1- and 2-Family Dwellings

Study Guide

ELECTRICAL INSPECTOR CERTIFICATION PROGRAM

NEC 2014

1- and 2- Family Study Guide

Electrical Inspector Certification Program

Electrical General Study Guide

Electrical Inspector Certification Program

Updated to the
2014 *NEC*

International Association of Electrical Inspectors
Richardson, Texas

ISBN-10:1-890659-67-3
ISBN-13:978-1-890659-67-7

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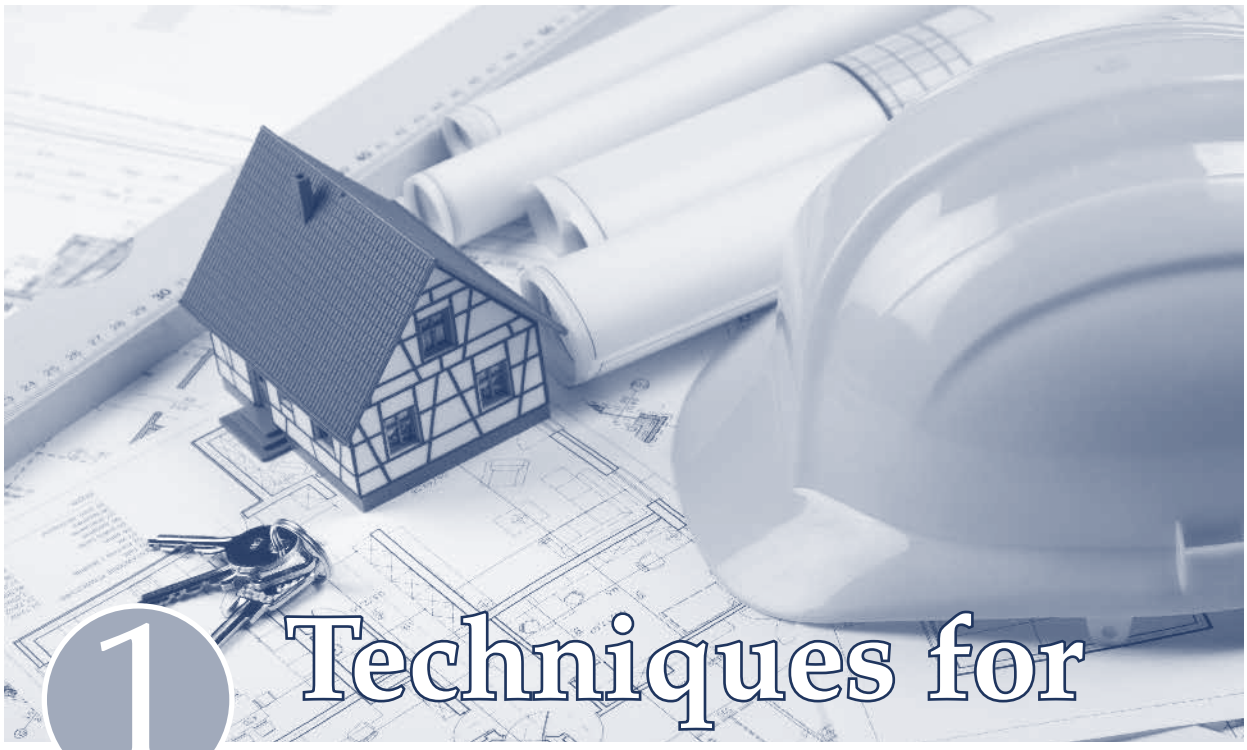


1 Techniques for Testing

People study for a variety of reasons. Some study to improve their understanding and grasp of their chosen field, but the vast majority study because they will be required to show their competence in a given subject. Competence is generally measured by test scores. Unfamiliarity with the specific subject is one of the main reasons for low scores. Another reason is, a person's performance is only a sample of his or her behavior at that point in time. In other words, test scores are not set in concrete and you can improve your score by preparing better, improving your attitude, and understanding the best methods to use in test taking.

The easiest way to improve your test performance is to reduce your anxiety level. The study guides sponsored by the International Association of Electrical Inspectors are designed to improve your understanding of how to find information in the *National Electrical Code*. The questions are designed to be similar to test formats you are likely to find in electrical inspector certification examinations. It should be understood that no effort is made to duplicate those questions exactly. To do so, would be nonproductive as questions are changed from time to time. Rather, the approach used in these study guides is to help you master locating information quickly and accurately. You can then master any test question. The refresher courses are available in three modules: *Electrical General Study Guide*, *One- and Two-Family Dwellings Study Guide*, and *Plan Review Study Guide*.

The goal of these courses is to ensure your best possible performance by understanding how to use the *National Electrical Code*® and thus reduce your anxiety level. The courses may be used for individual home study and are also ideally suited for an instructor/pupil classroom approach.

Examination for Certification

Methods to Improve Your Test Scores

1. *Prepare by studying.* The questions in this refresher course are designed to teach you how to find the rules quickly and efficiently. If you learn how to use the table of contents and index properly, you will find the material in a reasonably short period. This knowledge and confidence will help reduce your anxiety and raise your scores. Consistent study leads to a higher retention level than cramming just prior to the examination date. The ultimate

goal is to become familiar with the use of the *NEC* and testing format.

2. *Arrive on time*. Make sure you allow plenty of time to arrive promptly, but not too early. Since nervousness is contagious, don't associate too closely with the other examinees as you may pick up their anxiety level.
3. *Eliminate wrong answers.* If the test is multiple choice and you have four alternatives, the odds are 4 to 1 that you can guess the right answer. If you eliminate any two alternatives, your chances are increased to 50-50.
4. *Read directions carefully.* Many mistakes are made merely because the directions have been misunderstood. If, after reading carefully, you still are not sure, ask the proctor for clarification.
5. *Allow yourself enough time.* Based on the number of questions you have to answer, allot a specific amount of time for each question.
6. *Answer question first.* If the question has several alternatives, attempt to answer the question before you check the alternatives. In this way you can evaluate your answer against the alternatives.
7. *Skip difficult questions.* If you are unsure of the answer or know that you are familiar with the material but don't have a ready answer, skip the question and go on to other material. Complete known questions then return to those you don't know. Chances are, your mind will subconsciously work out the answer so that it will be easier when you return to it.
8. *First choice is usually best.* If you pick an answer to a multiple choice question and have later reservations about the right answer, remember that your first choice is usually best. If on later evaluation you know you have made a mistake, by all means change your answer.
9. *Read questions carefully.* Make sure you note key words that might change the meaning of the questions. Note negative disclaimers such as, "which of the following are not...". A handy way to increase understanding is to underline key words. This has a tendency to channel your thinking along the right path.
10. *Make sure you are comfortable.* If you have on too many clothes, remove some. Being too warm has a tendency to make you drowsy, which leads to a loss of concentration.
11. *Re-check your work.* The last thing you should do before handing in your paper is to recheck and make sure you have not made any clerical mistakes. Many times you will know the right answer, but lose points on your score because of a clerical error.

Study Plan

Familiarize yourself completely with the codebook. Until one is familiar with the *Code* to the extent that location of specific requirements is committed to memory, use of the index is the best way to find information. The index contains in alphabetical order a list of what is in the *Code*, telling where to find topics covered.

Even though you may know the answer to a question, follow this sequence to establish the answer:

1. Check the table of contents to find the proper code article.
2. Select key words from the question that will identify the code article and subject matter that will be used to find the requirements in the index.

   Select key words from the question that will identify the code article and subject matter that will be used to find the requirements in the index.

   For example, you have been asked to verify the size of a grounding electrode conductor for a 200 ampere AC service supplying a dwelling. The dwelling unit has a metal water pipe and the service-entrance conductors are 3/0, THWN, copper.

   From the question, you can identify the subject of the question is a grounding electrode conductor. Specifically, you are being asked to determine the size. Additional key words or subject matter are the *size of the service-entrance conductors* and the fact the dwelling is supplied by a *metal water pipe*.

   Looking in the index, you find "Grounding electrode conductors" under which you will find "Sizing 250.30(A)(6)(a), 250.66 and

250.166." Scanning 250.30(A)(6) you quickly realize this is related to separately derived systems; so the next choice was 250.66 from the index. Section 250.66 is titled "Size of Alternating-Current Grounding Electrode Conductors."

The opening paragraph of 250.66 states the grounding electrode conductor cannot be less than given in Table 250.66 except as permitted in (A)–(C). Scanning 250.66(A)–(C), you find they are not applicable to the question; so Table 250.66 must be used.

Table 250.66 is based on the size of the service-entrance conductors; so in our case, we determine a 4 AWG copper grounding electrode conductor is required for an AC service supplied by 3/0 copper conductors.

3. If, in the index, you do not readily find the location of the requirements related to the question, scan the bold face titles of the appropriate sections in the body of the code to locate quickly the subject material.

   The Table of Contents lists in numerical sequence the subjects covered by each chapter and each article. So it provides the article number, part number if applicable, and a page number that can be used to find a location to start scanning section and subsection titles. Experienced users of the *NEC* are generally familiar with the content of *NEC* articles and, therefore, often use the Table of Contents of to find a page number as a starting point.

   Using the above question, an experienced user of the *NEC* would know that grounding and bonding requirements are found in Article 250. Scanning the information in the Table of Contents, we find the requirements for the "Grounding Electrode System and Grounding Electrode Conductor" are in Part III of Article 250 and they start on Page 117. Scanning the boldfaced section and subsection titles starting on page 119, we find 250.66 "Size of Alternating-Current Grounding Electrode Conductors on page 121."

This study guide is divided into subject categories and each category has several questions. Each question is followed by the procedure for finding the correct answer. Follow the procedures step by step to learn good work habits. The answers are listed in the back of the book. Do not look up the answers until you have completed work in the entire category.

Remember, you are only shortchanging yourself by not following the step-by-step method of problem solving. The goal is to learn how to find code information in the most efficient manner.

This study guide is based on the *National Electrical Code*, 2014 edition.

2 How to Use the *NEC*

The *National Electrical Code*, sponsored by the National Fire Protection Association, is the most widely adopted code in the world. It is also, in all probability, the most widely misinterpreted code in the world. The *NEC* is adopted by federal, state and local governments as well as by private industry. As far as NFPA is concerned, the *NEC* is purely advisory. It becomes enforceable as law only upon adoption by an agency having authority to enforce its rules. Requirements for electrical inspection of installations, licensing of electrical contractors and electricians, as well as qualifications of electrical inspectors usually are contained in laws or ordinances that are associated with adoption and enforcement of electrical codes.

Scope of the *Code*

Article 90 serves as an introduction to the *NEC* and provides a scope to specify the electrical installations that are covered and those that are not covered. The *Code* covers installations of electric conductors and equipment within or on public and private buildings or other structures, including mobile homes, recreational vehicles, and floating buildings; and other premise wiring such as yards, carnival, parking, and other lots, and industrial substations. The *Code* also covers installations of conductors and equipment that connect to the supply of electricity, installations of other outside conductors and equipment on the premises, as well as installations of signaling and communications conductors and equipment and optical fiber cable.

In addition, the *Code* covers installations in buildings used by the electric utility, such as office buildings, warehouses, garages, machine shops and recreational buildings that are not an integral part of a generating plant, substation or control center.

The *Code* does *not* cover installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles.

It also does not cover underground mines, railway conductors, or installations of communications equipment under the exclusive control of the communications utility. This latter requirement generally applies to overhead and underground communications conductors up to their termination in

a locked room under the exclusive control of the communications utility. Installations, such as telephone distribution conductors, in hung ceilings or other accessible locations, are not normally under the exclusive control of the telephone company and are, therefore, covered by Article 800. Electric utility generation, transmission, transformation and distribution conductors including associated lighting are not normally covered by the *NEC*.

Enforcement

It is intended that the authority having jurisdiction interpret the rules in the *Code* and approve all devices, materials, equipment and conductors.

> **90.4 Enforcement.** This *Code* is intended to be suitable for mandatory application by governmental bodies that exercise legal jurisdiction over electrical installations, including signaling and communications systems, and for use by insurance inspectors. The authority having jurisdiction for enforcement of the *Code* has the responsibility for making interpretations of the rules, for deciding on the approval of equipment and materials, and for granting the special permission contemplated in a number of the rules.

While the code is primarily intended to apply to new construction, the second paragraph of 90.4 permits the authority having jurisdiction to use his or her judgment in applying the code to rewiring in old installations.

By special permission, the authority having jurisdiction may waive specific requirements in this code or permit alternative methods where it is assured that equivalent objectives can be achieved by establishing and maintaining effective safety.

In discharging the responsibilities granted in 90.4, authorities having jurisdiction should enforce the requirements of 110.3(B) to assure that equipment is used as intended by the manufacturer and electrical products testing laboratory.

All mandatory rules are characterized by the use of the word "shall." Where the word "may" is used it means that the authority having jurisdiction has the prerogative of granting permission.

This should not be confused with the permissive term "may," which has largely been replaced in current editions of the code by the term "shall be permitted."

> **90.5 Mandatory Rules, Permissive Rules, and Explanatory Material.**
> **(A) Mandatory Rules.** Mandatory rules of this *Code* are those that identify actions that are specifically required or prohibited and are characterized by the use of the terms *shall* or *shall not*.
>
> **(B) Permissive Rules.** Permissive rules of this *Code* are those that identify actions that are allowed but not required, are normally used to describe options or alternative methods, and are characterized by the use of the terms *shall be permitted* or *shall not be required*.
>
> **(C) Explanatory Material.** Explanatory material, such as references to other standards, references to related sections of this *Code*, or information related to a *Code* rule, is included in this *Code* in the form of informational notes. Informational notes are informational only and are not enforceable as requirements of this *Code*.
>
> Brackets containing section references to another NFPA document are for informational purposes only and are provided as a guide to indicate the source of the extracted text. These bracketed references immediately follow the extracted text.
>
> Informational Note: The format and language used in this *Code* follows guidelines established by NFPA and published in the *NEC Style Manual*. Copies of this manual may be obtained from NFPA.
>
> **(D) Informative Annexes.** Nonmandatory information relative to the use of the *NEC* is provided in informative annexes. Informative annexes are not part of the *NEC*, but are included for informative purposes only.

Informational notes are sometimes mistakenly enforced as mandatory requirements. They are in-

tended to provide information or explanatory material and are not intended to be enforced as a part of the requirements. Where more than one Informational Note follows a section, they are numbered consecutively such as Informational Note No. 1, Informational Note No. 2, etc.

Use the Table of Contents and Index

To save time, one should use the table of contents to his or her best advantage. The table of contents lists in numerical sequence the subjects covered by each chapter and each article. Review of the table of contents gives an excellent overview of where the *Code* covers specific subjects or equipment.

Until one is familiar with the *Code* to the extent that location of specific requirements is committed to memory, use of the index is the best way to find information. The index contains in alphabetical order a list of what is in the *Code*, telling where to find topics covered. In some cases, the location of topics can be found in more than one way. For instance, the ampacities for conductors can be found under the heading "Ampacities" and also under the heading "Conductors."

Seemingly vague requirements can often become crystal clear by making use of the definitions in Article 100. For instance, the definition of *overload* says that a fault, such as a short circuit or ground fault, is not an overload.

Code Arrangement

The arrangement of the *Code* is explained in 90.3. One should become thoroughly familiar with this concept for proper application of code rules. General rules in early chapters are sometimes supplemented or modified by later chapters.

> **90.3 Code Arrangement.** The *Code* is divided into the introduction and nine chapters, as shown in Figure 90.3. Chapters 1, 2, 3, and 4 apply generally; Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions. These latter chapters supplement or modify the general rules. Chapters 1 through 4 apply except as amended by Chapters 5, 6, and 7 for the particular conditions.
>
> Chapter 8 covers communications systems and is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter 8.
>
> Chapter 9 consists of tables.
>
> Annexes are not part of the requirements of the *Code* but are included for informational purposes only.

Chapter Arrangement

Many articles have a scope that explains what is covered by that article. Mistakes in understanding and application of *Code* requirements are often avoided by reviewing the article scope before assuming general coverage of a requirement. Let's look at the scope of Article 555.

> **555.1 Scope.** This article covers the installation of wiring and equipment in the areas comprising fixed or floating piers, wharves, docks, and other areas in marinas, boatyards, boat basins, boathouses, yacht clubs, boat condominiums, docking facilities associated with residential condominiums, any multiple docking facility, or similar occupancies, and facilities that are used, or intended for use, for the purpose of repair, berthing, launching, storage, or fueling of small craft and the moorage of floating buildings. Private, noncommercial docking facilities constructed or occupied for the use of the owner or residents of the associated single-family dwelling are not covered by this article.

Chapter 8 covers communication systems and is not subject to the requirements of Chapters 1 through 7, except where the requirements are specifically referenced therein. For example, refer to 800.44(A)(3), Climbing Space. "The climbing space through communications wires and cables shall comply with the requirements of 225.14(D)." Without a reference like this, there would not be any requirements for climbing space relative to communications conductors unless specifically included in Article 800.

Numbering System

Essential to the understanding of any standard is familiarizing oneself with the arrangement and numbering system employed. The numbering system utilized for the *NEC* consists of the introduction Article 90, along with chapters numbered from 1 through 9.

Chapters are further divided into several articles consisting of numbers in hundreds such as Article 100, Article 200, Article 300, etc. All articles in Chapter 1 begin with 100, Chapter 2 with 200, etc.

Some articles have several parts which are in roman numerical sequence such as I, II, III, IV, etc. Common requirements are grouped in parts of articles. Part I, General, usually contains provisions that apply to all the other parts of the article. Other parts contain provisions that are independent of all other parts; except Part I General. For instance, Part II of Article 680 contains provisions for permanently installed pools, and Part III contains provisions for storable pools. Each part is separate and independent of the other, but all parts must comply with the applicable general requirements of Part I; unless specifically stated otherwise.

All articles are divided into sections such as 110.3, 110.5, 110.8, 110.26, etc. Subsections are further numbered with lower case alphabetical characters similar to 110.26(A), 110.26(B), 110.26(C). In some cases, paragraphs following subsections are numbered similar to 110.27(A)(1), 110.27(A)(2), 110.27(A)(3), etc.

Parallel Numbering

The *NEC*-2002 introduced a new parallel numbering system. Common types of rules or information are assigned the same numbered section in each article. As an example, article scopes are designed as ".1" and definitions for the specific article are assigned as ".2". Uses permitted are ".10" in all articles. This will help users of the *Code* locate this type of common material without having to search for it in different locations on each article.

General Requirements

Users often miss important requirements by failing to review the general requirements before deciding that the subject is not covered in the Code. Article 110 contains general requirements for electrical installations that are applied throughout all the other articles, unless modified by other articles. Article 300 provides the general requirements for wiring methods and materials. By its scope it can be modified by other articles within Chapter 3. Remember that per 90.3 the general requirements of chapters one through three can be modified by other articles in chapters five, six or seven. Only those sections in Article 300 that are referenced in Articles 725, 760, 770, 800, 810, 820, 830, and 840, apply in the latter articles. The sections of Article 300 that apply to those later articles can be found under "Other Articles" which is typically in ".3" of the respective article. This is due to the unique nature of the requirements in the latter articles.

Table Notes

Tables utilize a smaller font size for the footnotes, which are mandatory to the application of the table. For example, see the footnotes that follow Table 300.5 that read as follows:

Notes:

1. Cover is defined as the shortest distance in millimeters (inches) measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.
2. Raceways approved for burial only where concrete encased shall require concrete envelope not less than 50 mm (2 in.) thick.
3. Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.
4. Where one of the wiring method types listed in Columns 1–3 is used for one of the circuit types in Columns 4 and 5, the shallowest depth of burial shall be permitted.
5. Where solid rock prevents compliance with the cover depths specified in this table, the wiring shall be installed in metal or nonmetallic raceway permitted for direct burial. The raceways shall be covered by a minimum of 50 mm (2 in.) of concrete extending down to rock.

Note also, in the case of Table 300.5, the definition of *cover*, which is located as note 1.

Exceptions

Basic rules are stated in standard (Roman) type and are followed by all the exceptions to the basic rule. Exceptions are set in italics. It is important to clearly read and understand the requirements of the basic rule be-

fore applying the exception. Exceptions apply only to the section or subsection they follow, unless stated differently in the rule. See the following example.

Several sections use a type of exception that can be considered "except as provided in _____ through_____." Look at 240.21 for an example of this concept. The general rule for location of the overcurrent device applies "except as specified in 240.21(A) through (H)."

Installation and Use

"Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling" [110.3(B)].

Purpose

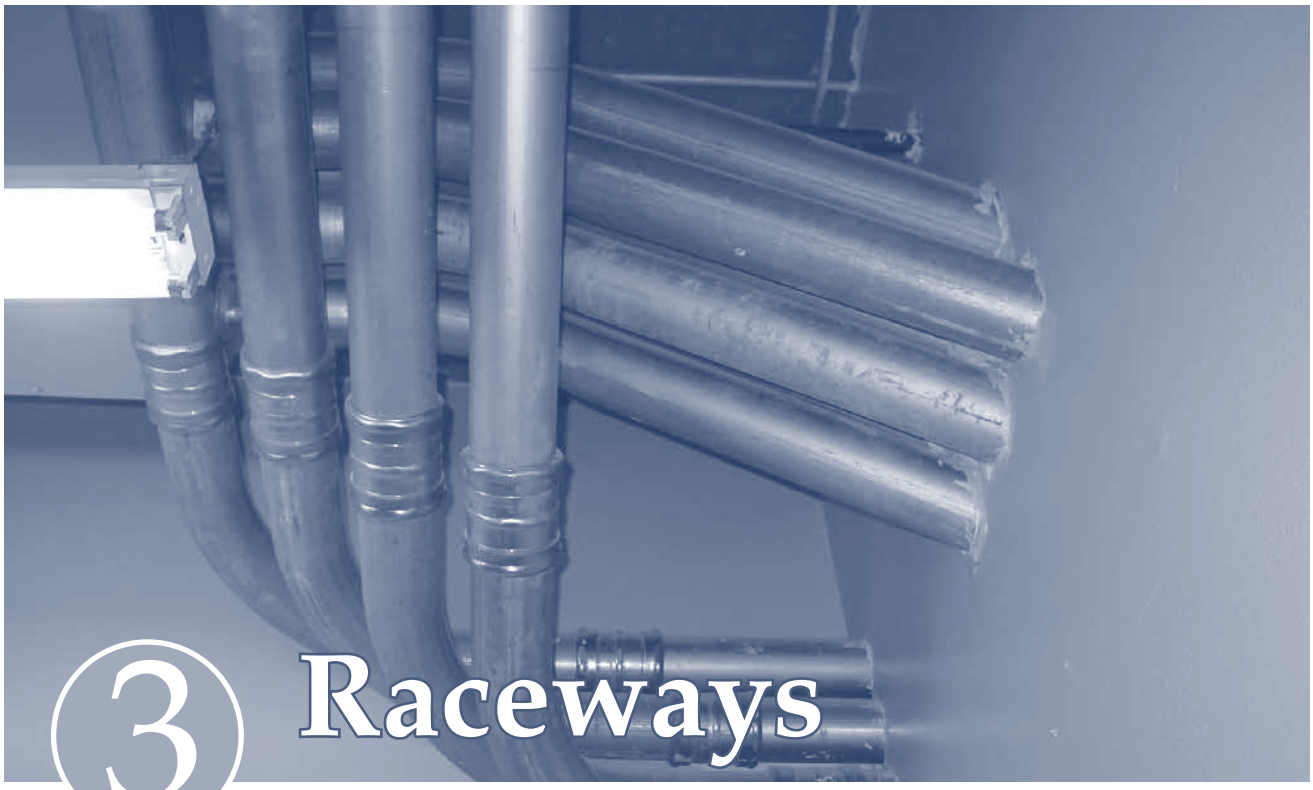
The *Code* is not intended as a design specification, and proper application dictates the use of nationally recognized product safety standards. Neither is the *Code* an instruction manual for untrained persons.

> **90.1(A) Purpose.** The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity. This *Code* is not intended as a design specification or an instruction manual for untrained persons.

Definitions

Article 100, Definitions, generally contains definitions of terms only where used in two or more articles as stated in the Scope. When an article requires a definition of a term not used in other parts of the *Code*, that definition will be found within the article in which it is used at ".2" in the parallel numbering system. In most other cases, *Webster's Dictionary* or the *Institute of Electrical and Electronics Engineers Dictionary* will suffice. The cultivation of an electrical technical vocabulary is a must to understand the more intricate requirements. The *IEEE Standard Dictionary of Electrical Terms* proves helpful even to the seasoned veteran.

Applying the subtle rules that are used in writing the *Code* will assist old hands as well as the beginner. Failure to follow the simple rules leads to controversy and non-uniformity.



3 Raceways

QUESTION 1. Under general conditions conductors installed in raceways shall be stranded if larger than what size?

A. 12 AWG
B. 10 AWG
C. 8 AWG
D. 6 AWG

ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about stranded conductors installed in raceways.

► 1. In Index, find "Conductors."

► 2. Under "Conductors," find "Stranded, 310.106(C)."

► 3. Section 310.106(C) provides that when installed in raceways, conductors of size 8 AWG and larger shall be stranded, except as permitted or required elsewhere in this *Code*.

► 4. When answering a question such as this, one has to really think before selecting the answer. As noted in Step 3, the *NEC* section is noting that conductors of 8 AWG and larger have to be stranded but the question is essentially asking, what is the largest size solid conductor that can be installed in a raceway?

► 5. The correct answer is B.

QUESTION 2. Raceways for service conductors are considered outside a building or structure if the raceway is installed:

A. in the hollow spaces of the building or structure
B. within rigid metal conduit (Type RMC) or intermediate metal conduit (Type IMC) used to accommodate the clearance requirements in 230.24 and routed directly through an eave but not a wall of a building

C. within insulation between studs in an outside wall
D. exposed in a crawlspace under a building

ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about when service conductors are considered to be outside a building.

► 1. In Index, find "Service-entrance conductors" under which find "Considered outside of building, 230.6."

► 2. Section 230.6(5) indicates that statement B is the correct answer.

► 3. The correct answer is B.

QUESTION 3. Which one of the following statements applies to a short section of raceway used to protect exposed wiring from physical damage?

A. It may be filled to 53 percent only.
B. It may be filled to 31 percent only.
C. It may be filled to 40 percent only.
D. Fill requirements do not apply.

ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about conduits used to protect conductors from physical damage.

► 1. In Index, find "Conduits" under which find "Conductors, number in, Chap. 9, Table 1, Annex C, Tables C1 through C12(A)."

► 2. In Chapter 9, Tables, find note 2 under the heading "Notes to Tables," which states short nipples or sections of conduit or tubing used to protect exposed wiring from physical damage are exempt from Table 1.

► 3. The correct answer is D.

QUESTION 4. The smallest size of electrical metallic tubing (EMT) that can be used for a residential service with two 2/0 AWG Type THW conductors and one 4 AWG bare conductor is a:

A. Metric Designator 27 (trade size 1)
B. Metric Designator 35 (trade size 1¼)
C. Metric Designator 41 (trade size 1½)
D. Metric Designator 103 (trade size 4)

ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
This question is related to various sizes of conductors in the same raceway so we are talking about number of conductors in a raceway or the "conductor fill." The fact that it is a residential service has no bearing on the answer.

► 1. There are at least two easily identifiable avenues in the Index to find this answer. In the Index find "Conduits" under which find "Conductors, number in, Chap. 9, Table 1, Annex C, Tables C1 through C12(A)." The reference to Table 1 is probably the more direct pathway of the two we are noting but may not be the most effective if the reader does not already know the number of conductors cannot exceed the percentage fill in Table 1.

Alternatively, you can find "Conductor fill" in the Index under which find "Electric Metallic Tubing, 358.22. Section 358.22 notes the number of conductors permitted shall not exceed the percentages allowed in Table 1, Chapter 9. As there are in most *NEC* tables, there are "Notes to Tables" in Table 1, Chapter 9. Notes to tables should always be considered as they are extremely important and will generally affect the use of the table.

► 2. Annex C was noted in the Index reference in Step 1 but Note 1 to Table 1, Chapter 9 states Annex C only applies to conduit and tubing fill for conductors and fixture wires of all the same size. Since the question states there are different conductor sizes, Annex C cannot be used.

► 3. Scanning the Notes to Tables, you will find that Note 6 applies to combinations of conductors of different sizes. It states that for combinations of conductors of different sizes, Table 5 and Table 5A can be used for conductor dimensions

and Table 4, for the applicable conduit or tubing dimensions.

► 4. Under Table 5 of Chapter 9, find the column for "Approximate Area" and use "in.^{2}" Under the "Type" column find THW, and then under the "Size" column find 2/0 AWG. It shows an approximate area of .2624 in.^{2} x 2 conductors = .5248 in.^{2}

► 5. Note 8 states that where bare conductors are permitted, the dimensions for bare conductors listed in Chapter 9, Table 8 can be used. Look under the "Conductors" column and then find the "Overall" column, followed by the "Area, in.^{2}"
4 AWG overall = 0.042. Adding the 0.042 to the .5248 for the 2/0 conductors there is a total sq. in. area of .5668 in.^{2}

► 6. To find tubing size for this fill, go to Chapter 9, Table 4, "Article 358—Electrical Metallic Tubing," "Over 2 Wires 40% column," and then "in.^{2}" A metric designator 27 (1 in.) tubing is permitted to have a conductor fill of only 0.346 square inches, which is not large enough. A metric designator 35 (1¼ in.) tubing is permitted to have conductor fill of 0.598 square inches at 40% fill.

► 7. To meet the minimum overall conductor fill of 0.5668 in.^{2}, a metric designator 35 (1¼ in.) EMT conduit would be required.

► 8. The correct answer is B.

QUESTION 5. Generally, electrical nonmetallic tubing shall be secured within a minimum of how many inches from each outlet box?

A. 300 mm (12 in.)
B. 450 mm (18 in.)
C. 600 mm (24 in.)
D. 900 mm (36 in.)

ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about securing electrical nonmetallic tubing.

► 1. In Index, find "Electrical nonmetallic tubing" under which find "Securing and supporting, 362.30."

► 2. Section 362.30(A) requires ENT to be securely fastened within 900 mm (3 ft) of each outlet box.

► 3. The correct answer is D.

QUESTION 6. What is the minimum size Schedule 40 rigid polyvinyl chloride conduit (PVC) permitted for three 4 AWG Type THW copper conductors used for a 100-ampere dwelling service?

A. Metric Designator 21 (trade size ¾)
B. Metric Designator 27 (trade size 1)
C. Metric Designator 35 (trade size 1¼)
D. Metric Designator 41 (trade size 1½)

ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about conductor fill. The fact that it is a dwelling unit service had no bearing on the question.

► 1. In Index, find "Conductor fill" under which find "Rigid polyvinyl chloride conduit, 352.22."

► 2. Section 352.22 refers to Table 1, Chapter 9, which permits 40 percent fill for over two conductors.

► 3. Note 1 to table permits the use of Annex C for conductors of same size.

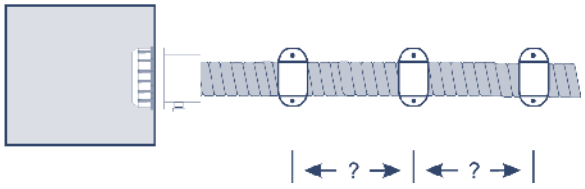
► 4. Table C10 applies to the maximum number of conductors permitted in polyvinyl chloride conduit (PVC), Schedule 40.

► 5. For Type THW conductors, size 4 AWG, a metric designator 27 (1 in.) conduit may contain three conductors. A metric designator 21 (¾ in.) conduit will accept only one conductor, so the 1 in. conduit is required.

► 6. The correct answer is B.

QUESTION 7. The maximum permitted spacing between supports for flexible metal conduit run exposed along the outside of a wall between two outlet boxes is:

A. 450 mm (1½ ft)
B. 1.4 m (4½ ft)
C. 1.8 m (6 ft)
D. 3.0 m (10 ft)



ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about supports for flexible metal conduit.

► 1. In Index, find "Flexible metal conduit" under which find "Securing and supporting, 348.30."

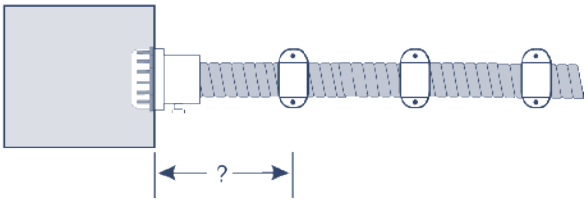
► 2. Section 348.30(A) requires flexible metal conduit to be supported at intervals not exceeding 1.4 m (4½ ft).

► 3. Since none of the four exceptions applies in this question, assume that the general conditions apply.

► 4. The correct answer is B.

QUESTION 8. Generally, flexible metal conduit shall be securely fastened within how many inches from an outlet box?

A. 150 mm (6 in.)
B. 200 mm (8 in.)
C. 300 mm (12 in.)
D. 450 mm (18 in.)



ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about securing flexible metal conduit.

► 1. In Index, find "Flexible metal conduit" under which find "Securing and supporting, 348.30."

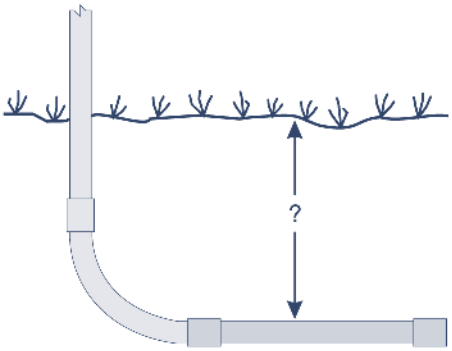
► 2. Section 348.30(A) requires flexible metal conduit to be securely fastened within 300 mm (12 in.) on each side of every outlet box or fitting.

► 3. Since none of the four exceptions is stated in the question, assume that the general conditions apply.

► 4. The correct answer is C.

QUESTION 9. Rigid polyvinyl chloride conduit is installed underground as a raceway between a dwelling and an outdoor post light. Two 12 AWG Type THW insulated conductors and a bare 12 AWG equipment grounding conductor are pulled into the raceway. The circuit is protected by a 20-ampere GFCI circuit breaker. What is the minimum burial depth permitted for the raceway?

A. 150 mm (6 in.)
B. 300 mm (12 in.)
C. 450 mm (18 in.)
D. 600 mm (24 in.)



ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about burial depth of rigid nonmetallic conduit for a branch circuit.

► 1. In Index, find "Direct burial" under which find "Rigid polyvinyl chloride conduit, 300.50, 352.10(G)."

► 2. Section 352.10(G) refers to 300.5, and 300.5(A) refers to Table 300.5 for minimum cover requirements.

► 3. Table 300.5, Column 4, allows 300 mm (12 in.) of cover for a residential branch circuit rated 120 volts or less with GFCI protection and a maximum overcurrent protection of 20 amperes.

► 4. The correct answer is B.

QUESTION 10. A 40-ampere, 240-volt feeder between a dwelling and garage in Schedule 80 rigid polyvinyl chloride conduit (PVC), buried in earth, shall be installed at a minimum depth of:

A. 150 mm (6 in.)
B. 300 mm (12 in.)
C. 450 mm (18 in.)
D. 600 mm (24 in.)

ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about burial depth of rigid nonmetallic conduit.

► 1. In Index, find "Direct burial" under which find "Rigid polyvinyl chloride conduit, 300.50, 352.10(G)."

► 2. Section 352.10(G) refers to 300.5, and 300.5(A) refers to Table 300.5 for minimum cover requirements.

► 3. Column 3 of Table 300.5 requires 450 mm (18 inches) of cover for all locations not specified below listed conditions.

► 4. Scan all conditions under "Location of Wiring Method or Circuit" as well as the notes below the table. The basic requirement of 450 mm (18 in.) applies.

► 5. The correct answer is C.

QUESTION 11. Raceways may be used as a means of support for which one of the following?

A. A raceway containing power supply conductors supplying power to a piece of electrical equipment is permitted to provide support for the Class 2 control circuit conductors for that same piece of equipment
B. Other raceways
C. Telephone cables
D. Nonelectric equipment

ANSWER _____

PROCEDURE TO ESTABLISH ANSWER
The question is about raceways used as a means of support.

► 1. In Index, find "Raceways" under which find "Support for nonelectrical equpment, 300.11(B)."

► 2. Section 300.11(B) prohibits raceways from being used as a means of support for other raceways, cables, or nonelectrical equipment.

► 3. Section 300.11(B)(2), however, permits raceways containing power conductors to support

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Illustrations & Photographs
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Composed at:
International Association of Electrical Inspectors
in Palatino Lt Std by OpenType©
Printed by Walsworth Print Group on 60# Book. Bound in 12 pt. Cover.

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