical outage. The procedures must take into account the worst case of risk to patients, staff, visitors, and VHA property. When a planned electrical outage cannot be accomplished, the following requirements are mandatory for working on energized circuit:

(a) Full and proper protective equipment (PPE) is available and worn by the qualified electricians (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools). ***NOTE:*** *Refer to the NFPA 70E, and General Safety Guidebook for guidance on the appropriate PPE.*

(b) Qualified electricians are provided with flame-retardant clothing for work at the proximity of energized electrical equipment.

(c) Before initiating work, a specific work plan is developed and a peer review of the plan documented.

1. The work plan must include: procedures to be used on and near the energized electrical equipment, barriers to be installed, safety equipment to be provided, and exit paths to be accessed.

2. An Energized Circuit Work Permit must be obtained from the Safety Office.

3. Any energized electrical work plan must have the prior knowledge, and approval of the Medical Center Director. ***NOTE:*** *However, the Chief of Engineering Service may approve energized electrical work plan for Branch Circuits, from the final overcurrent protecting devices to the outlets, that do not serve the critical patient care areas, such as Surgery Rooms, Critical Care, Intensive Care, Dialysis Units, Isolation Rooms, Catherization Laboratories, Emergency Rooms, or Supply, Processing, and Distribution (SPD) rooms.*

(6) An Electrical Distribution Operational Plan (EDOP) is developed which meets, or exceeds JCAHO, OSHA, and NFPA requirements.

(7) EDOP is approved.

(8) The Electrical Power Distribution System is supplied by a source of power from the Utility Power Company (UPC). A second independent source from the UPC, referred to as utility redundant feed, should be considered only when utility power reliability is proven to be questionable or it can be justified as cost effective.

(9) Where there are two sources of power supplies (Primary and Redundant Feeds) coming from the UPC, a test is coordinated with the UPC to maintain the tie-circuit breaker, or transfer switch for such system every 36-months.

(10) That where required by NFPA 70, NFPA 99, and NFPA 101, an Essential Electrical System (EES) is provided for each building.

(a) EES consists of alternate source of power, all connected electrical power distribution systems, and ancillary equipment.

(b) The EES must have a minimum of two independent sources of power: a normal source generally supplying electrical power to the entire Electrical Power Distribution 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 low voltage (600 volts or less) emergency generator(s) located on the facility property. ***NOTE:*** *When the alternate source requirements are sufficiently small, a stored energy (battery) supplied source may be considered.*

(11) The EES, including all related components, such as Automatic Transfer Switches and emergency generators, is inspected weekly.

(12) The EES, including all related components, is exercised under load at least monthly, for a minimum of 30 minutes, in accordance with the requirements of NFPA 99 and NFPA 110.

(13) A test of the EES is planned and executed every 36 months that lasts for 4 hours continuously, in accordance with the requirements of NFPA 99 and NFPA 110. ***NOTE:*** *All risks to the patients, staff, visitors, and VHA property must be mitigated with proper planning.*

(a) This test must meet two objectives:

1. EES Response - a thorough test of the EES initiated by a loss of utility normal power.

2. Facility Staff Response - a thorough test of the medical center staff's ability to operate while restricted only to the EES.

(b) This test requires coordination with the local UPC. The main electrical switch, owned by the local UPC that serves the medical center, must be opened to simulate a total electrical power outage. This switch is to remain opened for a minimum of 4 hours continuously. During this time, the facility's staff must test, inspect and record the operation of the EES, including all related components. Deficiencies found in the EES shall be recorded, and corrected immediately.

(c) This test may be incorporated into the JCAHO required facility-wide disaster drills. Moreover, an unscheduled facility power outage of at least 4 hours continuous duration may be documented and considered the equivalent of the EES test, providing that all requirements listed in preceding subparagraph 4b(13)(b) are met.

(d) Individual medical centers with a significant rate of staff turnover, absence of key staff during the most recent test, significant incidents during the most recent test, significant modifications to the Electrical Power Distribution System, significant modifications or seasonal variation to the electrical loads, may consider more frequent testing of the EES.

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

(14) 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:

(a) Transformers of 500 kiloVoltAmps (kVA) or larger shall be cleaned exteriorly, inspected for sign of overheating with an infra-red thermal detecting equipment, and inspected for any damages to the housing, connection points, or insulation.

(b) 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.

(c) Dry type transformers must be thoroughly cleaned exteriorly, and inspected for overheating with an infra-red thermal detecting equipment.

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

(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 sign(s) of overheating, misaligned contacts, damaged insulation, or lose 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.

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

(e) Inspect and tighten ground connections. Test ground resistance for the entire facility grounding system.

(f) Identify the hot spots in the electrical equipment by using an 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.

NOTE: *Subparagraphs 4b(15)(c), (d), (e), (f), (g), and (h) 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://vaww.ceosh.med.va.gov/sow_ElectPowDistSysTesting.Doc*

(16) All work related to the inspection, testing, maintenance, and calibration is documented, and filed appropriately with copies going to the Network Director.

5. REFERENCES

a. NFPA 70, Latest Edition.

b. NFPA 70B, Latest Edition.

c. NFPA 70E, Latest Edition.

d. NFPA 99, Latest Edition.

e. NFPA 101, Latest Edition.

f. JCAHO Accreditation Manual for Hospitals, Latest Edition.

g. OSHA - Occupational Safety and Health Requirements Part 1910 Subpart J — The control of hazardous energy (lockout/tagout) (1910.147).

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

i. OSHA - Safety and Health Regulations for Construction Part 1926 Subpart K — Electrical (1926.400 — 1926.499).

j. Statement of Work – Maintenance and Testing of the Electrical Power Distribution System. see website at: http://vaww.ceosh.med.va.gov/sow_ElectPowDistSysTesting.Doc

k. CEOSH – General Safety Guidebook, Latest Edition. see website at: http://vaww.ceosh.med.va.gov/Guidebooks/GenSafety/gensafety.htm

6. FOLLOW-UP RESPONSIBILITIES: The Director, Healthcare Engineering Office (10NB), is responsible for the content of this Directive. Questions may be referred to 202-273-5644.

7. RESCISSIONS: None. This VHA Directive expires October 31, 2011.

Michael J. Kussman, MD, MS, MACP
Acting Under Secretary for Health

DISTRIBUTION:	CO:	E-mailed 10/18/06
	FLD:	VISN, MA, DO, OC, OCRO, and 200 – E-mailed 10/18/06