Using Electrical Safety Programs

NFPA 70E® requires employers to develop and implement an electrical safety program that:

- Directs activities appropriate for the voltage, energy level and circuit conditions that employees may encounter
- Defines safety practices required by the employer and any applicable standards

Purpose of Electrical Safety Programs

Electrical safety programs are designed to help people make safe decisions when they are working around electricity. The goals of the program are to improve:

- **Awareness** about electrical hazards
- **Self-discipline** about using safety principles/practices

Capacitors

- Discharge capacitors following steps listed in energy control procedures
    - This commonly involves bleeding down stored energy using an insulated tool with properly sized resistor and grounding cable
    - Always assume that capacitors are charged until electrical metering proves otherwise
- Capacitors should be short circuited with a drain wire and grounded, if appropriate, to the case when not in use

Elements of an Electrical Safety Program

- Procedures
    - De-energize equipment before starting service/maintenance work (zero-energy state)
    - Follow lockout/tagout (LOTO) steps
- Controls
    - Consider every electrical conductor/circuit energized until proven otherwise
    - Avoid bare-hand contact with energized conductors/circuits
    - Use procedures to identify hazards and eliminate or control them
    - Clearly identify equipment controls
    - Remember that accurate and reliable electrical drawings are essential
- Hazard/Risk Evaluation
    - Complete electrical shock and arc-flash hazard analyses
- Work Permits
    - Remember that work permits are required for work on equipment that must remain energized and when workers are potentially exposed to live parts, or near enough to expose them to any hazard they present
    - Permits must include justification for working on live systems, descriptions of electrical shock and arc flash risk, precautions, and measures taken to exclude unqualified personnel
    - Know that permits are only valid when conditions remain the same
- Testing Equipment
    - Inspect testing equipment regularly
    - Use high-quality voltage meters
    - Use hot sticks and grounding cables, as needed

- Inspection
    - Inspect newly installed or modified equipment and systems for compliance with installation codes and standards
    - Following installation, equipment must be maintained according to manufacturer recommendations

Arc-flash Hazard Analysis

- Use *NFPA 70E*® tables to identify hazard classes and personal protective equipment (PPE)
- Perform a detailed analysis to identify approach boundaries
- Identify and label equipment
- Use signs, barricades and/or attendants

Approach Boundaries

Arc-flash Boundary

- Establishes how close a person without PPE could get to exposed energized conductors/parts and only receive incident energy equal to 1.2 calories per square centimeter from an arc-flash (that's the amount of energy associated with second-degree burns on exposed bare skin
- People must not cross the arc-flash boundary unless they are wearing the appropriate PPE and are under close supervision by a qualified person
- Only qualified people wearing appropriate PPE may cross the arc-flash boundary when energized work is being performed

Limited Approach Boundary

- Indicates where to place barriers to protect unqualified people from electrical shock hazards
- Only qualified people and escorted unqualified people are allowed

Restricted Approach Boundary

- Only qualified people wearing appropriate PPE are allowed as electrical arcing and electrical shock from inadvertent movement become a concern at this distance
- Qualified people must have a work plan and permit (if required)

Personal Protective Equipment (PPE) for Electrical Hazards

AVOID synthetic cloth that can melt on skin and cause extensive burns, such as:

- Acetate
- Polyester
- Nylon
- Polypropylene
- Spandex

CHOOSE natural fibers, such as:

- Cotton
- Wool
- Rayon
- Silk
- Untreated blends

Electrical hazard PPE must be arc-rated. It includes:

- Multi-layered flash suit jacket/pants
- Hard hat
- Arc-rated hard hat liner (if needed)
- Safety glasses, goggles, an arc-rated face shield, and an arc-rated balaclava or a flash suit hood
- Canal inserts
- Voltage-rated gloves and rubber sleeves
- Leather gloves (worn over rubber)
- Leather work shoes rated EH (for Electrical Hazards)
- Insulated blankets/mats
- Voltage-rated, insulated tools