Interpreting the National Electrical Code®

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Interpreting the NEC®

- The National Electrical Code is not written for the casual reader. To properly interpret the Code you must know:
  - Who is it written for
  - The NEC organization
  - The NEC definitions
  - How to apply this to Telecommunications.
Interpreting the NEC®

• We will consider the following simple Telecom system and apply our interpretation techniques.
References
NEC® Authoring

• NFPA 70® aka the NEC®
  – Authored by the NFPA using a consensus standards process.
  – Volunteers from the industry serve on different Article Committees to consider revisions and updates to the Code.
  – Code Panel 16 includes Articles 770 & 800
    • Representing BICSI – Robert Jensen, dbi, TX
    • Representing TIA – Donna Ballast, dbi, TX
    • Representing UL – Randolph Ivans, UL, NY
NEC® Authoring

— Code Panel 3 includes Articles 300 & 725
  • Representing BICSI – Ray Keden, ERICO, CA
  • Representing BICSI – Richard Anderson, RTKL Assoc. VA (Alt to Ray Keden)
  • Representing NECA – Stanley Kahn, Tri-City Electric, Inc CA

• There are many other volunteers.
• The make up of the Code panels help to ensure there isn’t bias towards one interest, manufacturer, industry or representative.
Who is the NEC® Written For?

• Refer to Article 90 - Introduction
  – 90.1 Purpose.
    • (A) **Practical Safeguarding.** The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity.
  – Note: The Code does not address system performance unless the performance of a system could compromise safeguarding.
Who is the NEC® Written For?

• Article 90 Introduction
  – 90.1 Purpose
    • *(D) Intention.* This Code is not intended as a design specification or an instruction manual for untrained persons.
    – Its intended audience are people that already have an understanding of electrical systems.
    – It’s not a training manual.
    – It does not provide values for design performance.
Who is the NEC® Written For?

• **History and Development of the NEC:**
  – *This Code [NFPA 70 NEC] is purely advisory as far as the NFPA is concerned. It is made available for a wide variety of both public and private uses in the interest of life and property protection.*

• **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.*...
Who is the NEC® Written For?

• 90.2 Scope
  – (A)Covered. This Code covers the installation of electrical conductors, equipment, and raceways; signaling and communication conductors, equipment, and raceways; and optical fiber cables and raceways for the following:
    • Public and private premises, buildings, structures, mobile homes, RV’s...
    • Yards, Lots, carnivals....
    • Installation of conductors and equipment that connect to the supply of electricity.
Who is the NEC® Written For?

• **90.2 Scope**
  - (B) Not Covered. *This Code does not cover the following:*
    • (1) *Installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles...*
    • (2) *Installations underground in mines...*
    • (3) *Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock...*
Who is the NEC® Written For?

• 90.2 Scope
  – (B) Not Covered. *This Code does not cover the following:*
    • (4) *Installations of communications equipment under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations.*
    • (5) *Installations under the exclusive control of an electric utility where such installations....*
  – Informational note in this article helps to define a “utility”.
NEC® Organization

| Chapter 1 – General                          | Applies generally to all electrical installations |
| Chapter 2 – Wiring and Protection           |                                                   |
| Chapter 3 – Wiring Methods and Materials    |                                                   |
| Chapter 4 – Equipment for General Use       |                                                   |

Supplements or modifies Chapters 1 - 4

| Chapter 5 – Special Occupancies             |                                                   |
| Chapter 6 – Special Equipment              |                                                   |
| Chapter 7 – Special Conditions             |                                                   |

Chapter 8 – Communications systems

Not subject to the requirements of Chapters 1 through 7 except where those requirements are specifically referenced in Chapter 8

Chapter 9 – Tables

Applicable as referenced

Informative Annex a through Informative Annex I

Informational only: not mandatory

90.3 Code Arrangement

- Chapters 1, 2, 3 & 4 generally apply unless amended by Chapters 5, 6 or 7.
- Unless Chapter 8 references another section of the Code, other sections do not apply to a Chapter 8 item.
NEC® Organization

• Article 725 - Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power Limited Circuits.
  – Chapters 1, 2, 3 & 4 generally apply unless amended by Chapters 5, 6 or 7.
  – 725.3 Other Articles. Circuits and equipment shall comply with the articles or sections listed in 725.3(A) through (J). Only those sections of Article 300 referenced in this article shall apply to Class 1, Class 2, and Class 3 circuits.
NEC® Definitions

• To properly interpret the code it is necessary to understand the NEC’s definitions to have the proper context of the rules.

• Article 100 has a list of definitions.

• Individual Articles will have additional definitions.
  – Article 800 is a standalone article but references Article 100 in 800.2. Therefore Article 100 applies. The terms defined in Article 90 Introductions also applies.
NEC® Definitions

– For Article 725:
  • This section modifies Chapter 1 through 4 but does not modify the definitions of Article 100, therefore they apply.
  • Article 725 has additional definitions.

• Other Definitions
  – Refer to words used in context by the NEC®
  – Informational Notes (used to be FPN – fine print notes)
  – Refer to the NEC® Handbook.
Interpreting Techniques

• Use the NEC® Handbook as an expert opinion of the Code.
  – The editorial notes in the handbook are not the Code itself but provide insight to the meaning of the Code. It also provides illustrations that the NEC® does not.
Interpreting Techniques

• The Code is not written in a form that makes it the easiest to understand.

• It is not uncommon for the Code to write with run-on sentences. For Example:

  – 90.2 Scope

    • (A) Covered. This Code covers the installation of electrical conductors, equipment, and raceways; signaling and communication conductors, equipment, and raceways; and optical fiber cables and raceways for the following:
Interpreting Techniques

• Article 90 Introduction
  – 90.2 Scope
  • (A) Covered. This Code covers the installation of electrical conductors, equipment, and raceways; signaling and communication conductors, equipment, and raceways; and optical fiber cables and raceways for the following:
  • Note the semicolons breaking up the list
Interpreting Techniques

• Article 90 Introduction
  – 90.2 Scope – (Rewritten with bullets instead of semicolons.)
    • (A) Covered. This Code covers the
      – Installation of electrical conductors, equipment, and raceways;
      – Signaling and communication conductors, equipment, and raceways; and
      – Optical fiber cables and raceways for the following:
Interpretation Example

• In this example we will look at what is the actual scope of Article 800.

• Let’s ask the question: Does Article 800 apply to the installation of a Category 6 cable from a network switch and PBX to a workstation outlet?
800.1 Scope. This article covers communications circuits and equipment.

- Informational Note No. 1: See 90.2(B)(4) for installations of communications circuits and equipment that are not covered.

- Informational Note No. 2: For further information for remote-control, signaling, and power-limited circuits, see Article 725.

- Informational Note No. 3: For further information for fire alarm systems, see Article 760.
Interpretation Example

• What is a “Communication Circuit”? 

• What you and I think it is does not matter. What does matter is what the NEC defines as a Communication Circuit.

• Let’s look at 800.2 Definitions
Interpretation Example

• 800.2 Definitions
  – Communications Circuit. *The circuit that extends voice, audio, video, data, interactive services, telegraph (except radio), outside wiring for fire alarm and burglar alarm from the communications utility to the customer’s communications equipment up to and including terminal equipment such as a telephone, fax machine, or answering machine.*
Interpretation Example

• In interpreting this definition:
  – Re-write the sentence to make it easier to understand but do not change the meaning.
  – For items in a list break out the listed items or write the sentence out several times using each listed item individually.
Interpretation Example

• Communications Circuit.
  – *The circuit that extends:*
    – voice
    – video
    – interactive services,
    – outside wiring for fire alarm
  – audio
  – data
  – telegraph (except radio)
  – and burglar alarm

• *from the communications utility to the customer’s communications equipment up to and including terminal equipment such as*
  – a telephone
  – fax machine
  – or answering machine.
Interpretation Example

• **Communications Circuit.** *The circuit that extends voice ... from the communications utility to the customer’s communications equipment up to and including terminal equipment such as a telephone.... OR*

• **Communications Circuit.** *The circuit that extends data ... from the communications utility to the customer’s communications equipment up to and including terminal equipment such as a fax machine....*
Interpretation Example

• Communications Circuit. The circuit that extends (a service) ... from the communications utility to the customer’s communications equipment up to and including terminal equipment such as a fax machine....

• The key to understanding this definition is to recognize a communication circuit is defined as “extending from a communication utility”.
Interpretation Example

• Therefore if the Scope of 800 is “This article covers communications circuits and equipment.”, per the definition of a communication circuit:
  – This article covers The circuit that extends (a service) … from the communications utility to the customer’s communications equipment….
Interpretation Example

A Utility is defined in 90.2 (B) Not Covered

Informational Note to (4) and (5): Examples of utilities may include those entities that are typically designated or recognized by governmental law or regulation by public service/utility commissions that install, operate and maintain electric supply (such as generation, transmission, or distribution systems) or communications systems (such as telephone, CATV, internet, satellite, or data services). Utilities may be subject to compliance with codes and standards covering their regulated activities as adopted under governmental law or regulation. Additional information can be found through consultation with the appropriate governmental bodies, such as state regulatory commissions, the Federal Energy Regulatory Commission, and the Federal Communications Commission.
**Interpretation Example**

• From the NEC® Handbook (800.1 Scope):

> Although information technology equipment systems are often used for or with communications systems, **Article 800 does not cover the wiring of this equipment.** Instead, Article 645 provides requirements for wiring contained solely within an information technology equipment (computer) room. (See 645.4 for a description of the type of information technology equipment room to which Article 645 applies.) **Article 725 provides requirements for wiring that extends beyond a computer room and also covers wiring of local area networks within buildings.** **Article 760 covers wiring requirements for fire alarm systems.**
In some cases, telephone system wiring is also used for data transmission; this use is covered by Article 800. Telephone company central offices are exempt from the requirements in Article 800 is similar to those of Articles 725, 760, 770, 820, 830 and 840. *Communications equipment* (see Article 100 for definition), such as private automatic branch exchange shown in Exhibit 800.1, and all of the premises wiring for communications circuits (see 800.2 for definition), are subject to the requirements of Article 800.
Our Question:

– Does Article 800 apply to the installation of a Category 6 cable from a network switch and PBX to a workstation outlet?

Answer:

– The Category 6 data cable from the network switch is not covered by 800 but instead covered by 725.
Answer to our Question

• Answer Continued:
  – The Category 6 cable from the PBX to the outlet is covered by Article 800 if the PBX is owned by the Utility.
  – The Category 6 cable from the PBX to the outlet is covered by Article 725 if the PBX is privately owned.
  – If the telephone circuit was a customer owned VOIP circuit, it would also be covered by Article 725.
Summary

• Take the time to know the NEC as a document; Who it is written for and its organization.
• Review the Definitions as Defined by the NEC. Don’t rely on conventional wisdom or trade knowledge.
• When interpreting run-on sentences with lists of items, carefully examine the sentence to interpret the meaning.
• Use the NEC Handbook as an expert opinion.
Questions?

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