

November 30, 2000

## ELECTRICAL DISTRIBUTION SYSTEMS

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

### 2. BACKGROUND

a. VA and the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) have adopted the National Fire Protection Associations' (NFPA) National Electrical Code (NFPA 70/NEC), Electrical Equipment Maintenance (NFPA 70B), Electrical Safety Requirements for Employee Workplaces (NFPA 70E), Health Care Facilities (NFPA 99), and Life Safety Code (NFPA 101) as the basis for the requirements of the design, installation, operation, and maintenance of the Electrical Distribution System at all VA 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 and operators of Electrical Distribution Systems.

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) shall apply.

d. Working on energized electrical equipment is inherently dangerous to electricians, patients, and medical facilities. Such actions can result in electrocutions, fires, unscheduled shutdowns of facilities, and emergency evacuations of patients.

**3. POLICY:** It is VHA policy that electrical distribution systems must operate in a safe and economical manner recognizing their importance and potential danger.

### 4. ACTION

a. Network Directors are responsible for:

(1) Ensuring that the facility's Electrical Distribution System meets or exceeds JCAHO and NFPA requirements, that all work on these systems is compliant with OSHA standards, that the requirements of this Directive are fully implemented, and that appropriate resources are provided to assure compliance with this directive. *NOTE: Installation, operation and maintenance of the Electrical Distribution Systems shall be performed in such a manner as to reduce risk to patients, staff, and facilities to the lowest practical level.*

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(2) Using qualified senior staff at each medical center to ensure that all components of the Electrical Distribution System are designed, installed, and maintained in accordance with JCAHO and NFPA requirements and that all work on these systems is compliant with OSHA standards. *NOTE: Where such components do not meet these requirements, appropriate corrective actions must be taken.*

(3) Developing and implementing, using qualified senior staff, an Electrical Distribution Operational Plan that meets or exceeds JCAHO, OSHA, and NEC requirements.

(4) Establishing a management system so that work on energized equipment cannot take place without the medical center Director's prior knowledge and approval.

**b. The Electrical Distribution System**

(1) The electrical distribution system must be supplied by a source of power (primary or secondary voltage) from the utility company. A second independent source should be considered only when utility reliability is questionable or it can be justified as cost effective.

(2) All new or renovated electrical work must comply with this paragraph. When required by NFPA 70/NEC, NFPA 99, and NFPA 101, medical centers must provide an Essential Electrical System (EES) for each building. The EES must have a minimum of two independent sources of power: a normal source 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 medical center property. When the alternate source requirements are sufficiently small, a stored energy (battery) supplied source may be considered.

(3) The EES must be tested at least monthly in accordance with the requirements of NFPA 99 and NFPA 110.

(4) At 36-month intervals the medical center staff must carefully plan and conduct a test of the Emergency Electrical system. *NOTE: At no time will patient, staff, visitor safety be compromised.* This test must meet two objectives:

(a) Emergency Equipment response-a thorough test of the emergency electrical system initiated by loss of normal power.

(b) Facility Staff Response- a through test of the staff's ability to operate while restricted to the emergency electrical system.

(5) In co-ordination with the local Power Company medical center staff shall open the main electrical feeders to the medical center to simulate a total electrical utility outage. This test should run a minimum of 4 hours to accomplish the above goals. *NOTE: This requirement*

*reflects the positive results of the Y2K testing.* This test may be incorporated into the JCAHO required facility-wide disaster drills. An unscheduled facility power outage of least 4 hours continuous duration may be documented and considered an equivalent of this test. Individual medical centers should consider more frequent testing if they have experienced significant staff turnover, if the majority of staff were not on duty during the most recent test, if there were significant incidents during the most recent test, if there are significant changes to the electrical distribution system, or the equipment powered by it or if there is a large seasonal variation in electrical load. The interval between testing must not exceed 36 months.

(6) Maintenance of the EES is very important to the safety of patients, visitors, and staff. Maintenance of all EES components should take place within the determined frequency intervals.

(7) Transformers and switchgear must be inspected, tested and calibrated every 36-months, as a minimum. The following is a minimum list of items to be inspected, tested and calibrated.

(a) Transformers of 500 kilovolt Amps (kVA) or larger must have the load tap changer inspected for tight connections, proper contact pressures, and signs of burning and pitting.

(b) Liquid transformers must have the cooling liquid tested and replaced when tests indicate that the liquid no longer meets manufacturers' requirements.

(c) Dry type transformers are to be thoroughly cleaned.

(d) Switchgear circuit breaker contacts are to be clean and in good alignment.

(e) The insulation system of metal-clad switch-gear is to be tested as part of the maintenance operation.

(f) All adjustable protective devices (relays) must be checked for proper calibration and recalibrate if necessary.

(g) All control systems must be tested for proper operation after maintenance is performed and before placing them back in normal service.

(8) All molded case circuit breakers (frames size 225 amps or less) must be tested annually to determine if contacts open and reclose when breaker is manually tripped and restored. All panels must 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 extended in 6-month increments. In no case may the interval between successive test be extended beyond 36-months.

c. **Safety.** All electrical work shall be completed with all proximate energized circuits off. It is the intent of this directive to make planned electrical system shutdowns for maintenance the

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standard operating procedure, not the exception. Written procedures shall be established to prepare the medical center for an electrical outage. The procedure shall take in to account the worst case risk of patients, staff and the facility. When an electrical outage cannot be accomplished the following requirements are mandatory.

(1) Full protective equipment must be available to the electricians (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.)

(2) Electricians must be provided flame-retardant clothing for work on energized systems.

(3) Before initiating work, a job specific work plan must be developed and a peer review of the plan documented. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment, and exit paths.

**5. REFERENCES**

- a. NFPA 70/NEC, 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).

**6. FOLLOW-UP RESPONSIBILITIES:** The Director, Safety and Technical Services Office (10NB), is responsible for the content of this Directive. Questions may be referred to 202-273-5870.

**7. RESCISSIONS:** None. This VHA directive expires November 30, 2005.

S/ Dennis Smith for  
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Under Secretary for Health

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