

2 Simple Ways to Comply with the 2020 National Electrical Code®

Changes to the 2020 National Electrical Code and its Impact on the ICT Industry

As recently as 2015, it's likely that a network cable installer's only concern was system performance - installing a compliant system that would meet the bandwidth and transmission requirements requested by the customer. Now, as the number of applications utilizing Power over Ethernet (PoE) technologies continues to grow, 4-pair cables are increasingly being used to transmit both data *and* power. This convergence of previously separate cabling systems is adding new dimensions to cabling performance and safety requirements, as is evidenced by revisions to the National Electrical Code (NEC®) starting with the 2017 edition and continuing with the 2020 edition.

Predictably, a 4-pair cable carrying up to 100W of power is prone to generating heat. Heat generation in a single cable is not generally a problem on its own, as most compliant category cables are rated to withstand above-ambient conditions. However, when these cables are bundled together, that heat rise can become a very significant safety issue. Depending on variables like wire gauge, the amount of current being carried, and the number of cables in a bundle, it's very easy to see how certain bundles could be prone to overheating, exceeding the max temperature rating of the cable. In fact, a 2015 Underwriters Laboratories (UL) fact finding study confirmed the reality of this issue and developed a roadmap to ensure safety in use.

This is where the NFPA got involved. The 2017 and 2020 editions of the *NEC (Article 725)* feature an "Ampacity Table" for Class 2 & 3 balanced twisted-pair cabling in applications involving power over 4-pair cables. The ampacity table in the 2020 *Code* has slightly higher ampacities than the ampacity table in the 2017 *Code*. See Table 1. The ampacity table provides the necessary guidance of maximum allowable number of cables in a bundle for users and installers who intend to carry power to connected devices (accounting for wire gauge and maximum current). Following the guidance provided by the ampacity table ensures cables in a given bundle will not exceed their temperature ratings.

AWG	Number of 4-Pair Cables in a Bundle																	
	1-7			8-19			20-37			38-61			62-91			92-192		
	Temp Rating (°C)			Temp Rating (°C)			Temp Rating (°C)			Temp Rating (°C)			Temp Rating (°C)			Temp Rating (°C)		
	60	75	90	60	75	90	60	75	90	60	75	90	60	75	90	60	75	90
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	NA	NA	NA
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

Table 1: Ampacities of each conductor in 4-pair balanced twisted-pair cables from Table 725.144 in the 2020 NEC.

In addition to following the guidance of the ampacity table, the 2020 *NEC* offers an alternative path to compliance through something called an “LP” or “limited power” designation. “LP” is an optional designation and cable marking that may be added to plenum, riser and general purpose listed cables. Communications “LP” cables are marked Type CMP-LP, Type CMR-LP, Type CMG-LP or Type CM-LP. These communications limited power cables are “listed as suitable for carrying power and data 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.” While the Code also provides for the listing of Class 2 and Class 3 limited power cables, virtually all the 4-pair listed “LP” cables in use are listed communications cables.



Figure 1: Example of “LP” test set-up

Figure 1 shows the “LP” cable test set-up.

“LP” designation allows installers and designers a simple installation option by not restricting bundle sizes, and eliminating the need to count cables.

While organizations like IEEE, TIA, and the IEC continue working to address the *performance* issues associated with cable heating, there remains an important need for distinction between performance and safety standards. Though the purpose of the *NEC* is not intended to be a design specification or instruction manual, following the requirements of the 2020 *NEC* through design choices or “LP” cable specifications will serve as a means of complying with the *NEC*’s goal of “safeguarding people and property from hazards associated with the use of electricity”. While enforcement of *NEC* requirements still reside with the local Authority Having Jurisdiction (AHJ), installers and users should find both the guidance of the ampacity table and the optional “LP” listing as simple ways to comply with the newest requirements of the National Electrical Code.