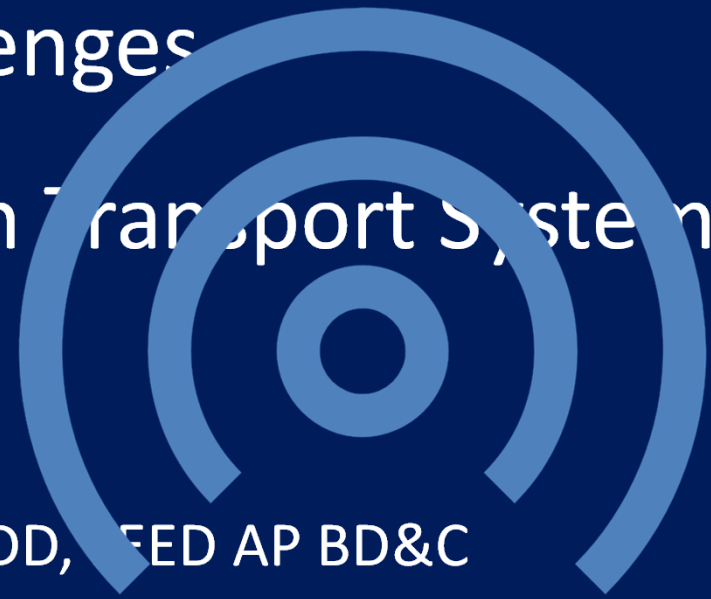


# 2020 Code + Communication = More Challenges

## 2020 NEC and Information Transport Systems



Daniel L. Pohnert, PE, RCDD, LEED AP BD&C

**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**

# Code Myth Busters

**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**

# Code Myth Busters

Busted

- The conduit fill in Chapter 9 applies to **all** communication cables?
- Fiber Section 770.110 (B) (1) **with fiber optic without line voltage circuits doesn't apply**
- Comm Cables and Coax **Section 800.110 (B) Communication cables and coax doesn't apply except to medium-power network-powered broad-band communications cables.**
- Network- data cables Section 725. 3 (A) Number and Size of Conductors in Raceway. Send you to Section 300.17.
  - **300.17 Number and Size of Conductors in Raceway.** The number and size of conductors in any raceway shall not be more than will permit dissipation of the heat and ready installation or withdrawal of the conductors without damage to the conductors or to their insulation.
  - Sections 342.22, 344.22, 350.22, 352.22, 353.22, 354.22, 355.22, 356.22, 358.22, 360.22, and 362.22 point to Chapter 9 Table 1 for cables
  - Also Chapter 9 Table 1 note (2) Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage.

# Code Myth Busters

Busted

- The Electrical Code covers **all** installed communication cables.
- ARTICLE 90 Introduction
  - 90.1 Purpose.
    - “(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”
  - Only customer cables not communication utilities

# Understanding what is the Code

- There are three things in the Code and Code Handbook to look out for:
  - Fine print or Informational notes- *Article 90.5 (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. Such notes are informational only and are not enforceable as requirements of this Code.*
  - Handbook commentary – *“The commentary and supplementary materials in this handbook are not a part of the NFPA Standard and do not constitute Formal Interpretations of the NFPA (which can be obtained only through requests processed by the responsible technical committees in accordance with the published procedures of the NFPA). The commentary and supplementary materials, therefore, solely reflect the personal opinions of the editor or other contributors and do not necessarily represent the official position of the NFPA or its technical committees.”*
  - **Code Text – Only this is the Code to be enforced.**  
New items for 2020 are in Yellow

# What is in the Code

- From the service provider Demarc in is covered. The service providers lines and equipment are not required to meet Code. (Article 90.1(B))



# Where is information technology transport in the Code?

- ARTICLE 90 Introduction
  - 90.3 Code Arrangement.
  - “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.”
  - I only have to look at Chapter 8 ,  
Maybe....

What is a communication system?

**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**



# What is a communication system?

- 805.1 Scope
  - “This article covers communications circuits and equipment.”
- 100 Communications Equipment
  - The electronic equipment that performs the telecommunications operations for the transmission of audio, video, and data, and includes power equipment (e.g., dc converters, inverters, and batteries), technical support equipment (e.g., computers), and conductors dedicated solely to the operation of the equipment.
  - Sound like PBX etc.

# What is a communication system?

- 800.2 Definitions
  - “Communications Circuit. The circuit that extends service from the communications utility or service provider up to and including the customer's communications equipment .”
  - Telephone, Fax, answering machine and other communication equipment see Chapter 1 (PBX)– Analog Voice Circuit are covered in Article 800 not network cables.

# What is a communication system?

- 725.121 Power Sources for Class 2 and Class 3 Circuits.
- “(A) (4). Listed audio/video **information technology** (computer), communications, and industrial equipment **limited-power circuits**. .”
  - *“Informational Note: One way to determine applicable requirements for listing of information technology (computer) equipment is to refer to UL 60950-1-2011, Standard for Safety of Information Technology Equipment. Another way to determine applicable requirements for listing of audio/video, information and communication technology equipment is to refer to UL 62368-1-2014, Safety of audio/video, information and communication technology equipment. Typically such circuits are used to interconnect data circuits for the purpose of exchanging information data. .”*
  - All Information Technology Equipment switches, routers, computers, VOIP equipment, etc. in North America are listed under UL 60950-1 ,if they are UL listed. And AV IP based equipment under UL62368-1.
  - But aren’t IT and communication cables the same physical cable and outlet, yes but...



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**

# What matters to the Code?

- In general, it is not the wire type. It is what **signal runs** in the wire that determines which sections it fits in the Code.



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**

Where does it go in the code?

**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**

## Where does it go in the code?

- ARTICLE 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power-Limited Circuits – Includes low voltage Security System cabling, control cabling, and information technology circuits (copper networks, except coax systems) Information technology circuits are Class 2 power limited.
- ARTICLE 800 Cover all the general requirements for communications circuits, community antenna television and radio distribution systems, network-powered broadband communications systems, and premises-powered broadband communications systems, unless modified by Articles 805, 820, 830, or 840.

## Where does it go in the code?

- **ARTICLE 805** Covers communications circuits from the Demarc into the building for analog phone lines
- **ARTICLE 810** Radio and Television Equipment -This article covers TV and radio antenna equipment including satellite receivers and DAS RF side
- **ARTICLE 820** Community Antenna Television and Radio Distribution Systems-This article covers Cable TV from the Demarc into the building cabling

**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**

## Where does it go in the code?

- ARTICLE 830 Network-Powered Broadband Communications Systems -This article covers broadband data network (cable) with carrier power for the network interface unit starting at the Demarc.
- ARTICLE 840 Premises-Powered Broadband Communications Systems -This article covers broadband data network (fiber) with the optical network terminal (ONT) starting at the fiber Demarc

**AECOM**

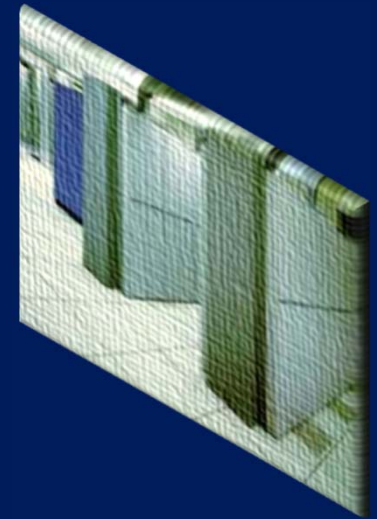
**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**



# Where does it go in the code?

- ARTICLE 645 Information Technology Equipment – Covers Data Center and some Equipment Rooms. It allow some exception to power wiring and references NFPA 75
- ARTICLE 646 Modular Data Centers also references NFPA 75.
  - “Prefabricated units, rated 1000 volts or less, consisting of an outer enclosure housing multiple racks or cabinets of information technology equipment (ITE) (e.g., servers) and various support equipment, such as electrical service and distribution equipment, HVAC systems, and the like..”



## Where does it go in the code?

- PoE LIGHTING - ARTICLE 411: Lighting Systems Operating at no more than 30 Volts AC or 60 volts DC and Lighting Equipment Connected to Class-2 Power Sources- Covers structured cabling used for low voltage lighting (generally requires that wiring has to meet Article 725 requirements for Class-2 power limited wiring).



# Pathways/ Raceway & Installation

**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**

# Pathways/ Raceway & Installation

- Customer owned outside plant
- Aerial
  - Fiber optic cables Section 770.133
  - Copper Twisted pair information technology cables Section 725.141 sends you to Section 800.44 requirements
  - Copper voice circuits Section 800.44



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

**Bicsi**

# Pathways/ Raceway & Installation

- Customer owned outside plant
- Aerial
  - Copper CATV coax circuits Section 820.44
  - Copper network powered broadband coax circuits Section 830.44
  - Copper broadband coax circuits default to Section 800.44 since article 840 doesn't cover aerial



# Pathways/ Raceway & Installation

- Customer owned outside plant
- Underground
  - Copper Twisted pair **data** cables Section 725.141 (general installation outside) which sends you to parts of Section **800** mostly unrelated to underground, Section 725.3 (L) sends you to Section 300.5 (B) requirements underground wet locations, and Section 725.136 (F) manhole (maintenance hole). Also Section 725.133 requirements which includes **Section 725.144**. **Section 725.144 includes ampacity for cable bundles** Clear???



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Pathways/ Raceway & Installation

- Customer owned outside plant
- Underground
  - Fiber optic cables Section 770.47
  - Copper voice circuits Section 805.47
  - Copper CATV coax circuits Section 820.47
  - Copper network powered broadband coax circuits Section 830.47
  - Copper broadband coax circuits Section 840.47

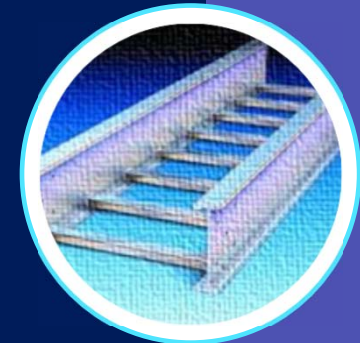


**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Pathways/ Raceway & Installation

- Inside plant
  - Fiber optic cables Section 770.110 and 133
  - Copper Twisted pair **data** cables Section 725.133
  - Copper **communication** circuits (voice) **Section 800.110** and **Section 805.133**



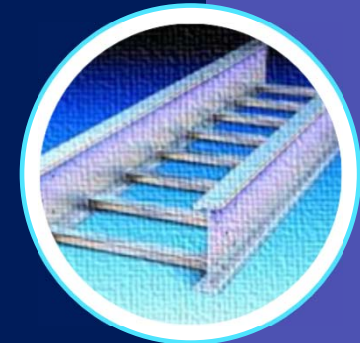
**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition



# Pathways/ Raceway & Installation

- Inside plant
  - Copper CATV coax circuits [Section 820.133](#)
  - Copper network powered broadband coax circuits [Section 830.133](#)
  - Premises powered broadband circuits [Section 840.133](#) but now only references fiber



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Cable Installation



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Cable Installation

- Inside plant
  - Fiber optic cables Section 770.113
  - Copper Twisted pair data cables Section 725.133 which includes Sections 725.135 to 144.
  - Copper voice circuits Section **800.113** and **805.133**
  - Copper antenna coax circuits Section 810.13 refers to requirements of Article 820



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Cable Installation

- Inside plant
  - Copper network powered broadband coax circuits [Section 800.113](#) and [830.133](#)
  - Copper broadband coax circuits [Section 800.113](#) and [840.133](#) which sends you to [770.133](#)



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

PoE



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# PoE- Levels

TYPE	CLASS	POWER WATTS		PAIRS	PER PAIR	IEEE 802.3	NOTES
		PSE	PD		mA		
1	0	15.4	12.95	2,4	350, 175*	af	
	1	4	3.84	2,4	104, 52*	af	
	2	7	6.49	2,4	175, 87.5*	af	
	3	15.4	12.95	2,4	350, 175*	af	
2	4	30	25.5	2,4	600, 300*	at	TYPE 2 COVER CLASSES 0-4
3	5	45	40	4	470	bt	TYPE 3 COVER CLASSES 0-6
	6	60	51	4	600	bt	
4	7	75	62	4	838	bt	TYPE 4 COVER CLASSES 0-8
	8	90	71	4	960	bt	

\* 4 pair with Type 3 & 4



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# PoE

- Article 725.144
- **(A) Use of Class 2 or Class 3 Cables to Transmit Power and Data.** Where Types CL3P, CL2P, CL3R, CL2R, CL3, or CL2 transmit power and data, the **rated current per conductor of the power source shall not exceed the ampacities in Table 725.1 44 at an ambient temperature of 30°C (86°F). For ambient temperatures above 30°C (86°F), the correction factors in Table 310.15(B) (1) or in Equation 310.15(B) shall apply.**



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# PoE

- Article 725.144 (A) cont.
- *Exception: Compliance with Table 725.144 shall not be required for installations where conductors are 24 AWG or larger and the rated current per conductor of the power source does not exceed 0.3 amperes.*
- This exception covers Classes 0-6 and Types 1, 2 & 3 unless de-rated by temperature
- Note the current per conductor is half the current per pair



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition



# PoE –LP Cable

- Article 725.144
- **(B) Use of Class 2-LP or Class 3-LP Cables to Transmit Power and Data.** Types CL3P-LP, CL2P-LP, CL3R-LP, CL2R-LP, CL3-LP, or CL2-LP shall be permitted to supply power to equipment from a **power source with a rated current per conductor** up to the marked **current** limit located immediately following the suffix "-LP" and shall be permitted to transmit data to the equipment. ...



## PoE –LP Cable

- Article 725.144 (B) cont.
- Where the number of bundled LP cables is 192 or less and the selected ampacity of the cables in accordance with Table 725.144 exceeds the marked current limit of the cable, the ampacity determined from the table shall be permitted to be used. For ambient temperatures above 30°C (86°F), the correction factors of Table 310.15(B) (1 ) or Equation 310.15(B) shall apply. The Class 2-LP and Class 3-LP cables shall comply with the following, as applicable :



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

## PoE –LP Cable

- Article 725.144 (B) cont.
- (1) Cables with the suffix "-LP" shall be permitted to be installed in bundles, raceways, cable trays, communications raceways, and cable routing assemblies.
- (2) Cables with the suffix "-LP" and a marked **current limit** shall follow the substitution hierarchy of Table 725.154 and Figure 725.154(A) for the cable type without the suffix "-LP" and without the marked current limit.



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# PoE –Bundle

- 725.2 Definitions.
  - Cable Bundle. A group of cables that are tied together or in contact with one another in a closely packed configuration for at least 1.0 m (40 in.).



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

## PoE -Ampacity

- Table 725.144 Ampacities of Each Conductor in Amperes in 4-Pair Class 2 or Class 3 Balanced Twisted-Pair Cables Based on Copper Conductors at an Ambient Temperature of 30°C (86°F) with All Conductors in All Cables Carrying Current, 60°C (140°F), 75°C (167°F), and 90°C (194°F) Rated Cables

AWG	Number of 4-Pair Cables in a Bundle																	
	1-7			8-19			20-37			38-61			62-91			92-192		
	Temperature Rating			Temperature Rating			Temperature Rating			Temperature Rating			Temperature Rating			Temperature Rating		
	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C	60°C	75°C	90°C
26	1.00	1.23	1.42	0.71	0.87	1.02	0.55	0.68	0.78	0.46	0.57	0.67	0.45	0.55	0.64	N/A	N/A	N/A
24	1.19	1.46	1.69	0.81	1.01	1.17	0.63	0.78	0.91	0.55	0.67	0.78	0.46	0.56	0.65	0.40	0.48	0.55
23	1.24	1.53	1.78	0.89	1.11	1.28	0.77	0.95	1.10	0.66	0.80	0.93	0.58	0.71	0.82	0.45	0.55	0.63
22	1.50	1.86	2.16	1.04	1.28	1.49	0.77	0.95	1.11	0.66	0.82	0.96	0.62	0.77	0.89	0.53	0.63	0.72

- Note 1: For bundle sizes over 192 cables, or for conductor sizes smaller than 26 AWG, ampacities shall be permitted to be determined by qualified personnel under engineering supervision.
- Note 2: Where only half of the conductors in each cable are carrying current, the values in the table shall be permitted to be increased by a factor of 1.4.

# PoE- Conduit Fill

- Conduit fill
  - Network- data cables Section 725. 3 (A) Number and Size of Conductors in Raceway. Section 300.17.
  - 300.17 Number and Size of Conductors in Raceway. The number and size of conductors in any raceway shall not be more than will permit dissipation of the heat and ready installation or withdrawal of the conductors without damage to the conductors or to their insulation.
  - Sections 342.22, 344.22, 350.22, 352.22, 353.22, 354.22, 355.22, 356.22, 358.22, 360.22, and 362.22 point to Chapter 9 Table 1 for cables



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# PoE- Conduit Fill

- TIA testing on heating
- UL test method uses near 100% fill by slicing the conduit in half and stuffing the conduit and strapping the halves together

TIA TSB-184-A

Table A.6 - Maximum bundle size for 15 °C temperature rise at 45 °C ambient.

Current per pair	26 AWG		Category 5e 24AWG		Category 6 23AWG		Category 6A 23AWG		Category 8 23AWG	
	Air	Conduit	Air	Conduit	Air	Conduit	Air	Conduit	Air	Conduit
600mA	124	68	191	129	252	182	313	242	918	514
720mA	75	39	121	79	163	114	203	151	581	317
1000mA	28	13	51	31	72	46	90	62	243	125

Note Table 725.144 is per conductor



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# PoE- Conduit Fill

- Base on TIA max cables for heating 15 C rise 1 amp(1000mA)/pair (red exceeds TIA limit)

EMT	Fill 40%		3/4"	1"	1-1/2"	2"	3"	4"
	dia	Area cable/ conduit	0.2132	0.3328	0.8144	1.3424	3.5384	5.9012
Cat 5E #24	0.250	0.049087	4	6	16	27	72	120
Cat 6 #23 AWG	0.300	0.070686	3	4	11	18	50	83
Cat 6A #23 AWG UTP	0.354	0.098423	2	3	8	13	35	59
Cat 6A #23 AWG F/UTP	0.265	0.055155	3	6	14	24	64	106



- Even with recommended 40% fill the TIA max pairs in conduit for temperature rise is exceeded.
- CAT 6A #23 AWG F/UTP limit based on TIA CAT 6A table entry which didn't specify UTP or F/UTP, but I am told that it was UTP used for the test.
- CAT 8 has a limit of 125 cables indicating shielding has a positive effect on heat dissipation

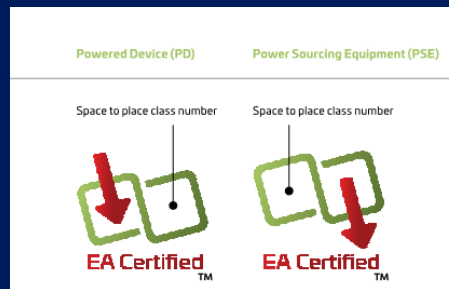
**AECOM**

**2020 BICSI WINTER  
Conference & Exhibition**



# PoE -Labeling

- Labeling
  - 725.121(C) Marking. The power sources for limited power circuits in 725.121 (A) (3), limited power circuits for listed audio/ video equipment, listed information technology equipment, listed communications equipment, and listed industrial equipment in 725.121(A)(4) shall have a **label** indicating the maximum voltage and rated current output per conductor for each connection point **on the power source**. Where **multiple connection points have the same rating**, a single label shall be permitted to be used. For equipment with a rated current per conductor less than 0.3 amperes, the effective date shall be January 1, 2021.

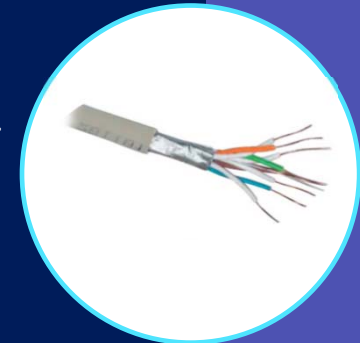


**A=COM**

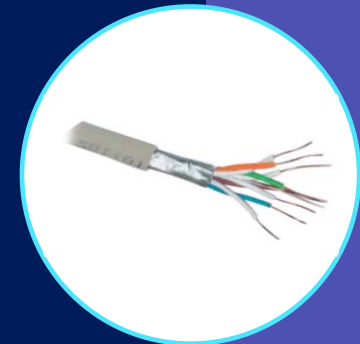
**2020 BICSI WINTER**  
Conference & Exhibition

# Cable Types

- There are four basis cable types
  - Plenum Rated (CMP, CL3P, CL2P, BLP, CATVP, OFNP & OFCP)
  - Riser Rated (CMR, CL3R, CL2R, BMR, BLR, CATVR, OFNR, & OFCR)
  - General (CM, CMG, CL3, CL2, BM, BL, CATV, OFN, OFNG, OFCG, & OFC)
  - Limited Use (CMX, CL3X, CL2X, BMX, BLX, & CATVX)



# Substitutions

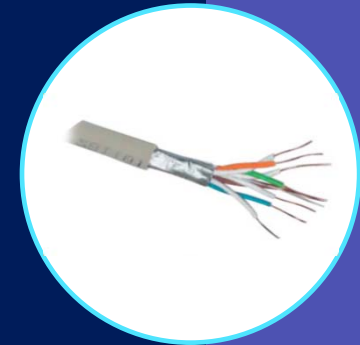


**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Substitutions

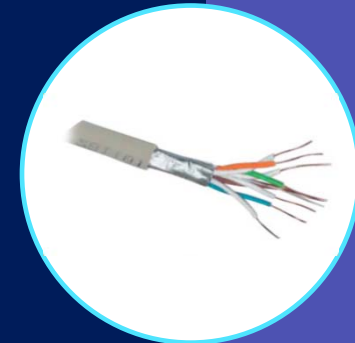
- General rules:
  - You can use plenum cable for the other 3 types.
  - You can use riser for the general or limited cable.
  - You can use general for limited cable.



# Substitutions

- Table 725.154(A) Copper twisted pair data

Table 725.154(A) Cable Substitutions	
Cable Type	Permitted Substitutions
CL3P	CMP
CL2P	CMP, CL3P
CL3R	CMP, CL3P, CMR
CL2R	CMP, CL3P, CL2P, CMR, CL3R
PLTC	
CL3	CMP, CL3P, CMR, CL3R, CMG, CM, PLTC
CL2	CMP, CL3P, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3
CL3X	CMP, CL3P, CMR, CL3R, CMG, CM, PLTC, CL3, CMX
CL2X	CMP, CL3P, CL2P, CMR, CL3R, CL2R, CMG, CM, PLTC, CL3, CL2, CMX, CL3X



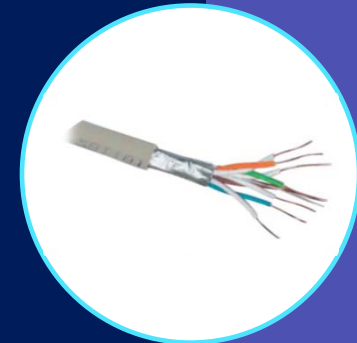
**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Substitutions

- Table 805.154 Voice cables

Table 805.154 Cable Substitutions	
Cable Type	Permitted Substitutions
CMR	CMP
CMG, CM	CMP, CMR
CMX	CMP, CMR, CMG, CM



# Substitutions

- Table 770.154 (b) Fiber optic

Table 770.154(b) Cable Substitutions	
Cable Type	Permitted Substitutions
OFNP	None
OFCP	OFNP
OFNR	OFNP
OFCR	OFNP, OFCP, OFNR
OFNG , OFN	OFNP, OFNR
OFCG,OFC	OFN,OFC, OFNR, OFCR, OFNG, OFN



# Substitutions

- Table 820.154 CATV cables

Cable Type	Permitted Substitutions
CATVP	CMP, BLP
CATVR	CATVP, CMP, CMR, BMR, BLP, BLR
CATV	CATVP, CMP, CATVR, CMR, CMG, CM,BMR, BM, BLP, BLR, BL
CATVX	CATVP, CMP, CATVR, CMR,CATV, CMG, CM, BMR, BM, BLP, BLR, BL, BLX





# Substitutions

- Table 830.154 Powered Broadband

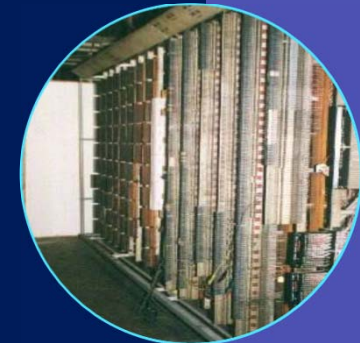
Cable Type	Permitted Cable Substitutions
BM	BMR
BLP	CMP, CL3P
BLR	CMP, CL3P, CMR, CL3R, BLP, BMR
BL	CMP, CMR, CM, CMG, CL3P, CL3R, CL3, BMR, BM, BLP, BLR
BLX	CMP, CMR, CM, CMG, CMX, CL3P, CL3R, CL3, CL3X, BMR, BM, BLP, BRP, BL



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Entrance Facility

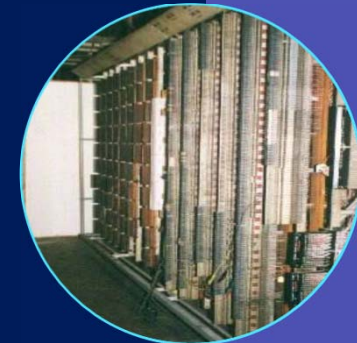


**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Entrance Facility

- Fiber optic cables Section **770.48**
- Section 770.48 A Conductive and Nonconductive-50' inside max from point of entrance for unlisted OSP cables and "The point of entrance shall be permitted to be extended from the penetration of the external wall or floor slab by continuously enclosing the entrance optical fiber cables in rigid metal conduit (RMC) or intermediate metal conduit (IMC) to the point of emergence."

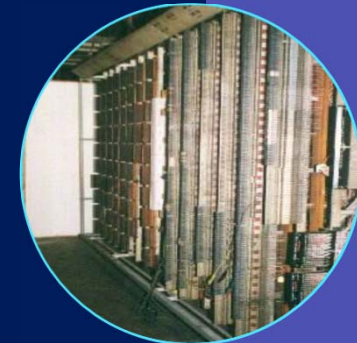


**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

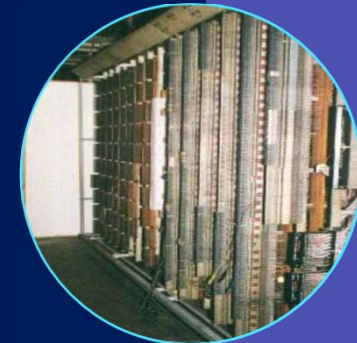
# Entrance Facility

- Fiber optic cables Section 770.48
- Section 770.48 B –“Nonconductive Cables in Raceway. Unlisted nonconductive outside plant optical fiber cables shall be permitted to enter the building from the outside and shall be permitted to be installed in any of the following raceways:
  - (1) Intermediate metal conduit (IMC)
  - (2) Rigid metal conduit (RMC)
  - (3) Rigid polyvinyl chloride conduit (PVC)
  - (4) Electrical metallic tubing (EMT) “



# Entrance Facility

- Copper OSP Section **805.48**
- Copper voice circuits **Section 805.48** – same as 770.48 A except it uses “communication cables” and “entrance cables” in the text



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Primary Protector-(Protected Entrance Terminal)

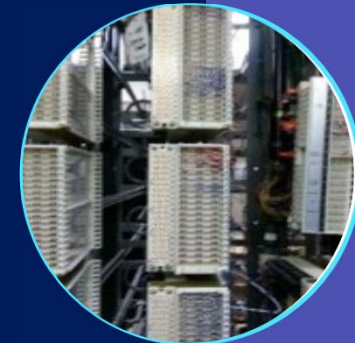


**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Primary Protector-(Protected Entrance Terminal)

- Copper Twisted pair data cables Section 725.141 which direct you to [Section 805.90](#). Where exposed outside circuits exist.
- Copper voice circuits [Section 805.90](#)
- Copper antenna coax circuits Section 810.20 -Antenna Discharge Units or grounding of shield
- Copper CATV coax circuits Section 820.93 –Grounding shield only



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Primary Protector-(Protected Entrance Terminal)

- Copper network powered broadband coax circuits Section 830.90 – All conductor protected with a primary protector
- Copper broadband coax circuits Section 840.90 sends you to Section 800.90. Grounding of cables is required by Section 840.93



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition



# Grounding & Bonding



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Grounding & Bonding

- Section 250.94 intersystem bonding. MGB connection to the PBB.
- Fiber optic cables Section 770.100 equipment and cable sheath
- Copper voice circuits Section 800.100 Primary Protector, equipment and cable sheath
- Copper antenna coax circuits Section 810.21 Antenna Discharge Units and grounding of shield conductor



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Grounding & Bonding

- Copper CATV coax circuits Section 820.100 –Grounding shield only. **Now refers back to Section 800.100**
- Copper network powered broadband coax circuits Section **830.93** grounding of cable shield, primary protector and NIU enclosure
- Cable tray Section 392.60 – Bond each segment with a jumper or approved connection



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Clean up Abandoned Cables

- Copper Twisted pair data cables Section 725.25
- Copper voice circuits Section 800.25
- Copper CATV coax circuits **Section 800.25**
- Copper network powered broadband coax circuits **Section 800.25**
- Copper broadband coax circuits **Section 800.25.**
- All it basically says if it is not terminated or marked for future use it is gone



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Code Nuance



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

## Code Nuance

- Copper Twisted pair data cables Article 725 assumes no cables have sheaths except PLTC and OSP thus there is grounding requirement in Section 725.141 for OSP and requires these sheaths be grounded per Article 805.50, 805.93 and 800.100.
- Copper voice circuits only Type CMP, CMR, CM, CMG, or CMX may be used, but for copper twisted pair data cables there are multiple substitutions allowed.
- Copper CATV coax circuits allows substituting CM, BL and BM type cables for CATV, but broadband allows CL3, CM but no CATV cable types



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Code Nuance

- Grounding electrode conductor
  - Section 810.21(H) Size minimum #10
  - Section 800.100(A) (3) Size minimum #14 but not required to be greater than #6
  - Section 770.100(A) (3) Size minimum #14 but not required to be greater than #6
  - Section 250.94 (A) (5) #6 minimum



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Conclusion

- It is clear the Electrical Code has some areas in Article 725 that very disjointed since it is divide by power limited class. Articles 770, and Chapter 8 are much clearer.
- Article 770 and 725 belong in Chapter 8 (my opinion)



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition



# Final Word

- 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.**”



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition

# Final Word

- 90.4 Enforcement.
- AHJ is the final word on what the Code means in their area of authority.
- All Code quotation in this presentation are from the NFPA 70 2020 edition. **The Code Handbook should only be used as commentary and not as Code or official Code interpretation from NFPA.**



**AECOM**

**2020 BICSI WINTER**  
Conference & Exhibition