



COURSE 70E-2021 Edition Overview: ELECTRICAL SAFETY IN THE WORKPLACE TRAINING, 8 Hour
Reference Docs: NFPA 70E-2021; OSHA 1910 Subparts 'S', 'J' & 'I'; OSHA 1926 Subpart 'V'

Course Overview: This course introduces attendees to the methods used to identify the shock and arc-flash '*hazards*' & '*risks*' associated with electrical energy, and work practices to establish an electrically safe work condition (ESWC). "Incident Energy" and "Limits of Approach" as defined on equipment Incident Energy (IE) labels, or using the arc flash personal protective equipment (PPE) categories method, are discussed along with the guidance on selection and use of personal protective equipment. Application of a lockout/tag out (LOTO) program along with job safety planning and job briefing requirements are also addressed to reduce the risk(s) of injury or damage to health from electrical hazards. In addition, updates to the NFPA 70E-2021 edition are reviewed within the presentation.

Attendees receive a hard copy workbook that follows the presentation and allows room to take notes. The workbook also includes attachments of arc-flash label examples, tables identifying Shock Protection Approach Boundaries and Arc-Flash PPE Categories for AC & DC Systems, arc-rated protective clothing levels, rubber glove class & chart, and procedures to establish an ESWC. A student group proficiency exam is given at class end and certificates are provided to those students completing the training. The end customer also receives documentation, along with the student roster, for file to meet employer record keeping requirements for employee(s) training as outlined in NFPA 70E.

Course Outline:

- I. Electrical injuries & work related “AT Risk” behaviors**
 - A. Electrical Safety Injury Statistics; Bureau of Labor Statistics past 25 yrs.
 - 1) Lost time related injuries; 2) Shock injuries vs Burn injuries medically treated
 - B. Safety Triangle of Probability “At Risk Behaviors”
 - 1) At-Risk Behaviors; 2) Near-Miss Events; 3) Recordable events; 4) Lost Workday Cases
 - 5) Fatalities

- II. Codes, Standards and Enforcement; OSHA & NFPA and Focus of NFPA 70E-2021 standard (1 hour)**
 - A. OSHA requirements; general and specific duty clauses [OSHA 29USC654 Sec 5, Duties]
 - B. OSHA relationship with NFPA (OSHA 1910 Subpart S)
 - C. OSHA identifies what “shall” be done & NFPA 70E provides ‘groundwork’ and ‘concepts’ for a safe electrical work environment.
 - D. Verification of zero energy state prior to start work on or about electrical equipment [OSHA 1910 Subpart S & NFPA 70E Article 120]
 - E. Essential Elements of NFPA 70E; divided into five sections
 - F. Summary of NFPA 70E-2021 edition updates

- III. General Requirements for Electrical Safety Related Work Practices [NFPA 70E Article 110]**
 - A. Electrically Safe Work Condition (ESWC)
 - B. Energized Work
 - C. Training requirements to include:
 - 1. ‘Qualified’ and ‘Unqualified’ Persons working about electrical equipment
 - 2. Hierarchy of Controls: elimination; substitution; engineering controls; awareness; administrative support; level of ppe required
 - 3. Contact release and responsible employees responding to a medical emergency
 - D. NIOSH Film; Journeyman electricians involved in two separate arc-flash electrical events

- IV. Work Involving Electrical Hazards [NFPA 70E Article 130]**
 - A. Exposure to electrical shock; touch and step potential
 - B. Arc Flash and Blast magnitude and energies released during an arc-flash event
 - C. Video shorts: Arc Flash Hazard Clearing Time and three arc flash events
 - D. Measuring ‘Incident Energy’ as calories per centimeter squared, bolted fault conditions and arcing fault conditions
 - E. Approach boundaries: Arc-Flash, Limited Approach & Restricted Approach
 - F. Electrical Hazard “Risk Assessments”: Arc-Flash and Shock risk assessments; review of book tables to identify shock Protection Boundaries and Arc-Flash PPE Categories for AC & DC Systems
 - G. Student Exercise: Using Book Method to define Shock and Arc Flash boundaries

- H. Equipment Labeling; Nominal System Voltage, Arc-Flash Boundary & available 'incident energy' at the corresponding working distance for low and medium voltage applications, and applicable shock and arc flash clothing
- I. Review of equipment labeling layout and application

V. PERSONAL PROTECTIVE CLOTHING (PPE) [NFPA 70E Paragraph 130.7]

- A. Clothing designed for protection from arc-flash and electrical shock events; undergarments; movement and visibility; head, face, neck & chin (head area); eye protection; hearing protection; body protection; hand and arm protection; foot protection; clothing materials and characteristics
- B. Arc-Rated clothing types and categories I, II, III, IV rated in calories per square centimeter
- C. PPE clothing care and maintenance
- D. Video Shorts: 3-ea. Arc flash events and effects on AR clothing
- E. Shock protection ppe and electrical gloves use and care
- F. Energized Electrical Work Permit (EEWP)

VI. Lockout and Tagout {LOTO} [NFPA 70E Article 120]

- A. Principles of LOTO
- B. LOTO procedures: simple and complex
- C. LOTO equipment
- D. Procedures to establish Electrical Safe Work Condition (ESWC)
- E. Temporary Protective Grounding Equipment

VII. Summary of Safe Work Practices [NFPA 70E Article 110 & 130]

- A. Job Safety Planning elements; completed by a 'Qualified' person
- B. Job Briefing(s) conducted by 'Qualified' person prior to "start work"
- C. Other precautions: alertness; blind reaching; illumination; conductive articles of clothing being worn; conductive materials, tools, and equipment being handled
- D. Responsibility for maintenance; equipment owner or the owner's designated representative
- E. Safety signs and barricades

VIII. Review of "At Risk Behaviors" and Student Exam

