



16 Hour Electrical Renewal-2023 NEC Changes and NFPA 70 E Safety

Course Outline

Course Structure: Six 2-Hour Sections with 10 Subtopics Each

Section 1: Introduction to the 2023 NEC and General Code-Wide Changes (2 Hours)

1. **Overview of the NEC Code Cycle** – Understanding the three-year update process and its impact on electrical work.
2. **Significance of the 2023 NEC Revisions** – Why changes were made and how they improve safety and efficiency.
3. **New Terminology and Definitions** – Updated and newly introduced NEC terms.
4. **Code-Wide Revisions for Clarity and Consistency** – Changes made for better usability across multiple sections.
5. **Revised Requirements for Grounding and Bonding** – Updates to articles 250 and beyond.
6. **Revised Working Space and Access Requirements** – Modifications in Article 110 for electrical equipment access.
7. **Changes to Conductor Ampacity Calculations** – Adjustments affecting temperature and correction factors.
8. **Expansion of AFCI and GFCI Requirements** – Broadened protection requirements for residential and commercial applications.
9. **New Load Calculations and Demand Factors** – Updates to load calculations for dwellings and commercial properties.

Section 2: Residential Electrical System Changes (2 Hours)

1. **Expansion of GFCI Protection Requirements** – Added locations requiring GFCI protection in homes.

2. **New Outdoor Emergency Disconnect Requirement for Dwelling Units** – 230.85 changes for improved safety.
 3. **Service Equipment Working Space Modifications** – Updated clearance rules for better safety and access.
 4. **Updates to Ground-Fault Protection for Equipment (GFPE)** – Expanded coverage for larger residential equipment.
 5. **Changes to Dwelling Unit Receptacle Spacing and Placement** – Updated requirements for rooms, garages, and basements.
 6. **Energy Efficiency and Smart Home Considerations** – Provisions for energy monitoring and smart systems.
 7. **Revisions to 210.52: Outlet and Receptacle Spacing in Kitchens** – Adjusted rules for kitchen counter space.
 8. **Changes in NEC 406 Regarding Tamper-Resistant Receptacles** – Expanded applications for residential installations.
 9. **Surge Protection for Dwelling Units** – Expansion of requirements under NEC 242.
 10. **New Electrical Vehicle (EV) Charging Infrastructure Requirements** – Growth of home-based EV charging station rules.
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Section 3: Commercial and Industrial Electrical System Updates (2 Hours)

1. **Expansion of GFCI and AFCI Protection in Commercial Settings** – New rules for safety in non-dwelling structures.
2. **Revised Requirements for Arc Energy Reduction** – NEC 240.87 changes for circuit breakers above 1,200A.
3. **New Rules for Emergency Disconnects in Commercial Locations** – Updates to Article 225.
4. **Changes to Conductors for Parallel Installations** – Modifications in NEC 310 for wiring methods.
5. **Revised Guidelines for Industrial Control Panels** – Updates to UL 508A and NEC 409.
6. **Changes to Service Equipment Labeling Requirements** – Enhanced identification for emergency response.
7. **New Rules for Outdoor and Rooftop Equipment Installation** – HVAC disconnect placement and accessibility.
8. **Revised Lighting Load Calculations for Commercial Buildings** – Adjustments to NEC 220.
9. **Expanded Rules for Electrical Room Accessibility and Working Spaces** – Improved safety regulations for technicians.

10. **Integration of Energy Storage and Microgrid Systems in Commercial Installations** – Preparing for advanced electrical infrastructure.

Section 4: Wiring Methods and Equipment Installation (2 Hours)

1. **New Ampacity and Derating Considerations** – Changes affecting conductor sizing and temperature adjustments.
2. **Expansion of Wiring Method Approvals for Specific Applications** – Conduit and cable updates.
3. **Updated Rules for Underground Installations and Protection** – Depth and material changes.
4. **Revisions in Flexible Conduit Usage** – Adjusted limitations for flexible metallic and non-metallic conduits.
5. **Updated Raceway Sealing and Fire Protection Requirements** – Increased focus on fire-resistant installations.
6. **Revised Rules for Cable and Conduit Support and Securing** – NEC 300 updates.
7. **Expanded Requirements for Conductors in Wet Locations** – Updated NEC 310.10 rules.
8. **Changes to MC and AC Cable Uses in Commercial Applications** – Expanded allowable applications.
9. **New Rules for Photovoltaic (PV) System Wiring and Conduit Placement** – NEC 690 updates for solar installations.
10. **Updated Bonding and Grounding Provisions for Wiring Methods** – NEC 250 refinements.

Section 5: Renewable Energy, Energy Storage, and Electric Vehicles (2 Hours)

1. **Expansion of NEC 690 Solar PV System Requirements** – Updates to module-level shutdown and safety.
2. **Revised Grounding and Bonding for PV Systems** – NEC 690.47 updates.
3. **New Energy Storage System (ESS) Requirements** – NEC 706 changes to address battery storage safety.
4. **Updated Disconnecting Means for PV Systems and Storage** – Revised location and labeling standards.
5. **Microgrid and Distributed Energy Resource (DER) Integration** – NEC 705 changes.
6. **Increased Safety Requirements for Battery Energy Storage Systems (BESS)** – Lithium-ion system considerations.
7. **Expansion of Electric Vehicle (EV) Charging System Requirements** – NEC 625 changes for home and commercial charging stations.

8. **Revised Rules for Wind Power Installations** – NEC 694 updates for turbine integration.
 9. **Changes in NEC 705 Related to Grid-Tied Energy Systems** – Smart grid compatibility.
 10. **New NEC Labeling and Identification Requirements for Renewable Energy Equipment** – Enhancements for safety and serviceability.
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Section 6: Special Occupancies, Hazardous Locations, and Safety Enhancements (2 Hours)

1. **Updated Rules for Electrical Installations in Hazardous Locations** – NEC 500 changes for classified areas.
 2. **Expansion of Requirements for Healthcare Facilities** – NEC 517 updates for critical systems.
 3. **New Code Requirements for Marinas and Floating Buildings** – NEC 555 safety enhancements.
 4. **Changes in Temporary Power and Jobsite Electrical Safety** – NEC 590 updates.
 5. **Revised Emergency System Requirements for Hospitals and Essential Facilities** – Updates to NEC 700.
 6. **Increased Fire Pump and Emergency Generator Standards** – NEC 695 and 701 revisions.
 7. **New Guidelines for Fire Alarm and Life Safety Systems** – NEC 760 updates for high-risk buildings.
 8. **Revised Wiring and Protection Rules for Agricultural Buildings** – NEC 547 modifications.
 9. **Enhancements in NEC 410 for LED and Smart Lighting Controls** – Growth of adaptive lighting systems.
 10. **Final Review and Compliance Considerations for 2023 NEC Implementation** – Ensuring adherence to updated regulations.
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Section 7: Fundamentals of Electrical Safety and NFPA 70E (1 Hour)

1. **Purpose and Scope of NFPA 70E** – Understanding its role in protecting personnel from electrical hazards
2. **Relationship Between OSHA and NFPA 70E** – How NFPA 70E supports OSHA enforcement and employer responsibilities
3. **Key Definitions and Terminology** – Arc flash, arc blast, shock hazard, approach boundaries, etc.
4. **Hierarchy of Risk Controls** – Elimination, substitution, engineering controls, administrative controls, and PPE
5. **Responsibilities of Employers and Employees** – Safety program development, documentation, and training obligations

6. **Applicable Work Environments** – Facilities, job sites, industrial and commercial applications of NFPA 70E
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Section 8: Shock and Arc Flash Hazard Identification and Risk Assessment (1 Hour)

1. **Identifying Electrical Hazards** – Distinguishing shock, arc flash, and arc blast hazards
 2. **Shock Risk Assessment** – Voltage, approach boundaries, and likelihood of injury
 3. **Arc Flash Risk Assessment Process** – Determining incident energy and likelihood of occurrence
 4. **Establishing and Using Boundaries** – Limited, restricted, and arc flash boundaries explained
 5. **Labeling and Signage Requirements** – Proper equipment labeling per Article 130.5
 6. **Documentation and Risk Assessment Records** – Maintaining compliance and audit trails
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Section 9: Safe Work Practices and Energized Work Requirements (1 Hour)

1. **Justification for Energized Work** – When de-energizing is not feasible or introduces increased risk
 2. **Energized Work Permits** – When required, what must be included, and who authorizes them
 3. **Establishing an Electrically Safe Work Condition** – Lockout/tagout procedures and verification steps
 4. **Job Briefings and Pre-Task Planning** – Communication, scope of work, PPE, and hazard control
 5. **Tools and Test Equipment Safety** – Use of insulated tools and voltage-rated instruments
 6. **Human Error and Situational Awareness** – Preventive practices and behavioral safety
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Section 10: Personal Protective Equipment (PPE) and Emergency Response (1 Hour)

1. **Arc-Rated PPE Categories and Selection** – Understanding arc ratings, clothing layers, and Category 1–4
2. **Shock Protection PPE** – Insulated gloves, mats, shields, and dielectric footwear
3. **Proper Use, Care, and Maintenance of PPE** – Inspection, testing, cleaning, and replacement timelines
4. **Electrical Incident Response Planning** – Arc flash injuries, burns, and emergency medical protocols
5. **Training and Retraining Requirements** – Frequency, documentation, and qualification standards

6. **Recent Changes in NFPA 70E (2021–2024 Editions)** – Summary of important updates and how they affect field practices

Course Objectives

Upon successful completion of this course, the licensee will be able to:

1. **Interpret and apply key revisions from the 2023 National Electrical Code (NEC)**, including updates to grounding and bonding, conductor ampacity, AFCI/GFCI protection, and load calculation methods across residential, commercial, and industrial settings.
2. **Identify and integrate new NEC requirements for renewable energy systems, energy storage systems (ESS), electric vehicle (EV) infrastructure, and microgrid applications**, ensuring compliance with Articles 690, 705, 706, and 625.
3. **Evaluate NEC standards for wiring methods and equipment installation**, including updated rules for underground conduit, flexible conduit use, raceway sealing, and bonding in wet locations.
4. **Analyze and apply NEC changes for special occupancies and hazardous locations**, including healthcare facilities, agricultural buildings, marinas, floating structures, and emergency systems such as fire pumps, generators, and life safety circuits.
5. **Explain the purpose, scope, and enforcement role of NFPA 70E**, and distinguish between its safety standards and those outlined by OSHA and the NEC.
6. **Perform hazard identification and risk assessment procedures for electrical work**, including shock and arc flash evaluations, boundary establishment, signage, and documentation of findings per NFPA 70E Article 130.
7. **Implement safe work practices when energized work is justified**, including the use of energized work permits, establishing electrically safe work conditions, and preparing effective job briefings and hazard control measures.
8. **Select and maintain appropriate personal protective equipment (PPE)** based on NFPA 70E arc flash category ratings, and apply best practices for shock protection, equipment inspection, and PPE care.
9. **Respond to electrical incidents with effective emergency planning**, including arc flash injury protocols, training frequency, documentation standards, and awareness of NFPA 70E updates through the 2024 edition.
10. **Integrate safe design, testing, and troubleshooting practices** into fieldwork, using NEC-guided methods for circuit analysis, voltage drop testing, fire alarm integration, and power quality diagnosis.