Updates to the NFPA 70E

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Agenda – Updates to the NFPA 70E

NFPA 70E - What is it?
New Section Article 360 ‘Safety-Related Requirements for Capacitors’
PPE Personal Protection Equipment
Coordination Curves
Arc Flash labels
Purpose of the NFPA 70E

• Standard for Electrical Safety in the Workplace
  • Chapter 1: Safety Related Work Practices
  • Chapter 2: Safety Maintenance Requirements’
  • Chapter 3: Safety Requirements for Special Equipment
Annexes

• D. Incident Energy and Arc Flash Boundary Calculation Methods
• E. Electrical Safety Program
• F. Risk Assessment
• G. Lock out/Tag Out LOTO
• H. PPE Personal Protective Equipment
• I. Job Briefing and Job Safety Planning Checklist
• J. Energized Work Permit
• O. Safety Required Design Requirements
• Q. Human Performance and Workplace Electrical Safety
• R. Capacitors
Definition

• Electrical Safe Work Condition: A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to verify the absence of voltage, and, if necessary, temporary grounded for personnel protection.

• NEW Balaclava an arc rated head protective fabric that protects the neck and head expect for a small portion of the facial area.
PPE Personal Protection Equipment

• Table 130.7 (C)(15)(c) Personal Protective Equipment (PPE)
  • Arc-Rated Clothing Minimum Arc Rating of 8 cal/cm² (33.5 J/cm²)
    Arc Rated long-sleeve Shirt and pants or arc-rated coveralls
    Arc Rated flash suit hood or arc-rated face shield and arc-rated balaclava
    Arc Rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner
    (AN) = As Needed
    Hard Hat
  Safety glasses or safety googles (SR) = Selection required
  Hearing protection (ear canal inserts)
  Heavy duty leather glove, arc-rated gloves, or rubber insulating gloves with
  leather protectors (SR)
  Leather footwear
Energized work
NFPA 70 sect. 110.16 Arc-Flash Hazard Warning

- Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that is in other than dwelling units, and is likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.
Energized work
NFPA 70 sect. 110.16 Arc-Flash Hazard Warning

(B) Service Equipment.

- In other than dwelling units, in addition to the requirements in 110.16(A), a permanent label shall be field or factory applied to service equipment rated 1200 amps or more. The label shall meet the requirements of 110.21(B) and contain the following information:
  - (1) Nominal system voltage
  - (2) Available fault current at the service overcurrent protective devices
  - (3) The clearing time of service overcurrent protective devices based on the available fault current at the service equipment
  - (4) The date the label was applied

- Exception: Service equipment labeling shall not be required if an arc flash label is applied in accordance with acceptable industry practice.

Informational Note No. 1: NFPA 70E-2018, Standard for Electrical Safety in the Workplace, provides guidance, such as determining severity of potential exposure, planning safe work practices, arc flash labeling, and selecting personal protective equipment.

Informational Note No. 2: ANSI Z535.4-2011, Product Safety Signs and Labels, provides guidelines for the design of safety signs and labels for application to products.

Informational Note No. 3: Acceptable industry practices for equipment labeling are described in NFPA 70E-2018, Standard for Electrical Safety in the Workplace. This standard provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.
Arc Flash Warning/Danger Labels

Warning Labels 0-40 calories/cm² – Danger +40 cal/cm²

1) Flash Boundary at 9’-2”
2) Working Distance 18”
3) Incident energy at working distance
4) Bolted Fault (Short Circuit worst case) 8500A
5) Note: Warning: Changes in the settings or system configuration will ‘invalidate’ the calculated values and required PPE
Single Line Diagram

• Field information needed
  • Wire sizes
  • Wire lengths
  • Available Fault Current
  • Motor sizes, HP, voltage, ph
  • Panelboard size, ratings
  • Breaker Sizes, plug sizes
    Mfg., type, settings
  • Transformer size, voltage
    Impedance ZI%, kW
Coordination Curves
Field Data for Power Studies

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<tr>
<th>Cable Name</th>
<th>From Bus To Bus</th>
<th>In/Out Service Qty/Ph</th>
<th>Length Feet</th>
<th>Size</th>
<th>Cond. Type</th>
<th>Duct Type</th>
<th>Insul</th>
<th>Per Unit (100 MVA Base)</th>
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IEEE 1584 Calculations vs. Table Method

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<th>Bus Name</th>
<th>Bus kV</th>
<th>Bus Bolted Fault (kA)</th>
<th>Prot Dev Bolted Fault (kA)</th>
<th>Prot Dev Arcing Fault (kA)</th>
<th>Trip Delay Time (sec.)</th>
<th>Breaker Opening Time (sec.)</th>
<th>Ground</th>
<th>Equip Type</th>
<th>Gap (mm)</th>
<th>Arc Flash Boundary (in)</th>
<th>Working Distance (m)</th>
<th>Incident Energy (cal/cm²)</th>
<th>Required Protective FR Clothing Category</th>
<th>Label #</th>
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Available Fault Current

Sir/Madam:

We are presently performing the power systems study for the [name of project or location]. The study includes the arc flash risk assessment, protective device coordination and short circuit analysis. In order to complete the study we need to know the following, including the size, %Z and available fault current for the PSE Utility transformer:

- Size ______ kVA 480V sec (voltage primary ______ V)
- Phase ___
- Impedance %Z min ______ max ______
- Available Fault Current ______ A (min) 480V sec
- Available Fault Current ______ A (max) 480V sec
- X/R _______ 480V sec

Fuse ______ size
Fuse ______ manufacturer
Fuse _______ type

Sincerely,

Michael Brisbois

Maximum short circuit current (in amps) for three-phase transformers, padmounted

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<tr>
<th>Type</th>
<th>Secondary Voltage</th>
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<th>R/X</th>
<th>Minimum %Z</th>
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NPFA 70E 130.5 (G) Incident Energy Analysis

• The incident energy analysis shall be updated when changes occur in the electrical distribution system that could affect the results of the analysis. The incident energy analysis shall also be reviewed for accuracy at intervals not to exceed 5 years.

• 205.2 Single Line Diagram. A Single Line Diagram, where provided for the electrical system, shall be maintained in a legible condition and shall be kept current.
110.4 (D) Normal Operations

- Normal Operation of electrical equipment shall be permitted where a normal operating condition exists. A normal operating condition exists when all of the following conditions are satisfied:
  1) The equipment is properly installed
  2) The equipment is properly maintained
  3) The equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer’s instructions
  4) The equipment doors are closed and secured
  5) The equipment covers are in place and secured
  6) There is no evidence of impending failure
D.4.6 Electrical Configuration

VCB = Vertical Conductors/electrodes inside a metal box enclosure
VCBB = Vertical conductors/electrodes terminated in an insulating barrier inside a metal box
HCB = Horizontal conductors/electrodes inside a metal box or enclosure
VOA/HOA = Vertical/Horizontal conductors in open Air
Questions, Comments, Concerns?

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