

# TIA AND PUBLIC COMMENT INPUTS

## ISSUES ADDRESSED:

SAFETY EMERGENCY DUE TO LACK OF AMPACITY IN 840.160 60W EXCEPTION (issue 1 - resolved)

SAFETY EMERGENCY ON HEALTH CARE SYSTEMS WITH >60C CABLE (issue 2 - under discussion)

SAFETY EMERGENCY DUE TO MISSING TEMPERATURE ADJUSTMENT FOR LP CABLING (issue 3 - resolved)

CLARIFICATION OF EQUIPMENT LABELING (ALIGNS WITH OTHER CHANGES) (issue 4 - resolved)

CLARIFICATION OF INCORRECT AMPACITY ON 8P8C CONNECTORS (issue 5 - resolved)

CLARIFICATION THAT RESULTS RELATE TO 4-PAIR LAN CABLING AND NO OTHER (issue 6 – resolved - final note under discussion)

CLARIFICATION OF LP CABLING INFORMATIONAL NOTE (issue 7 - resolved)

CLARIFICATION FOR CURRENT UNBALANCE (issue 8 – related to issues 1 & 4 – may be clarified see homework item 725.121(C))

Text highlighted in bright green has not yet gotten consensus

Text highlighted in yellow has achieved consensus

*Everything has been looked at at least once:*

*Remaining issues relate to: Temperature, Health Care, and Notes to the table.*

*Additionally: - reexamine 840.160 after 725.144 is stable, and look at all changes and ask which provide more detail/design info than necessary.*

## 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 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.

### TIA EXPECTED FROM MANUFACTURERS DUE TO IMPRACTICAL DEADLINE

*725.121 (C) Changed to include nominal current in labeling and multi-point labeling (Does not include changes above under Manufacturer's TIA to change date is rolled in through another effort):*

**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

**Commented [GZ1]:** Issues 8 – clarification of current unbalance. This concept is used for all 725.144 and 725.121(C) labels.

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 [GZ2]:** 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 [g3]:** Issue 8 - Homework item (4/5/17) – consider how 20% deviation from nominal might be included in the marking. (or on listing requirements 725.121(4))

The effective date shall be January 1, 2018.

**Commented [GZ4]:** 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. **The nominal current shall not exceed the ampacity of a single conductor in 4-Pair Class 2 or Class 3 cables.**

Joel's comment for consideration:

- Remove Note 3 (Health care systems) under Table 725.144.
- Add a new paragraph to 725.144, after the first paragraph, stating:

**In order to ensure that data integrity is preserved under the higher temperature conditions found within cabling bundles providing power, the use of 75°C (167°F) or higher temperature cabling to meet the requirements of 725.144(A) or (B) to transmit power and data shall be permitted only under engineering supervision for the following:**

**Commented [GZ5]:** Issue 2 – safety for data in critical systems – currently under discussion

- (1) Fire pumps
- (2) Essential electrical systems in health care facilities
- (3) Emergency systems
- (4) Legally required standby systems
- (5) Critical operations power systems
- (6) Circuits supplying emergency lighting

**Commented [GZ6]:** Suggestion by Geoff Thompson to improve clarity. 4/12/2017

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 these connectors are to have a current carrying capacity per contact 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 [GZ7]:** Issue 5 – ampacity of connectors and temperature dependence

Informational Note No. 3: The requirements and ampacity tables of 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 [GZ8]:** 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 [GZ9]: Issue 6 – 725.144 is derived for 4-pair LAN cabling

(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 [GZ10]: Issue 1 – lack of ampacity for 60W exception.

Commented [GZ11]: Discussing whether this is only at 30C when we left off. (3/30)

Commented [GZ12]: Issue 8 – current unbalance

(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:

Commented [GZ13]: Issue 3 – temperature adjustment for LP cabling

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.

Commented [GZ14]: Issue 7 – clarification of LP cabling note

- (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.

Note 3: Health Care facilities and other essential electrical systems shall only be permitted to use the 75°C (167°F) or higher temperature operation under engineering supervision.

Informational Note 1: For information on practices for 4 pair LAN cabling see ANSI/TIA-568-C.2 and TIA-TSB-184-A. The conductor sizes in data cables in wide spread use are typically 22-24-26 AWG.

Informational Note 2: Transmission parameters for data cables in common use are often unspecified at temperatures above 60°C (140°F), communications can be unreliable at these temperatures.

Informational Note 3: For small bundles sizes or larger diameter cables the per-contact current limitation of the connectors can limit the ampacity of the power circuit below that shown in Table 725.144.

## CHANGES PROPOSED TO ARTICLE 840 – PANEL 16

Per Text offered by Stan Kauffman:

(this text was reviewed by the Task Group prior to 725 changes – should review it at the end to see if more changes are required)

(Note – text has been updated to delete controversial reference to 725.130(C) which is no longer necessary)

**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 [GZ15]:** Issue 2 – safety for data in critical systems – currently under discussion

**Commented [G16]:** Note 3 needs attention because the only place essential electrical systems is used is in Health Care facilities. See new proposal from Joel in normative text under 725.144 first paragraph.

**Commented [GZ17]:** Issue 6 – table is derived for TIA-568 4-pair LAN cabling. Under discussion, see note below.

**Commented [GZ18]:** Removed note about cordage exception for 26AWG cabling because it could be considered a requirement in an informational note – may want to consider text in the main section to this effect if needed.

**Commented [G19]:** Consider deleting entirety of Informational Note 1 or combining with Informational Note 2

**Commented [GZ20]:** Issue 2 – safety for data in critical systems – currently under discussion

**Commented [GZ21]:** Issue 5 – connector may limit ampacity

**Commented [GZ22]:** Issue 1 – Lack of ampacity – section now just refers to 725.144 and 725.144 contains the exclusion for 60W PoE (0.3A) or less