

Instructions:

Fee \$20

1. Print these pages.
2. Circle the correct answers and transfer them to the [answer sheet](#).
3. Page down to the last page for the [verification forms](#) and mailing instructions.
4. Use the included analysis information as your reference materials.
5. 20 questions are listed in a straight order mini-section format throughout the complete quiz.

Course: 17110 2014 NEC Analysis PART 1

This course is valid for these credentials:

Credential Description	Cred Code	Credit Hours
Registered/Beginner Electrician	BE	2.0
Commercial Electrical Inspector	CEI	2.0
Industrial Journeyman Electrician	IJE	2.0
Journeyman Electrician	JE	2.0
Master Electrician	ME	2.0
Residential Journeyman Electrician	RJE	2.0
Residential Master Electrician	RME	2.0
UDC-Electrical Inspector	UEI	2.0

2014 NEC Analysis Part 1

New articles for the 2014 NEC

Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems. A new article was added to address low-voltage Class 2 ac and dc volt equipment connected to ceiling grids, and walls built specifically for this type of power distribution system. The growing interest in alternative energy sources (e.g., photovoltaics, wind turbines, batteries, fuel cells, etc.) and the proliferation of low-voltage, low-power devices (sensors, LV lighting, IT equipment, AV equipment, etc.) have created a significant need for adequate language supporting the practical safeguarding of circuits and electrical equipment operating at 30 volts ac, or 60 volts dc, or less. This new article addresses equipment with similar characteristics to track lighting, but includes the wiring and power supply requirements as well. It also provides the specific requirements for the safe installation of low-voltage, power-limited power distribution providing power to lighting and non-lighting loads. See Proposal 18-10a and Comments 18-7, 18-8, 18-9, 18-10, and 18-1 Qa.

Article 646 Modular Data Centers. This new article was added in Chapter 6 to distinguish between data centers that currently fall under the scope of Article 645, Information Technology Equipment. Modular Data Centers (MDCs) are an important emerging trend in data center architecture. Their construction, installation and use result in a unique hybrid piece of equipment that falls somewhere in-between a large enclosure and a prefabricated building. The contained equipment in the enclosures or prefabricated buildings would be fully customizable and scalable to provide data center operations but, typically, would not be permanently installed. Article 645 is applicable only to installations that meet the criteria of 645.4. Otherwise, Article 645 would not be applicable to these products and the other articles of the Code would have to be applied. However, it is not always obvious which requirements of the NEC are applicable, or how they should be applied given the complexity, customization and scalability of modular data centers. This article identifies those areas of the NEC that should be applied to MDCs and also includes additional new requirements where necessary. See Proposal 12-147 and Comments 12-71, 12-72, 12-74, 12-75, 12-76, 12-77, 12-78, 12-80, 12-81, 12-82, and 12-83.

Article 728 Fire-Resistive Cable Systems. A new article has been added to address installations of fire-resistive cables. The installations of these cables are critical to their ability to function during a fire.

These cable systems must be installed in accordance with very specific materials, supports, and requirements and are critical for the survivability of life safety circuits. There are diverse details for installing fire-rated cables that differ from other type cables. Some of these variances pertain to conduit, conduit supports, type of couplings, vertical supports and boxes and splices. Without these details being included in the NEC, the installer and the enforcement community can be left uninformed. See Proposal 3-1 70 and Comments 3-79, 3-80, 3-81, 3-82, 3-83, 3-83a, and 3-83b.

Article 750 Energy Management Systems. A new article was added to provide some general requirements to address the types of loads permitted to be controlled through energy management. Energy management has become commonplace in today's electrical infrastructure through the control of utilization equipment, energy storage and power production. Installation codes currently establish requirements for utilization equipment, for energy storage, and for power production that serve to address facility and personnel safety. However, limited consideration has been given in installation codes to actively managing these systems as a means to reduce energy cost or to support peak power needs for a much broader electrical infrastructure demand. This article resulted from the work of the Smart Grid Task Group appointed by the NEC Correlating Committee. This task group identified two key areas of focus: interconnection and energy management systems. This article includes such things as definitions, requirements for alternative power sources, load-management provisions and field-marking requirements. See Proposal 13-180.

1. The newly added article that will provide requirements to address the types of loads permitted to be controlled through energy management defines:
 - a. Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - b. Article 646 Modular Data Centers
 - c. Article 728 Fire-Resistive Cable Systems
 - d. Article 750 Energy Management Systems
2. The newly added article that will provide requirements to address installations of fire-resistive cables defines:
 - a. Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - b. Article 646 Modular Data Centers
 - c. Article 728 Fire-Resistive Cable Systems
 - d. Article 750 Energy Management Systems
3. The newly added article that will provide requirements to distinguish between data centers that currently fall under the scope of Article 645, Information Technology Equipment. Modular Data Centers (MDCs) are an important emerging trend in data center architecture defines:
 - a. Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - b. Article 646 Modular Data Centers
 - c. Article 728 Fire-Resistive Cable Systems
 - d. Article 750 Energy Management Systems
4. The newly added article that will provide requirements to address low-voltage Class 2 ac and dc volt equipment connected to ceiling grids, and walls built specifically for this type of power distribution system defines:
 - a. Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - b. Article 646 Modular Data Centers
 - c. Article 728 Fire-Resistive Cable Systems
 - d. Article 750 Energy Management Systems
5. The newly added article that will provide the specific requirements for the safe installation of low-voltage, power-limited power distribution providing power to lighting and non-lighting loads defines:
 - a. Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - b. Article 646 Modular Data Centers
 - c. Article 728 Fire-Resistive Cable Systems
 - d. Article 750 Energy Management Systems
6. This article identifies those areas of the NEC that should be applied to MDCs and also includes additional new requirements where necessary defines:

- a. Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - b. Article 646 Modular Data Centers
 - c. Article 728 Fire-Resistive Cable Systems
 - d. Article 750 Energy Management Systems
7. The installations of these cables are critical to their ability to function during a fire defines:
- a. Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - b. Article 646 Modular Data Centers
 - c. Article 728 Fire-Resistive Cable Systems
 - d. Article 750 Energy Management Systems
8. This article includes such things as definitions, requirements for alternative power sources, load-management provisions and field-marking requirements defines:
- a. Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems
 - b. Article 646 Modular Data Centers
 - c. Article 728 Fire-Resistive Cable Systems
 - d. Article 750 Energy Management Systems

Field-Applied Hazard Markings. A new 110.2(B) lists specific requirements for warning labels and similar markings where required or specified elsewhere in the Code. The NEC contains several requirements for labels to be installed on wiring methods and equipment. These required labels or markings typically include one of the following hazard commands: DANGER, WARNING, or CAUTION. This new requirement will incorporate consistent uniformity to rules where additional direction and guidance were needed. These markings, signs or labels should meet ANSI Z535.4 for suitable font sizes, words, colors, symbols and location requirements. Coordinated companion proposals and comments were submitted where caution, warning, and danger markings or signs are required throughout the NEC with reference to this new requirement in Article 110.

Lockable Disconnecting Means in Article 110. A new 110.25 was added to deliver a one-stop location providing consistent requirements for a lockable disconnecting means. Forty-six companion proposals were submitted throughout the NEC to reference this new requirement and to send users of the Code back to one location for lockable disconnecting means requirements. These companion proposals were submitted by a Usability Task Group assigned by the NEC Correlating Committee (NEC CO) to look at the numerous locations in the 2011 NEC that referenced lockable disconnecting means requirements.

Requirements for dc Systems Integrated throughout the NEC. Direct current (dc) applications are experiencing a re-emergence because of such things as electric vehicle charging, solar photovoltaic (PV) systems, microgrids, wind generated electric systems, etc., In a great number of cases, these dc systems can achieve greater efficiencies and energy savings than their conventional alternating current (ac) contemporaries. The industry trades installing these different dc applications have been known to use inconsistent polarity identification schemes, particularly with regard to whether or not the grounded conductors of negatively-grounded or positively-grounded two-wire dc systems are actually identified as such. Such inconsistency can result in risk and confusion to installers and service personnel where the branch circuits of these various applications, as well as branch circuits of conventional ac circuits, come together. These inconsistencies are the backdrop for the need to have consistent and reliable rules throughout the NEC for these dc systems. Several of the proposals for expanding these dc system requirements were developed and submitted by a subgroup of the NEC DC Task Force of the NEC Correlating Committee.

Use of the Term Switchgear Incorporated throughout the NEC. The existing definition for metal-enclosed power switchgear was modified and retitled to simply switchgear to make it inclusive of all types of switchgear under the purview of the NEC. This revised definition created the opportunity to utilize this generic term in all locations where the term switchboard is already mentioned, and where the use of the term switchgear is appropriate. The term switchgear includes all types of

switchgear such as metal-enclosed low-voltage power circuit breaker switchgear, metal-clad switchgear, and metal-enclosed interrupter switchgear.

Definitions Relocated to Article 100. Several existing definitions which appeared in the definitions of a particular article have been relocated to Article 100 as these terms are also found in other articles, not just in the article where the previous definition was located. An example of this would be the definition of effective ground-fault current path relocated from 250.2 to Article 100. The NEC Style Manual at section 2.2.2.1 generally requires that Article 100 contain definitions of terms that appear in two or more other articles of the NEC.

9. Several existing definitions which appeared in the definitions of a particular article have been relocated to Article 100 as these terms are also found in other articles, not just in the article where the previous definition was located defines:

- a. Definitions Relocated to Article 100
- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

10. The existing definition for metal-enclosed power switchgear was modified and retitled to simply switchgear to make it inclusive of all types of switchgear under the purview of the NEC defines:

- a. Definitions Relocated to Article 100
- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

11. Direct current (dc) applications are experiencing a re-emergence because of such things as electric vehicle charging, solar photovoltaic (PV) systems, microgrids, wind generated electric systems, etc. defines:

- a. Definitions Relocated to Article 100
- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

12. A new 110.25 was added to deliver a one-stop location providing consistent requirements for a lockable disconnecting means defines:

- a. Definitions Relocated to Article 100
- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

13. A new 110.2(B) lists specific requirements for warning labels and similar markings where required or specified elsewhere in the Code defines:

- a. Definitions Relocated to Article 100
- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

14. These markings, signs or labels should meet ANSI Z535.4 for suitable font sizes, words, colors, symbols and location requirements defines:

- a. Definitions Relocated to Article 100
- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

15. The industry trades installing these different dc applications have been known to use inconsistent polarity identification schemes, particularly with regard to whether or not the grounded conductors of negatively-grounded or positively-grounded two-wire dc systems are actually identified as such defines:

- a. Definitions Relocated to Article 100
- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

16. The term switchgear includes all types of switchgear such as metal-enclosed low-voltage power circuit breaker switchgear, metal-clad switchgear, and metal-enclosed interrupter switchgear a.

Definitions Relocated to Article 100

- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

17. The NEC Style Manual at section 2.2.2.1 generally requires that Article 100 contain definitions of terms that appear in two or more other articles of the NEC defines:

- a. Definitions Relocated to Article 100
- b. Use of the Term Switchgear Incorporated throughout the NEC
- c. Requirements for dc Systems Integrated throughout the NEC
- d. Lockable Disconnecting Means in Article 110
- e. Field-Applied Hazard Markings

Section 90.1(A) relating the purpose of the Code was revised to contain a positive statement of the intent of the Code, By deleting subsection (C), which dealt with the intention of the Code, in its entirety and incorporating the deleted text into subsection (A), the purpose of the Code is consolidated into one paragraph that includes both its purpose and language limiting its intended use. The title of 90.1 (A), was changed from "Practical Safeguarding," to "Purpose" to better reflect the objective of the Code. The previous language at 90.1 (C) was a negative statement that told users of the Code what the NEC was not intended for. By combining the intent and the purpose of the Code into one subsection, there is a positive statement about the intention of the NEC.

18. Previous "Intention" of the Code was _____.

- a. amended
- b. revised
- c. moved
- d. deleted

19. The title of 90.1 (A) was changed to _____ to better reflect the objective of the Code.

- a. Practical Safeguarding
- b. Purpose
- c. Intention
- d. none of the above

As previously written, 90.8(B) was misleading by indicating that a shortcircuit or ground-fault condition was limited to just one circuit within a raceway or enclosure. The removal of the phrase "in one circuit" clarifies that a short-circuit or ground-fault condition is not limited to any one circuit within raceways or enclosures. The previous phrase "in one circuit" was excessive and unnecessary and added no clarity to the Code.

20. The words "in one circuit" in the last sentence has been _____.

- a. amended
- b. revised
- c. moved
- d. removed

2014 NEC Analysis Part 1-Quiz Answer Sheet

- | | | |
|------------------|---------------------|---------------------|
| <u>1</u> a b c d | <u>8</u> a b c d | <u>15</u> a b c d e |
| <u>2</u> a b c d | <u>9</u> a b c d e | <u>16</u> a b c d e |
| <u>3</u> a b c d | <u>10</u> a b c d e | <u>17</u> a b c d e |
| <u>4</u> a b c d | <u>11</u> a b c d e | <u>18</u> a b c d |
| <u>5</u> a b c d | <u>12</u> a b c d e | <u>19</u> a b c d |
| <u>6</u> a b c d | <u>13</u> a b c d e | <u>20</u> a b c d |
| <u>7</u> a b c d | <u>14</u> a b c d e | |

To obtain your Continuing Education Credits follow the below instructions

1. Print out first.
2. Fill in all fields applicable.
3. Include your certification or license number.
4. We'll take care of crediting with the state and mailing back to you the quiz results.

Send by mail

1. Mail just the answer sheet and keep the quiz for your records.
2. Fill out this form below completely.
3. Applicable fees by check payable to Gary Klinka.
4. Mail to: Gary Klinka at 228 Mandella Ct Neenah WI 54956.

Office: 920-727-9200 Fax: 888-727-5704 Cell: 920-740-4119 or 740-6723 aklinka@hotmail.com

-----Educational Course Attendance Verification Form -----

Attendee's name _____ Date _____

Address _____

Credential Number _____ Phone# _____

Course Title and Name 2014 NEC Analysis Part 1 Course ID# 17110

List the name of each credential held by attendee _____

_____ Credited 2 hrs

Email address _____

Fax# _____ Course Fee \$20

To be completed by Gary Klinka www.garyklinka.com My credential #70172

Attendee passed the course with a greater than 70% score on date _____

Instructor's signature _____