

## U.S. 600 V CATEGORY CABLE

### CATEGORY CABLE

Category cables, also known as Ethernet cables, are twisted, low pair-count cables (usually four pairs) designed for use in local area networks such as Ethernet. Currently, they are available in categories 3, 5e, 6, 6A and 7, which provide different levels of performance in signal bandwidth, attenuation and crosstalk associated with each cable's design.

Category cables have been installed in industrial settings for many years by separating communication and power and control circuits. Applications are evolving and now electrical and network engineers want to install category cables in 600 V cable trays without installing barriers. Other end users want to integrate Ethernet cables into industrial machinery where 600 V is required.

### INDUSTRY STANDARDS

Installation requirements for communication circuits and industrial equipment are driven by the National Electrical Code (NEC) and NFPA 79 Electrical Standard for Industrial Machinery. These industry codes apply to different regulatory environments and have different allowances for cable selection and installations.

The NEC provides provisions on electrical wiring, grounding, over-current protection and industrial equipment installation standards for commercial, residential and industrial facilities in the United States. The NEC provides installation requirements for 300 V communication cable types such as CM, CMR or CMP that are dual listed to a category cable type. However, the NEC limits 300 V communication cables from being installed in the same environment as 600 V cables. For example, Section 800.133 *Installation of Communications Wires, Cables, and Equipment* states that communication cables must be separated by a physical barrier if installed in the same raceway, compartment, junction box, etc. as conductors of electric light, power, Class 1 circuits, etc. Section 300.3(C) states that conductors occupying the same cable, enclosure or raceway must contain an insulation voltage rating equal to the maximum voltage of any conductors installed in the system.

NEC applications for 300 V category cables would not be acceptable to be installed in the same raceway, enclosure or cable as other 600 V cables unless the application allows barriers to be installed. If a network engineer wants to install category cable near 600 V cable, the category cable will need to be rated to 600 V.

NFPA 79 can also be applied to industrial applications, but only provides installation requirements for electrical equipment operating 600 V



or less. NFPA 79 also covers the point of the supply to the electrical equipment of the machine. NFPA 79 provides provisions on acceptable cable types installed as an integral part of a piece of equipment. It is important to note that NFPA 79 defaults to the NEC for applications that do not fall directly within the scope of NFPA 79 and NEC provisions may apply. Similar to the NEC, NFPA 79 Section 13.1.3 *Conductors of Different Circuits* does require that conductors occupying the same cable, enclosure, or raceway must contain an insulation voltage rating equal to the maximum voltage of any conductors installed in the same system. Otherwise the circuits must be separated by a barrier.

### 600 V CABLE CONSTRUCTIONS

NEC and NFPA standards allow different cable types to be installed in 600 V applications. It's important to understand which industry code applies to the application before selecting the correct wiring method.

The National Electrical Code does not recognize Appliance Wiring Materials (AWM) wiring. Category cables that meet a 600 V AWM rating would still need to be separated from power cables. The NEC does recognize and provide provisions for CM, CMR, CMP and PLTC cables. Standard category cables can be dual listed to a CM, CMR, CMP or PLTC listing, but these constructions are rated to 300 V and would not be permitted to be installed near 600 V cables.

Instead, NEC allows the use of 600 V multi-conductor cable under the listing Type TC (tray cable). Category cables can be dual listed to a TC listing, but TC cables are only permitted in sizes 18 AWG and larger and must meet industry vertical flame tests per UL 1277 Tray Cables. Category

cables approved to be dual listed to Type TC have a significant increase in overall construction and performance requirements. The conductor sizes must be at least 18 AWG along with increased insulation and jacket thicknesses. Type TC category cables are permitted to be installed in cable trays and raceways next to other 600 V cables without separation depending on the application.

NFPA 79 allows AWM cables to be installed in listed assemblies where the cable has been indentified for use in the equipment or installation. NFPA 79 Section 12.9.2 provides additional information. Category cables that meet a 600 V AWM rating would not need to be separated from power cables for NFPA 79 applications.

## CONCLUSION

Category cable applications are evolving where the need to install cables next to power cables are growing. It is important to understand which industry code applies to the application and the associated permitted cable standards. The NEC recognizes Type TC for 600 V applications, while NFPA 79 allows 600 V AWM wiring.



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