

# TIA AND PUBLIC COMMENT INPUTS

## ISSUES ADDRESSED:

SAFETY EMERGENCY DUE TO LACK OF AMPACITY IN 840.160 60W EXCEPTION [ISSUE 1]  
COMMUNICATIONS AT >60C CABLE [ISSUE 2]  
SAFETY EMERGENCY DUE TO MISSING TEMPERATURE ADJUSTMENT FOR LP CABLING [ISSUE 3]  
EQUIPMENT LABELING (ALIGNS WITH OTHER CHANGES) [ISSUE 4]  
INCORRECT AMPACITY ON 8P8C CONNECTORS, CONNECTOR MAY LIMIT ALLOWED CURRENT [ISSUE 5]  
RESULTS RELATE TO 4-PAIR LAN CABLING AND NO OTHER [ISSUE 6]  
LP CABLING MAY BE USED ALSO AS REGULAR CL2/CL3 CABLING – OUT OF INFORMATIONAL NOTE,  
RESTATEMENT AS REQUIREMENT [ISSUE 7]  
DEFINITION OF NOMINAL CURRENT TO ACCOUNT FOR CURRENT UNBALANCE AND IMPLEMENT 0.3A  
EXEMPTION [ISSUE 8 – related to 1 & 4]  
Text highlighted in **bright green** has not yet gotten consensus [NONE]  
Text highlighted in **yellow** has achieved consensus

**All text has consensus of the Task Group (on 5/3 we reviewed to additions)**

## CHANGES PROPOSED FOR ARTICLE 725 – PANEL 3

### TIAS RELATED TO VARIOUS ISSUES WITH 725

(NOMINAL CURRENT TEXT SHOWN IN YELLOW HIGHLIGHT):

**725.2 insert new definition:**

**Nominal Current** The designated current per conductor as specified by equipment design.

**Informational Note:** One example of nominal current is 4-pair Power over Ethernet (PoE) applications based on IEEE Std 802.3-2015 that supplies current over 2 or 4 twisted pairs, but can deviate up to 20% from the nominal on individual conductors due to circuit imbalance. The nominal current for 60W PoE power sourcing equipment is 0.3A per conductor. IEEE Std 802.3 allows the current for one conductor to be 0.36A and another conductor to be 0.24A.

### 725.121(C) Marking, and exception for sources not exceeding 0.3A nominal

**725.121 (C) Changed to include nominal current in labeling and multi-point labeling (If accepted, no need for a Manufacturer's TIA to change):**

**725.121 (C) Marking.** The power sources for limited power circuits in 725.121(A)(3) and limited power circuits for listed audio/video, information **and communications technology (equipment)**, and listed industrial equipment in 725.121(A)(4) shall have a label indicating the maximum voltage and **maximum current or maximum voltage and nominal current** output for each connection point. **Where multiple connection points have the same rating, a single label shall be permitted to be used.**

**Commented [A1]:** Issue 8 – clarification of current unbalance. This concept is used for all 725.144 and 725.121(C) labels.

**Commented [A2]:** Issue 4 – clarification of equipment (PSE) labeling, exception of existing class 6 and under PSEs.

**Exception** – Power sources providing 0.3 A nominal current or less per conductor shall be permitted without marking.

**Commented [A3]:** Issue 4 – relieves economic emergency without safety justification.

The effective date shall be January 1, 2018.

**Commented [A4]:** The effective date will be deleted in the 2020 code – Stan has submitted a PI to do this.

**No change to 725.130 in this version.**

*Change 725.144 as shown, changes relevant to nominal current are shown in yellow highlight:*

**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.

**Commented [A5]:** I could not associate the new text: "The nominal current shall not exceed the ampacity of a single conductor in 4-Pair Class 2 or Class 3 cables" with any of the change issues. This may be left over from our earlier thinking on nominal current, and, if nobody remembers why it is needed, I recommend deleting it.

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. IEC 60603-7 specifies ~~that these connectors are to have a current carrying capacity per contact of typically rated at 1.03 amperes maximum at 60°C (140°F).~~ See IEC 60603-7, **Connectors for electronic equipment – Part 7: Detail specification for 8-way, unshielded, free and fixed connectors;** for more information on reduced current carrying capacity at higher temperatures.

**Commented [A6]:** Issue 5 – corrects incorrect information on ampacity of connectors and temperature dependence

**Informational Note No. 3:** The requirements of Table 725.144 were derived for carrying power and data over 4-pair copper LAN cabling. This type of cabling is described in ANSI/TIA 568-C.2-2009, **Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling and Components Standard.**

**Commented [A7]:** Issue 6 - 725.144 is derived for 4-pair LAN cabling.

**Informational Note No. 4:** See TIA-TSB-184-A, **Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling,** for information on installation and management of LAN cabling supporting power delivery.

**Commented [A8]:** Issue 6 - 725.144 is derived for 4-pair LAN cabling, provides pointer to where engineering supervision can go for information.

(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 following shall apply, as applicable:

- (1) **Systems with a nominal current of less than or equal to 0.3 Amperes per conductor on all conductors shall be permitted using conductors of 24 AWG or larger.**
- (2) **The ampacity ratings in Table 725.144 shall apply to the nominal current at an ambient temperature of 30°C (86°F).**

**Commented [A9]:** Issue 1 – lack of ampacity for 60W exception, 60W exception is implemented here. Relieves economic emergency as well.

**Commented [A10]:** Issue 8 – part of 'nominal current' changes

(3) For ambient temperature 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 24AWG, 60C 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.** Types CL3P-LP, CL2P-LP, CL3R-LP, CL2R-LP, CL3-LP, or CL2-LP shall be permitted to supply power to equipment at a **nominal** current level up to the **marked ampere-current limit** located immediately following the suffix LP and shall be permitted to transmit data to the equipment. **Installation of LP cables in bundles smaller than 192 cables shall be permitted to use the ampacities in Table 725.144. For ambient temperature above 30C (86F), the correction factors of 310.15(B)(2) shall apply.** 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 current limit** 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 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-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 ampere level**.
- (3) System design shall be permitted by qualified persons under engineering supervision.

**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 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 1: **For information on practices for 4 pair LAN cabling see ANSI/TIA-568-C.2 and TIA-TSB-184-A, where transmission parameters for data cables are only specified up to 60°C (140°F). Elevated cable temperatures can reduce a cable's data transmission performance. The conductor sizes in data cables in wide spread use are typically 22-24 26 AWG.**

**Commented [A11]:** Issue 7 – the LP cabling informational note really was describing this requirement. Moves from informational note to normative text to conform with style manual.

**Commented [A12]:** Issue 3 – temperature adjustment for LP cabling was missing.

**Commented [A13]:** Issue 7 – Moving requirement out of informational note.

**Commented [A14]:** Issue 6 – Table is derived for TIA-568 4-pair LAN cabling.

**Commented [A15]:** Issue 2 – communications cable is usually only specified to 60C and this can cause data unreliability.

**Informational Note 2:** The per-contact current rating of connectors can limit the maximum allowable current below the ampacity shown in Table 725.144.

**Commented [A16]:** Issue 5 – connector may limit current that can be carried

*Change 725.170 as shown, changes relevant to nominal current are shown in yellow highlight:*

#### Part IV. Listing Requirements

725.170 Listing and Marking of Equipment for Power and Data Transmission. The listed power source for circuits intended to provide power and data over Class 2 cables to remote equipment shall be as specified in 725.121(A)(1), (A)(2), (A)(3), or (A)(4). **The current on individual conductors of the powering circuit shall be permitted to deviate from the nominal current up to +20% due to circuit imbalance provided this increased current is offset by a reduction of current in the other conductors.** In accordance with 725.121(B), the power sources shall not have the output connections paralleled or otherwise interconnected, unless listed for such interconnection. Powered devices connected to a circuit supplying data and power shall be listed. Marking of equipment output connections shall be in accordance with 725.121(C).

**Commented [A17]:** Issue 8 – part of ‘nominal current’ changes – limits unbalance in current.

### CHANGES PROPOSED TO ARTICLE 840 – PANEL 16

*840.2 insert new definition:*

**Nominal Current** The designated current per conductor as specified by equipment design.

**Commented [A18]:** Issue 8 – clarification of current unbalance. This concept is used for all 725.144 and 725.121(C) labels.

**Informational Note:** One example of nominal current is 4-pair Power over Ethernet (PoE) applications based on IEEE Std 802.3-2015 that supplies current over 2 or 4 twisted pairs, but can deviate up to 20% from the nominal on individual conductors due to circuit imbalance. The nominal current for 60W PoE power sourcing equipment is 0.3A per conductor. IEEE Std 802.3 allows the current for one conductor to be 0.36A and another conductor to be 0.24A.

Per Text offered by Stan Kaufman:

**840.160 Powering Circuits.** Communications cables, listed in accordance with 800.179, in addition to carrying the communications circuit, shall also be permitted to carry circuits for powering communications equipment listed in accordance with 800.170. The power source shall be listed in accordance with 840.170(G). **Where the power supplied over a communications cable to communications equipment is greater than 60 watts, communication cable and the power circuit shall installation of the listed communications cables shall comply with 725.144 where listed communications cables are used in place of substituted for Class 2 and Class 3 cables in accordance with 725.154(A).**

**Commented [A19]:** Issue 1 – lack of current limit on 60W exemption.

**Exception** - Installing listed communications cables in compliance with 725.144 shall not be required for listed 4-pair communications cables where the nominal current does not exceed 0.3 A in any conductor.

**Commented [A20]:** Issue 1