NATIONAL ELECTRICAL CODE® (NEC) & NFPA 70E ARC FLASH ELECTRICAL SAFETY

A new twist on the National Electrical Code® - a practical application workshop. If you sign up in this class, prepare to work!

- ***Day 1: Fundamentals of OSHA requirements for performing electrical work - NFPA 70E.***
- ***Days 2: Practical applications of NFPA 70E - not just the typical Code lecture.***
- ***Day 3-5: Practical side of NEC including important Code calculations, the best methods to find information quickly in the Code.***
- ***Receive a new NFPA 70E Code Book and the NTT NEC Practical Applications Workbook.***

Whether new to the NEC or a seasoned electrician or engineer, this class is all about learning how to use the Code. Our new practical applications and calculations requirements brings the workshop courses together, and relates to Article 250 and other articles of the National Electrical Code® (NEC) as well as NFPA 70E. The practical applications and calculations section uses the code to perform calculations and solve common residential and industrial application issues, detect size conductors using tables, determine overcurrent protection (fuses and breakers), set motor overloads, and size starters, controllers, disconnects and conduits. You will also cover how to maintain your electrical systems with the correct grounding and bonding techniques.

CLASS FORMAT:

Classroom Lecture

STANDARD CLASS SIZE:

NTT recommends a class of no more than 35 participants to obtain the best results.

NTT TO PROVIDE:

- Textbooks
- Classroom consumables
- Completion certificates
- Course syllabus, outline, table of contents, or training objectives
- Shipping and instructor travel logistics

CLIENT PROVIDES:

- Classroom of 500 square feet or greater
- Projection screen, white board and/or flip chart(s)

WHO SHOULD ATTEND:

- Electricians
- Mechanics
- Environmental health & safety personnel
- Apprentice and experienced HVAC technicians
- Supervisors working on or who oversee employees working on 50V or greater equipment
- Linemen & Utility workers
- Owners & managers
- Warehouse employees
- Maintenance Technicians
- Energy management personnel
- Fire Alarm Technicians
- Plant & facility maintenance technicians
- Building engineers
- Building managers & superintendents
- Plant & facility managers
- Stationary engineers
- Safety directors

NTT Training

NATIONAL ELECTRICAL CODE® (NEC) & NFPA 70E ARC FLASH ELECTRICAL SAFETY

COURSE AGENDA

INTRODUCTION TO ELECTRICAL SAFETY

- History and overview of Electrical Safety
- Brief History of OSHA
- Overview of the OSHA Regulations and where Electrical Safety Regulations are found

OVERVIEW OF THE NFPA 70E STANDARD

- Relationship to OSHA Regulations and how to implement the NFPA 70E Standard
- Article 90 Introduction to NFPA 70E overview
- Key definitions in Article 100
- Determine the breakdown of responsibilities in your facility

THE HAZARDS OF ELECTRICITY

- Basic of Electricity
- Arc Flash Hazard PPE Categories
- Electrical Hazards
  - Shock
  - Arc Flash
  - Arc Blast

GENERAL REQUIREMENTS FOR ELECTRICAL SAFETY-RELATED WORK PRACTICES (ARTICLE 110)

- The Electrical Safety Program
- Training Requirements
- Relationships with Contractors
- Use of Equipment
  - Test Instruments
  - Portable Electric Equipment
  - Extension Cords
  - GFCI's
- Underground Electrical Lines and Equipment

ESTABLISHING AN ELECTRICALLY SAFE WORK CONDITION (ARTICLE 120)

- The six-step LOTO process

WORK ON OR NEAR EXPOSED ENERGIZED PARTS (ARTICLE 130)

- Limitations for working when exposed to energized parts
- Hazard analysis
- Energized Electrical Work permit requirements
- Energized Electrical Work permit Approval process
- Description of Safe Work Practices to be employed
- Energized Electrical Work permit Exemptions

SHOCK PROTECTION BOUNDARIES

- Shock Risk Assessment
- Establishing Shock Protection Boundaries
  - Using the AC and DC tables
- Approach Requirements for Qualified Persons
- Approach requirements for Unqualified Persons

ARC FLASH BOUNDARY

- The Arc Flash Risk Assessment
- Establishing the Arc Flash Boundary
- PPE within the Arc Flash Boundary
- Equipment labeling requirements

OTHER PRECAUTIONS

- Alertness / Situational Awareness
- Blind Reaching
- Illumination
- Conductive articles being worn

2014 NATIONAL ELECTRICAL CODE® (NEC) & NFPA 70E ARC FLASH ELECTRICAL SAFETY

- Conductive materials
- Confined or enclosed work space
- Doors or hinged panels
- Housekeeping duties
- Use of flammable materials
- Anticipating failure
- Routine opening and closing of circuits.
- Reclosing circuits after protective device operation

PERSONAL AND OTHER PROTECTIVE EQUIPMENT

- General: Responsibilities
- Care
- PPE Specifics
- Other PPE

INTERPRETING EQUIPMENT LABELS

- Arc-flash information
- Shock protection information
- Selecting PPE
- Boundary Selection

USING THE TABLES

- Identifying equipment and tasks
- Applicability of the tables
- Determining the table parameters
- Determining equipment meets installation requirements
- Determining equipment has been properly maintained
- Selecting PPE

WORKING WITHIN THE LIMITED APPROACH BOUNDARIES TO OVERHEAD LINES

- Applicability
- Specific requirements
- Which rules apply: Applicability of other rules and standards
  - 1910.269
  - NESC

SAFETY-RELATED MAINTENANCE REQUIREMENTS

- General maintenance requirements
- Substations, switchgear assemblies, switchboards, panelboards, motor control centers, and disconnect switches
- Premises wiring
- Controller equipment
- Fuses and circuit breakers
- Rotating equipment
- Hazardous (classified) locations
- Batteries and battery rooms
- Portable electric tools and equipment
- Personal safety and protective equipment

SAFETY REQUIREMENTS FOR SPECIAL EQUIPMENT

- Electrolytic Cells
- Batteries and Battery Rooms
- Safety-Related Work Practices for Use of Lasers
- Power Electronic Equipment
- Research and Development Laboratories

NATIONAL ELECTRICAL CODE® (NEC) & NFPA 70E ARC FLASH ELECTRICAL SAFETY

The purpose of the 2014 NEC® is the practical safeguarding of persons and property from hazards arising from the use of electricity. The requirements in the 2014 NEC® address the fundamental principles of installation for safety.

NEW OR REVISED ARTICLES FOR 2014

- Article 393—Low Voltage Suspend Ceiling Power Distribution Systems
- Article 646—Modular Data Centers
- Article 728—Fire Resistant Cable Systems
- Article 750—Energy Management Systems
- Symbol requirements for controlled receptacles
- DC voltage requirements expanding
- Increasing the voltage threshold from 600 volts to 1,000 volts
- Electrical Safety labeling requirements changing and new sections added
- Increased requirements for GFCIs in laundry areas, facilities like car washes, and generator receptacles
- AFCI requirements expanding into laundry rooms and kitchens as the NEC move towards whole-house protection
- New section on Ground Fault Protection of equipment Exception for XHHW-2 conductors for specified temperature corrections for ampacity values
- Mounting of luminaires
- Increasing receptacle requirements in health care facilities
- Deleting the term “Emergency Systems” in health care facilities
- Moving several definitions from individual articles to Article 100

ALTERNATE ENERGY, GREEN TECHNOLOGIES, AND IT EQUIPMENT CHANGES

- Revised Article 625: Updates on safe battery charging for plug-in hybrid vehicles that reduce the risk of explosion
- Revisions to Article 645: IT Equipment
- New Article 694: First-time requirements for small wind electric systems
- Revised Article 705: Interconnecting generators, windmills, and solar and fuel cells with other power supplies
- New Article 840: The increased demand for broadband communication systems with requirements for wireless, routers, and wireless disconnects

OTHER REQUIREMENTS FOCUSED ON WORKPLACE SAFETY

- Provisions on electrical installations over 600 volts
- 240.87: Means to reduce incident energy
- New Article 399: Incorporates requirements for overhead distribution systems for large electrical system users, such as school or business campus settings
- 408.4B: Labeling at subpanels to identify feeder supply source
- 450.14: Disconnecting means for transformers

NEC COURSE AGENDA

APPLYING THE NEC ARTICLE 90

- NEC process and definitions
- Equipment examination
- Code change introduction
- Metric and standard units

ELECTRICAL INSTALLATIONS ARTICLE 110

- Approval
- Conductors
- Equipment
- Mechanical installations
- Mounting and cooling
- Electrical connections
- Arc flash protection
- Spaces about electrical equipment

NATIONAL ELECTRICAL CODE® (NEC) & NFPA 70E ARC FLASH ELECTRICAL SAFETY

NEC COURSE AGENDA, continued

BRANCH CIRCUITS AND FEEDERS ARTICLE 210

- Branch circuits
  - Review of Code changes
  - Branch circuit ratings
  - Multiwire branch circuits
  - Identification of ungrounded conductors
  - Color code for branch-circuit grounded conductors
  - Color code for branch-circuit equipment grounding conductors
- Receptacle and cord connectors
  - Replacing receptacles
  - Review of code changes
  - Dwelling units
  - Bathrooms
  - Garages and accessory buildings
- Buildings
  - Other than dwelling units
  - Required branch circuits
- Branch-circuit ratings 210.19
  - Review of code changes
  - Minimum size conductors
  - Overcurrent protection
- Feeders
  - Review of code changes
  - Minimum rating and size
  - Feeders with common neutral
  - Identifying high-leg in Delta 4-wire systems
  - Ground-fault protection of equipment

SERVICES ARTICLE 230

- Review of Code changes
- Definitions
- Service limitations
  - Number of services
  - Conductors—outside of buildings
  - Service raceways and seals
  - Clearance from openings
- Overhead service-drop conductors
- Underground service-lateral conductors
- Service-entrance conductors
- Service Equipment
  - AIC rating
  - Identification
  - Disconnecting mMeans
  - Ground-fault protection of equipment

CONDUCTORS AND OVERCURRENT PROTECTION ARTICLE 240

- Conductors
- Ampacity
  - Insulation ratings
  - Ambient temperature
- Overcurrent protection
  - Review of code changes
  - Protection of conductors
  - Ampere ratings
- Location of overcurrent protection devices
  - Underground conductor
  - Grounded conductor
  - Circuit location
- Overcurrent Devices
  - Plug and cartridge fuses
  - Circuit breakers
  - CB markings

GROUNDING & BONDING ARTICLE 250

- Review of Code changes
- Grounding terminology
- Grounding systems
- Grounding equipment and enclosures
- Grounding means
- Bonding
  - Services
  - Bonding over 250 volts
  - Main and equipment bonding jumpers

NATIONAL ELECTRICAL CODE® (NEC) & NFPA 70E ARC FLASH ELECTRICAL SAFETY

NEC COURSE AGENDA, continued

- Grounding Electrode System—Part III
- Equipment Grounding Conductors

WIRING METHODS ARTICLE 300

- Wiring Methods
  - Conductors of same circuit
  - Conductors of different systems
  - Protection from physical damage
  - Underground installations
  - Protection against corrosion
  - Mechanical continuity of raceways and cables
  - Length of conductors at outlet box
  - Boxes, conduit bodies, or fittings required
- Supporting conductors in a vertical raceway
- Preventing heating effects of inductive current in metallic parts
- Securing integrity of fire-resistant-rated walls
- Preventing spread of toxic fumes in an air-handling system

WIRING MATERIALS—RACEWAYS AND BOXES ARTICLE 300

- Review of Code changes
- Raceway systems
  - Rigid metal and nonmetallic conduit
  - Electrical metallic tubing
  - Flexible metal conduit
  - Liquid-tight flexible metal and nonmetallic conduit
- Cable Assemblies
  - Metal-clad cable
  - Armored cable
  - Nonmetallic-sheathed cable
- Other wiring systems
  - Cable Tray Systems
  - Wireways
  - Busways
  - Auxiliary gutters
- Boxes, Conduit Bodies, and Fittings

WIRING MATERIALS

- Review of Code changes
- Switches Article 404
- Switchboards and panelboards

ARTICLE 408

- Panelboards
  - Number of overcurrent devices on one panelboard
  - Grounding of panelboards

EQUIPMENT FOR GENERAL USE—ARTICLE 400

- Review of Code changes
- Flexible Cords and Flexible Cables
- Luminaries Article 410
  - Luminaries locations
  - Flush and recessed fixtures
  - Electric-discharge equipment 1000 volts or less
  - Lighting track
- Receptacles, cord connectors and attachment plugs
  - Tamper resistant receptacles
  - Grounding and non-grounding receptacles
  - Isolated-ground receptacles
  - Hospital-grade receptacles
  - GFCI-type receptacles
- Appliances Article 422
  - Installation requirements
  - Disconnecting means
  - Safety provisions
  - Markings

MOTORS, GENERATORS, A/C & REFRIGERATION, AND FIRE PUMPS

- Motors Article 430
  - Review of Code changes
  - Ampacity and motor ratings
  - Markings on motors and multimotor equipment and controllers
  - Branch circuit—single motor

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NEC COURSE AGENDA, continued

- Motor control circuits and centers
- Disconnecting means

MOTORS, GENERATORS, A/C & REFRIGERATION, AND FIRE PUMPS, CONTINUED

- A/C and Refrigeration Equipment Article 440
  - Single equipment
  - Disconnecting means
  - Branch-circuit fuses or circuit breakers
  - Room A/Cs—Part VII
- Fire Pumps Article 695
  - Power source to electric-motor driven fire pumps

TRANSFORMERS ARTICLE 450

- Transformer construction and types
- Transformer installation
- Transformer vaults

SPECIAL LOCATIONS ARTICLE 500 AND 600

- Electrified truck parking spaces

ARTICLE 626

- Review of Code changes
- Hazardous locations Article 500
  - Group classifications
  - Wiring methods
  - Conduit seals
  - Motors and generators
  - Grounding
- Intrinsically safe systems
- Service and Repair Garages Article 511
- Health care facilities
- Places of assembly