

2014 NEC Major Change Overview

by **Neil F. LaBrake, Jr., P.E.**; Manager, Retail Connections Engineering, National Grid; Ex Officio EEI Electric Light & Power NEC Task Force



*For the Nov. 11, 2013
CNY Engineering
Expo in Liverpool, NY*



Presenter:

Neil F. LaBrake, Jr., P.E.

nationalgrid

- Experienced since 1981 as an electrical engineer with an upstate New York utility (previous Niagara Mohawk, now National Grid) in generation, distribution, transmission, and substation design. Six years of experience in electrical design for an operating nuclear power plant and experience since 1987 in utility electric service requirements, procedures and methods.
- Presently the Manager of Retail Connections Engineering directing engineering studies, installation acceptance review, and compliance verification of complex distributed generation (DG) facilities integrated to National Grid's electric power system (EPS) in NY, MA, and RI from receipt of complete application to energization.
- Since 1995, direct involvement in national codes: National Grid's representative to Edison Electric Institute serving as the Chair from 2001-2008 to the EEI/Electric Light & Power NEC Task Force. Served on National Electrical Code (NEC) Panels 3 and 20, special NEC task groups, and on National Electrical Safety Code (NESC) Subcommittee 4. EEI's representative to the NEC-NESC Ad Hoc since 2008. Presently the EEI Principal Representative on both the NEC Code-making Panel 1 and the NEC Correlating Committee.
- Presently on the Executive Board of the Empire Chapter IAEI. Past Board member of the Technology Alliance of Central New York 2002-2012. Chaired the NYS Electric Service Committee 1995-1996 and 2007-2008. An IEEE/Power Engineering Society member.

Objectives

➤ **NEC Overview**

- Purpose of the NEC
- NEC Code Arrangement & Related Publications
- NFPA's NEC Publication and Process

➤ **Highlights of Major Changes in the 2014 NEC**

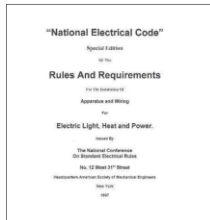
- Code-wide
- Chapters 1-8 Major Highlights
 - Chapter 6 DG Related Highlights
- Informative Annexes
- Where to Get More Information



➤ **Public Input for 2017 NEC**



Purpose of NFPA 70 - the National Electrical Code (NEC)



The 1897 Edition was the first edition of the NEC!



➤ What is NFPA 70?

“Model Document Suitable for Adoption by Law”

The NEC is the benchmark for safe electrical design, installation, and inspection to protect people and property from electrical hazards.

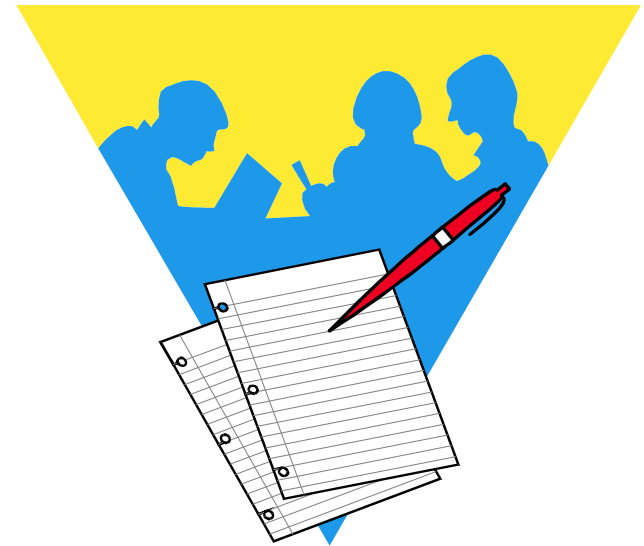
➤ What does NFPA 70 address?

“ANSI Standard on the Safe Installation of Electrical Systems by the National Fire Protection Association”

The NEC addresses the installation of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways in commercial, residential, and industrial occupancies.

NEC Code Arrangement & Related Publications – What is the structure of the NEC?

- Chapters
 - Articles
 - Parts
 - Sections
 - Levels & List Items
 - Informational Annexes
- 1M Manual of Style
- NEC Style Manual



The NEC is not a Design Specification or an Instruction Manual for Untrained Persons!

NEC Code Arrangement & Related Publications –

Are there other documents like the NEC?

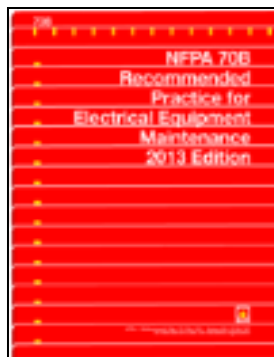
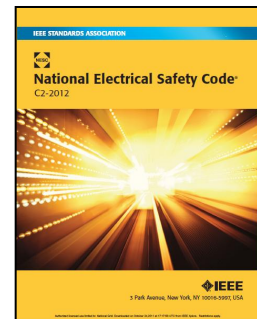


➤ User Codes

- IEC 60364 - Electrical Installations of Buildings
- Canadian Electrical Code Part I

➤ Supply Codes

- National Electrical Safety Code (NESC)
- Electrical Equipment Maintenance (NFPA 70B, NETA-MTS)
- Electrical Safety in the Workplace (NFPA 70E)



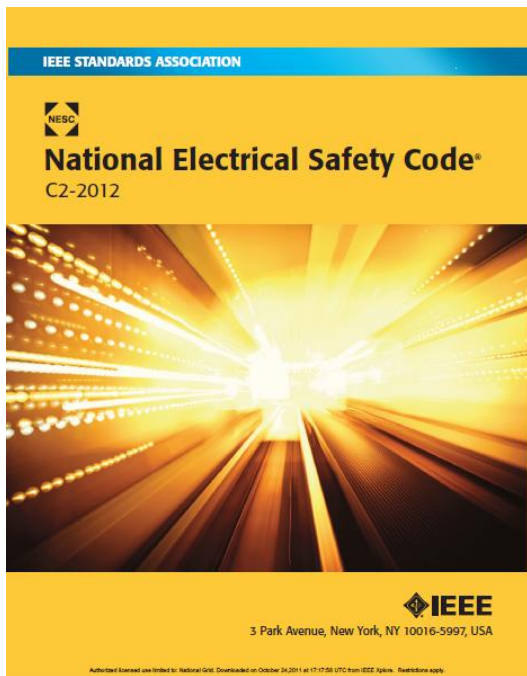
NEC Code Arrangement & Related Publications – Supply vs. Utilization Codes

- Supply Code

- National Electrical Safety Code (NESC)

- User Code

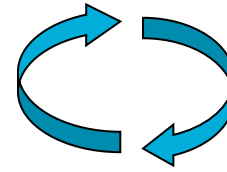
- National Electrical Code (NEC)



The utility's rules typically **do not exceed** the National Rules

Except for local specific requirements

NFPA's NEC Publication and Process



NFPA's 6 Steps:

1. *Public Input*

2. *First Draft Report*

- NFPA Technical Committees:
 - NEC Code-Making Panels (CMP)
 - NEC Correlating Committee (CC)

- Issue **First Draft Report** and Call for Comments

3. *Public Comment*

4. *Second Draft Report*

- NFPA Technical Committees: CMP followed by CC
- Issue **Second Draft Report** and Call for Intent to Make a Motion

5. *Technical Committee Report Session*

- **NITMAM**
- Annual Meeting of the NFPA
 - **Adoption of the Amended Document**

6. *Standards Council Issuance*

- **Appeals Hearings**
 - Standards Council Disposition of Appeals
- **Document Issuance**

The NEC is on a 3-year cycle.

Highlights of Major Changes in the 2014 NEC



2014 NEC

Adoption

- The **2014 National Electrical Code (NEC)** was officially adopted by the National Fire Protection Association (NFPA) general membership on June 13th, 2013 at the NFPA Annual Meeting in Chicago, IL and issued by the Standards Council on August 1st, 2013, **effective August 21st, 2013** concluding the 3-year cycle.
 - *There were **3,745 Proposals** and **1,625 Public Comments** for the **2014 NEC** – supporting documents:*

<http://www.nfpa.org/Assets/files/AboutTheCodes/70/70-A2013-ROP.pdf>

<http://www.nfpa.org/Assets/files/AboutTheCodes/70/70-A2013-ROPErrata.pdf>

<http://www.nfpa.org/Assets/files/AboutTheCodes/70/70-A2013-ROC.pdf>

http://www.nfpa.org/Assets/files/AboutTheCodes/70/70-A2013-ROCErrata_14-1.pdf

http://www.nfpa.org/Assets/files/AboutTheCodes/70/70-A2013-ROCErrata_2-82_2-84_16-37_17-37.pdf

http://www.nfpa.org/Assets/files/AboutTheCodes/70/A2013_FloorAction_final.pdf





2014 NEC

Code-wide Changes

- 4 new articles added:
 - 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - 646 Modular Data Centers
 - 728 Fire Resistive Cable Systems
 - 750 Energy Management Systems
- Code-wide changes:
 - Requirements for DC systems
 - Changing voltage threshold of 600 volts to 1000 volts
 - More prescriptive requirements for markings



2014 NEC

Highlights of Major Changes – Chapter 1

- **90.1** Purpose was clarified about the intention
- **100.Control Circuit** covers the previous similar definitions of 409.2 Control Circuit, 430.2 Motor Control Circuit, and 522.2 Control circuit
- **100.Coordination (Selective)** revised for clarity and distinguish “coordination” from “selective coordination” for over limited ranges versus over complete ranges of available overcurrents and the times associated
- **100.Effective Ground-Fault Current Path** relocated from 250.2 since it is used in many articles of the NEC
- **100.Premises Wiring (System)** has an Informational Note added to provide examples of power sources
- **100.Accessible, Readily** was revised to prohibit “the use of tools” when equipment is required to have ready access
- **100.Separately Derived System** clarified grounding and bonding connections from sources
- **100.Substation** relocated from 225.2 since it applies to more than outside branch circuits and feeders and is used elsewhere in the NEC



2014 NEC

Highlights of Major Changes – Chapter 1 (cont'd)

- **110.21(B)** adds specific requirements for field applied hazard warning labels and similar markings where required or specified elsewhere in the NEC
- **110.24(A) IN** new informational note clarifies that the available fault current markings are for short circuit ratings and equipment rating purposes under the NEC and not for arc flash hazard analysis required in NFPA 70E
- **110.25** "Lockable Disconnecting Means" is provided for consistent requirements throughout the NEC
- **110.26(C)(3)** revised lowering equipment size to 800A where personnel doors and listed panic hardware are required for safe egress
- **110.26(E)(2)(a)&(b)** adds new requirement for dedicated equipment space at outdoor installations correlating with existing indoor provisions in 110.26(E)(1)(a)
- **110.27(A)(4)** revised to increase elevation of live parts against accidental contact to 8-1/2 ft. for voltages 301 to 600V above the floor or working surface – *corresponds with the NESC 124A3 and Table 124-1*



2014 NEC

Highlights of Major Changes – Chapter 2

- GFCI protection in branch circuits' requirements changed in [210.8\(A\)](#), [-\(7\)](#), [-\(9\)](#), [-\(10\)](#) and [210.8\(B\)\(8\)](#) and [210.8\(D\)](#)
- [210.12](#) requires AFCI devices to be readily accessible
- [210.12\(B\)](#) revised to allow up to 6 ft. extension of branch circuits without AFCI protection – See also [406.4\(D\)](#) on replacements
- [210.13](#) is new ground fault protection for branch circuits' equipment which is the same as for feeders ([Article 215](#)) and services ([Article 230](#))
- [210.17](#) adds branch circuit requirements for electric vehicle (EV) charging
- [210.64](#) adds new requirement for 125V, 15A or 20A receptacle in electric service areas within 50 ft. except for 1 & 2 family dwellings
- [225.52\(A\)](#) revised location requirements for >1kV disconnect means
- [230.30](#) revised to include list of acceptable wiring methods for underground services
- [230.82\(3\)](#) adds label requirement to the meter disconnect



2014 NEC

Highlights of Major Changes – Chapter 2 (*cont'd*)

- **240.87** arc energy reduction requirements revised to allow $\geq 1200\text{A}$ circuit breakers to be adjusted to protect workers and reduce arc flash injuries
- **250.64(D)(1)** revised for common Grounding Electrode Conductor and Taps to address bus bar connections
- **250.66 & .68** have clarifications made to grounding electrode connections
- **Table 250.102(C)** is new adding sizing of grounded conductors, main bonding jumpers, system bonding jumpers, and supply side bonding jumpers
- **250.166** adds max. size grounding electrode conductor for DC systems
- **250.167** adds ground fault detection on DC systems
- **250.186** is a new requirement for services over 1kV to have supply side bonding jumper brought to the service equipment
- **250.194** adds requirements for bonding and grounding metal fences and structures around substations



2014 NEC

Highlights of Major Changes – Chapter 3

- **300.38** new requirement for raceways in wet locations above grade >1kV
- **310.15** has changes to tables in subparts (B)(3)(a) and (B)(3)(c) and removed Table 310.15(B)(7) which requires the user to size 100A to 400A service conductors and the main power feeder for dwellings according to a calculation – *an IN references new Example D7 in Informational Annex D*
- **314.15** added requirements for outlet box hoods and weep holes for boxes in damp or wet locations
- **330.30(B)** modified the securing requirements for MC cable not to exceed 10 ft.
- **376.56(B)(1) and (B)(5)** requires power distribution blocks be listed for purpose where used on line side of service equipment – *Listings need to be checked as the devices may be limited to 10kAIC*
- **392.20(A) and (B)** revised to clarify cables installed in cable trays to be based on operating voltage rather than the cable rating



2014 NEC

Highlights of Major Changes – Chapter 4

- **408.4(B)** requires switchgear, switchboards, and panelboards having more than 1 source of power to be marked indicating where all sources originate
- **408.55** adds provisions for minimum required wire bending space for conductors entering the enclosure from the rear similar to that of pull or junction boxes in 314.28(A)(2)
- GFCI protection is extended to **422.23** Automotive Vacuum Machines, **422.49** High Pressure Spray Washers, **422.51** Vending Machines, and **445.20** 15kW or smaller Portable Generators
- **450.10(A)** revision does not permit grounding and bonding terminal bar to be installed on or over vent screen portion of dry type transformer enclosure
- **490.48(B)** covers requirements for substations relocated from 225.70 in the 2011 NEC – *See 2014 NEC Errata for corrections to text*



2014 NEC

Highlights of Major Changes – Chapter 5

- **517.18(A)** requires coverplate for receptacles on critical branch to have distinctive color or marking
- **517.30(G)** revised “Coordination (Essential Electrical System)” for coordination of faults that exceed 0.1 seconds – *correlates with NFPA 99-2012*
- **547.2** clarifies the “Equipotential Plane” definition that it intends on “minimizing” voltage potentials
- **551.71** requires every recreational vehicle site with a 50A receptacle to be equipped with a 30A receptacle as well as the minimum one 20A 125V receptacle requirement
- **590.4(J)** prohibits cable assemblies and flexible cords and cables as branch circuits and feeders from being installed on the floor or ground except extension cords – *this is an OSHA requirement*



2014 NEC

Highlights of Major Changes – Chapter 6

- **600.6(A)(1)** requires disconnect means at the sign's supply wiring point of entry to its enclosure
- **645.27** new requirement for all critical operations data systems' overcurrent devices to be selectively coordinated with all supply side overcurrent devices
- **680.22(B)(6)** adds permission to install specific low voltage luminaires within 5 ft. of inside walls of permanent pools
- **680.26(C)** clarifies requirement for “bonding” of pool water
- **680.42(B)** adds 4 specific conditions to meet for equipotential bonding of perimeter services for spas and hot tubs



2014 NEC

Highlights of Major Changes – Chapter 6 (*DG Topics*)

- **690.12** has new provisions for rapid shutdown of PV systems on buildings when utility supply is de-energized within 10 seconds – *this originated from First Responders*
- **690.35** requires ground fault protection for ungrounded PV DC systems to be listed
- **690.47(D)** clarifies ground- and pole- mounted PV arrays require a grounding electrode system
- **690.81** is a new listing requirement for PV wire used in systems over 600 V not exceeding 2 kV
- **Article 694** revised to apply to wind electric systems regardless of size – previously it applied to 100 kW and less



2014 NEC

Highlights of Major Changes – Chapters 7 & 8

- **700.8** requires listed surge protective devices (SPD) for emergency systems switchboards and panelboards
- **700.24** new requirement for emergency luminaires and external bypass controls to be individually listed for use in emergency systems where illumination is provided by one or more directly controlled luminaires
- **700.27** requires a licensed professional engineer or other qualified person to design the selective coordination
- **702.7(C)** requires warning sign placed near optional standby system power inlet for temporary connection to a portable generator
- **708.52(D)** requires separation of ground fault protection time-overcurrent characteristics to conform to manufacturer's recommendations for COPS equipment
- **770.180** adds grounding devices used for optical fiber cables
- **800.12** adds new provision and definition in **800.2** for "Innerduct"
- **810.6** requires antenna lead-in surge protectors be listed



2014 NEC

Highlights of Major Changes – Informative Annexes

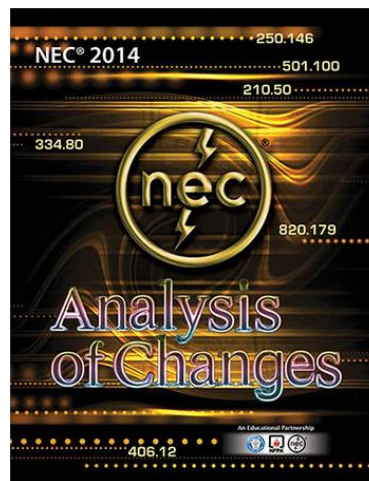
- **Informative Annex D Example D7** is new to describe how to apply revised 310.15(B)(7) by using the 83% factor rather than the former Table 310.15(B)(7) that was removed
- **Informative Annex J** is new for provisions to assist users of the Code to properly consider the **2010 American Disabilities Act (ADA) Standards for Accessible Design**
 - Protruding Objects
 - Clearances
 - Reach



2014 NEC

Where to Get More Information...

- *And there are many more changes to note!*
 - For more complete coverage of these and many other revisions refer to the *IAEI Analysis of Changes 2014 NEC*.
 - Look for and attend a local IAEI seminar in your area to find out more. Check the *Empire Chapter's Web site* at <http://www.iaei.org/group/1,10,0>



Public Input for the 2017 NEC

- Any suggested proposals for the next NEC revision (2017) are required to be submitted as Public Input to NFPA **by October 3, 2014** (paper) or **November 7, 2014** (online – ePI). *Anyone can make a submission!*

- Form is available on-line at

<http://www.nfpa.org/70next>

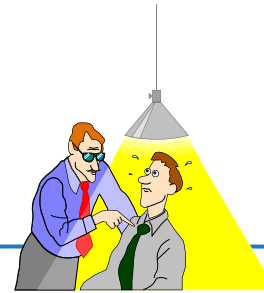
<http://www.nfpa.org/~media/files/Codes%20and%20standards/Regulations%20directory%20and%20forms/nfpapublicinputform.ashx>

What did we talk about?

- ✓ Purpose of the NEC
- ✓ NEC Code Arrangement & Related Publications
- ✓ The NEC Publication and Process
- ✓ Highlights of Major Changes in the 2014 NEC
 - ✓ Code-wide
 - ✓ Chapters 1-8
 - ✓ Chapter 6 DG Related
 - ✓ Informative Annexes
 - ✓ Where to Get More Information
- ✓ Public Input for 2017 NEC



Questions



1. True or False? The NESC applies on the supply side of the service point.
2. True or False? Premises wiring is covered by the NEC.
3. True or False? The IEEE publishes the NEC.
4. Yes or No? Is the arrangement of the NEC made up with Chapters, Articles, Parts, Sections?
5. Yes or No? Are there other related publications like the NEC?
6. Yes or No? Is the NEC revised as a public process?
7. True or False? Article 750 “Energy Management Systems” is a new Article in the 2014 NEC.
8. Yes or No? Was the voltage threshold of 600 volts changed to 1000 volts throughout most of the 2014 NEC?
9. Yes or No? Are photovoltaic electric installations covered by Article 690?
10. True or False? Anyone can submit Public Input for the next 2017 NEC.



Answers

1. True, the NESC does apply to the supply side of the service point.
2. True, premises wiring is covered by the NEC.
3. False, the NFPA, not the IEEE, publishes the NEC.
4. Yes, the arrangement of the NEC is made up with Chapters, Articles, Parts, Sections.
5. Yes, there are other related publications like the NEC, such as the Canadian Electrical Code Part 1.
6. Yes, the NEC is revised as a public process and is a consensus document.
7. True, Article 750 “Energy Management Systems” is a new Article in the 2014 NEC.
8. Yes, the voltage threshold of 600 volts was changed to 1000 volts throughout most of the 2014 NEC. CMPs 1 and 8 need more technical substantiation before making the change.
9. Yes, photovoltaic electric installations are covered by Article 690.
10. True, anyone can submit Public Input for the next 2017 NEC.

Thank You For Your Time

