

**IEEE SA SCC-18  
NFPA70 / NEC  
Liaison Report  
Joel Goergen  
Cisco Systems, Inc.**

# What is IEEE SA SCC-18

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- A Type 1 Standards Coordinating Committee (SCC) serves as a forum for the exchange of information in the technical area of relevance to the SCC. This type of SCC does not develop standards. For further information, see Subclause 4.3.1 of the *IEEE-SA Standards Board Bylaws*.
- The Committee is responsible for coordinating and establishing the IEEE position on certain National Fire Protection Association (NFPA) technical committees.
- <http://sites.ieee.org/scc18/>

# IEEE SA SCC-18

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- IEEE802 Representation on SCC-18
  - Joel Goergen / Cisco Systems, Inc.
  - Bill Szeto / Xtera Communications, Inc.
- The Committee meets once every 3 years to establish the IEEE position on certain National Fire Protection Association (NFPA) technical committees.
  - Per the SCC-18 Chair.
  - Working to create more meetings and more dialog across IEEE groups creating power related standards.
  - Current process is not effective to bridge expertise between NEC/NFPA and IEEE.
  - Current committee work is now over for this NEC 2017 code cycle.
- NEC currently requires any SCC-18 member seeking a code making panel position not be a manufacturer of equipment. Joel and Bill are unable to fill NEC code making panels because they represent a manufacturer. Looking for up to 3 more volunteers that are not manufacturers.

# What is NFPA70 / NEC

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- NFPA70
  - National Fire Prevention Association - Group 70 National Electrical Code (NEC).
  - Writes the National Electrical Code book every 3 years.
- The current NEC2017 code is almost complete – release Jan 2017.
- Next code cycle is 2017 – 2019 for release Jan 2020.
- [www.nfpa.org/70](http://www.nfpa.org/70)
- There are 19 Code Making Panels. SCC-18 has member positions on all panels.
- Relevant CMPs for IEEE802.3
  - CMP3 – Section 725 class 1, 2, and 3 Power Sources.
  - CMP5 – Section 250 Grounding.
  - CMP6 – Table 310.15 Wire Gauge Ampacity ratings and adjustments.
  - CMP12 – Special Equipment and ITE (data centers).
  - CMP16 – Communications Systems and power over those communications conductors.

# NFPA70 Technical Session

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- Tech Session members meeting was June 16, 2016.
- Last chance to make significant changes by bringing issues to the membership for a vote.
- Almost 14 hour straight meeting.
- Topics taken in order from A to Z.
  - Motions for 725.144 and 840.160 were last.
  - Started with 614 voters / Ended with 284 voters .
- Motion to remove 725.144 failed.
  - 141 in favor / 177 against.
  - Adds bundling vs ampacity tables, and new high temp cable.
- Motion to correct failures of 840.160 failed.
  - 119 in favor / 165 against.
  - Creates a 60W or less exclusion for power on the communications cable. Sends the installer to 725.144 when 60W is exceeded.

# NFPA70 Appeal

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- Standards Council Meeting is August 3, 2016.
- Last chance to make any changes before print by appealing to the NFPA Standards Council.
- <http://www.nfpa.org/codes-and-standards/standards-development-process/standards-council/agendas-minutes-and-decisions/2016-standards-council-meetings>
- There is an Appeal for 840.160.
  - Adds Ampacity and Wattage.
  - Falls within the last known UL position on ampacity and wattage (peker\_1\_0305.pdf).
- Appeal raises valid concerns that need to be addressed in the NEC.
  - 802.3 protocol and signaling is not defined for safe operation up to 90degC conductor temperature.
  - 802.3bu Power over Data Lines, while targeting larger wires sizes in the automotive sector, can be used on CAT “X” wiring in other Ethernet applications – table 104 is well under the wattage identified as a problem in the NEC, but shows ampacities that are an issue in 725.144.

# Requesting Ad-hoc to Address:

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1. Draft a letter to TR42 requesting electrical definitions and loss de-rating (or channel model loss table) for cable operation in the 60degC to 90degC operating region. At this time, no known 802.3 communications and/or power delivery have been tested on data center or enterprise Ethernet based communications circuits at 90degC conductor temperature.
2. Discuss possible connector temperature issues for conductors at 90degC within 2 feet of an RJ45 connector.
3. Draft a letter to the NFPA Standards Council advising that the present 840.160 and 725.144 text for communications circuits allows for conductor temperatures that may not be advisable for safe operation of critical circuits such as fire alarms or patient care. Further study or electrical changes to the LP cable definition may be required.
4. Draft a letter to the Ethernet Alliance advising the NEC 2017 text allows operation of telecommunications systems with conductor temperatures up to 90degC without warning the reader that the communications equipment might not support it, based on no de-rating or available channel models in 802.3 to verify intended operation.
5. Recommend an Ad-hoc be formed within IEEE802.3 to address conductor operating temperatures, potential BER changes, and channel loss de-rating.

# Back Up Slides

725.144

840.160



# NITMAMs/CAMs Posted

Motion Seq #	NITMAM Log #	Panel #	Section/Para	Person(s) Authorized to Make the Motion	Certified Amending Motion**	Motion Page #
70-39	79	3	725.144	Jeff Silveira, BICSI	Reject Second Revision No. 611, Including any Related Portions of First Revisions and First Correlating Revisions	74
70-40	84	3	725.179	Jeff Silveira, BICSI	Reject an Identifiable Part of Second Revision No. 615	77
70-42	76	16	840.160	Joel Goergen, Cisco Systems, Inc.	Accept an identifiable part of Public Comment No. 1262	79
70-43	105 85	16	Part VI., 840.160	Jeff Silveira, BICSI; Tony Obrien, Cisco Systems	<b>Multiple Notices for a Single Motion:</b> Reject Second Revision No. 4564, including any related First Revision No. 4643	80

- NITMAMs 79, 84– reject 725.144 ampacity table in its entirety and related LP cabling text
- NITMAMs 85 (BICSI) and 105 reject 840.160 communications equipment text referring to 725.144 in its entirety
- NITMAM 76 amends 840.160 to correct defects

# 725.144 as Proposed (1 of 2)

## NITMAM 79 (BICSI), rejects SR611 to add 725.144 including ampacity limits

725.144 Transmission of Power and Data.

The requirements of 725.144(A) and (B) shall apply to Class 2 and Class 3 circuits that transmit power and data to a powered device. The requirements of Parts I and III of Article 725 and 300.11 shall apply to Class 2 and Class 3 circuits that transmit power and data. The conductors that carry power for the data circuits shall be copper. The current in the power circuit shall not exceed the current limitation of the connectors.

Informational No. 1: One example of the use of cables that transmit power and data is the connection of closed-circuit TV cameras (CCTV).

Informational Note No. 2: The 8P8C connector is in widespread use with powered communications systems. These connectors are typically rated at 1.3 amperes maximum.

Table 725.144 Ampacities of Each Conductor in Amperes in 4-Pair Class 2 or Class 3 Data Cables Based on Copper Conductors at an Ambient Temperature of 30°C (86° F) with all 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			2-7			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	60°C	75°C	90°C
26	1	1	1	1	1	1	0.7	0.8	1	0.5	0.6	0.7	0.4	0.5	0.6	0.4	0.5	0.6	NA	NA	NA
24	2	2	2	1	1.4	1.6	0.8	1	1.1	0.6	0.7	0.9	0.5	0.6	0.7	0.4	0.5	0.6	0.3	0.4	0.5
23	2.5	2.5	2.5	1.2	1.5	1.7	0.8	1.1	1.2	0.6	0.8	0.9	0.5	0.7	0.8	0.5	0.7	0.8	0.4	0.5	0.6
22	3	3	3	1.4	1.8	2.1	1	1.2	1.4	0.7	0.9	1.1	0.6	0.8	0.9	0.6	0.8	0.9	0.5	0.6	0.7

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.

Informational Note: The conductor sizes in data cables in wide-spread use are typically 22-26 AWG.

(A) Use of Class 2 or Class 3 Cables to Transmit Power and Data.

(1) Where Types CL3P, CL2P, CL3R, CL2R, CL3, or CL2 transmit power and data, the following shall apply, as applicable:

The ampacity ratings in Table 725.144 shall apply at an ambient temperature of 30°C (86°F).

(2) For ambient temperatures above 30°C (86°F), the correction factors of 310.15(B)(2) shall apply.

Informational Note: One example of the use of Class 2 cables is a network of closed-circuit TV cameras using 24 AWG, 60°C rated, Type CL2R, Category 5e local area network (LAN) cables.

(B) Use of Class 2-LP or Class 3-LP Cables to Transmit Power and Data.

# 725.144 as Proposed (2 of 2)

Types CL3P-LP, CL2P-LP, CL3R-LP, CL2R-LP, CL3-LP, or CL2-LP shall be permitted to supply power to equipment at a current level up to the marked ampere limit located immediately following the suffix LP and shall be permitted to transmit data to the equipment. The Class 2-LP and Class 3-LP cables shall comply with the following, as applicable:

Informational Note 1: The “(xxA)” following the suffix -LP indicates the ampacity of each conductor in a cable.

Informational Note 2: An example of a limited power (LP) cable is a cable marked Type CL2-LP(0.5A), 23 AWG. A Type CL2-LP(0.5), 23 AWG could be used in any location where a Type CL2 could be used; however, the LP cable would be suitable for carrying up to 0.5 A per conductor, regardless of the number of cables in a bundle. If used in a 7-cable bundle, the same cable could carry up to 1.2 amperes per conductor.

- (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 ampere level 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 ampere level.
- (3) System design shall be permitted by qualified persons under engineering supervision.

Additionally, NITMAM 84 (BICSI), rejects change to add LP cabling listing and marking, which is related to 725.144

725.179 Listing and Marking of Class 2, Class 3, and Type PLTC Cables....

(I) Limited Power (LP) Cables.

Limited power (LP) cables shall be listed as suitable for carrying power and data circuits up to a specified current limit for each conductor without exceeding the temperature rating of the cable where the cable is installed in cable bundles in free air or installed within a raceway, cable tray, or cable routing assembly. The cables shall be marked with the suffix “-LP” with the ampere limit located immediately following the suffix LP, where the current limit is in amperes per conductor.

Informational Note: The ampere limit located immediately following the suffix LP is the ampacity of each conductor in a cable. For example, 1 ampere Class 2 limited-power cables would be marked CL2-LP (1.0A), CL2R-LP (1.0A), or CL2-LP (1.0A).

# 840.160 as Proposed

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NITMAMs 85 (BICSI) and 105 (Tony O'Brien), reject SR 4564 to add 840.160

Part VI. Premises Powering of Communications Equipment over Communications Cables

840.160 Powering Circuits.

Communications cables, in addition to carrying the communications circuit, shall also be permitted to carry circuits for powering communications equipment. Where the power supplied over a communications cable to communications equipment is greater than 60 watts, communication cables and the power circuit shall comply with 725.144 where communications cables are used in place of Class 2 and Class 3 cables.

NITMAM 76 (Joel Goergen), accepts parts of comment 1262 to amend 840.160

**Recommended Text if Motion Passes:**

840.160 Powering Circuits.

Communications cables, in addition to carrying the communications circuit, shall also be permitted to carry circuits for powering communications equipment. Where the power supplied over a communications cable to communications equipment is greater than ~~60 watts~~ 0.5A per conductor or greater than 100 watts, communication cables and the power circuit shall comply with 725.144 where communications cables are used in place of Class 2 and Class 3 cables.

Cables and Equipment Marking Supplying Premises Power and Communications. Powering circuits supplying more than 0.5A per conductor or greater than 100 watts per cable must be clearly labeled on the equipment face plate in maximum watts per port.

# NITMAM 76



Panel 16 NFPA 70, *National Electrical Code*

Motion Seq # 70-42: Joel Goergen, Cisco Systems, Inc.

A2016

<b>Motion Seq#</b>	<b>Certified Amending Motion:</b> Accept an Identifiable Part of Public Comment No. 1262
70-42	<p><b>Recommended Text if Motion Passes:</b></p> <p>840.160 Powering Circuits. Communications cables, in addition to carrying the communications circuit, shall also be permitted to carry circuits for powering communications equipment. Where the power supplied over a communications cable to communications equipment is greater than <del>60 watts</del> <u>0.5A per conductor or greater than 100 watts</u>, communication cables and the power circuit shall comply with 725.144 where communications cables are used in place of Class 2 and Class 3 cables.</p> <p><u>Cables and Equipment Marking Supplying Premises Power and Communications. Powering circuits supplying more than 0.5A per conductor or greater than 100 watts per cable must be clearly labeled on the equipment face plate in maximum watts per port.</u></p>
	<p><b>Recommended Text if Motion Fails:</b></p> <p>840.160 Powering Circuits. Communications cables, in addition to carrying the communications circuit, shall also be permitted to carry circuits for powering communications equipment. Where the power supplied over a communications cable to communications equipment is greater than 60 watts, communication cables and the power circuit shall comply with 725.144 where communications cables are used in place of Class 2 and Class 3 cables.</p>