Applying Electrical Standards

Consequences of Not Following Electrical Standards

For employees, failing to follow Occupational Safety and Health Administration (OSHA) regulations and consensus standards can result in death, injuries or loss of employment.

For employers, failing to follow OSHA regulations and consensus standards can result in:
- Civil penalties (fines)
- Criminal penalties (jail time)
- Increased costs (lawsuits, insurance premiums, etc.)
- Lost business (negative publicity, damaged reputation/brand integrity)
- Property damage

OSHA: 29 CFR 1910 (General Industry) and 29 CFR 1926 (Construction)

Workers should NOT work on energized equipment **unless**:
- De-energizing introduces additional or increased hazards (example: hospital life support)
- Removing power is not feasible due to equipment design or operational limitations (example: power is needed to troubleshoot equipment)

Where an electrical hazard exists, such as when electrical equipment must remain energized while servicing and maintenance is performed, the work must be performed by a **qualified person**. A qualified person is someone who has the skills, training or credentials needed to work safely around electrical hazards. A person can be qualified for specific equipment and methods, but still be unqualified for others.

Consensus Standards

Consensus standards are guidelines that nationally recognized, standards-producing organizations produce and distribute. Consensus standards are updated more frequently than OSHA standards and provide additional information.

Consensus standards for electrical work include:
- National Fire Protection Association (NFPA)
    - NFPA 70, National Electrical Code (NEC)
    - *NFPA 70E*®
- National Electrical Safety Code (NESC)
- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
    - ASTM F1506 – fabric flame-resistance
    - ASTM F2178 – eye and face protection

NFPA 70E® Training Requirements

Unqualified Worker Training

Employers must train unqualified workers about:

- Electrical dangers
- Approach boundaries
- Lockout/tagout (LOTO) procedures

Qualified Worker Training

Employers must train qualified workers about **safe work practices**, such as:

- Verifying the energy condition
- De-energizing equipment that has lockout/tagout applied
- Releasing stored electrical energy
- Using temporary protective grounding equipment
- Releasing or blocking stored mechanical energy
- Responding to emergencies (including contact release and first aid)
- Using electrical equipment, such as testing instruments and GFCI protection
- Verifying proper installation, maintenance, use and safeguards
- Getting energized electrical work permits

Work will be supervised during the training and qualification process, and a hands-on demonstration of skills is essential to the qualification process. Training is needed every 3 years and sooner if everyday supervision or annual skills inspections determine deficiencies. Training is also needed after changes to equipment, procedures and job roles. Employees are expected to review infrequently performed and unfamiliar tasks.

Employers must train qualified workers about **safety-related maintenance and operating requirements**:

- Qualified persons
- Single-line diagrams
- General requirements
- Overcurrent protection
- Working space
- Grounding and bonding
- Guarding energized conductors
- Safety equipment
- Clear spaces
- Identification of components
- Warning signs
- Identification of circuits
- Single/multiple conductors and cables
- Flexible cords and cables
- Overhead line clearances
- Substations
- Premises wiring
- Controller equipment
- Fuses and circuit breakers
- Rotating equipment
- Hazardous locations
- Batteries and battery rooms
- Portable electrical tools and equipment
- Personal safety/protective equipment

Employers must train qualified workers about **safety requirements for special equipment**, including safety-related work practices for:

- Electrolytic cells and use of lasers
- Power electronic equipment
- Research and development laboratories
- Batteries and battery rooms

If a qualified person performs work within the **limited approach boundary** of exposed energized parts operating at 50 volts or more, they must be trained on:

- Distinguishing exposed energized parts from other parts of electrical equipment
- Determining nominal voltage of exposed energized parts
- Approach-boundary distances and corresponding voltages of exposure
- Decision-making processes to determine the degree and extent of a hazard and the PPE and job planning necessary to perform a task safely

Using *NFPA 70E*® Tables

NFPA 70E® tables contain vital information about approach boundaries, hazard categories and PPE. Always use the most current edition of the *NPFA 70E*® when working on energized electrical equipment. You can purchase the latest standards at www.nfpa.org.