

Industrial strength cabling

It's taken five years and numerous meetings, but a new draft that has been slimmed down considerably, is now in circulation.

For this month's column I wanted to bring you up to date on the Industrial Cabling Standard that is under development in the TIA TR 42.9 subcommittee.

It has been a long time in the making. The current draft is circulating in the industry as ANSI/TIA- SP-3-4822-H ballot document dated March 26, 2008.

The draft has changed significantly since its inception, which goes back over five years.

First, the document has slimmed down considerably. It doesn't contain any requirements for pathways and spaces; these are left by reference to TIA-569-B.

The document focuses primarily on horizontal and backbone cabling topology and performance requirements.

There is a normative Annex on the use of two-pair cabling. The document also includes several informative Annexes 1) to explain the MICE concept, 2) on the use of more than 4 connectors in a channel, and 3) on the supported optical fiber cabling distances for the ContolNet application.

What are the key points for the designer of industrial cabling systems? The first step is to identify the MICE environment. MICE refers to the Mechanical, Ingress, Climatic/Chemical and Electromagnetic noise environment where the cabling system will be installed.

The areas within the industrial premises include the factory floor, the work area and the automation island. The environmental classifications are described by the MICE table. Without getting into too many intricate details, MICE 1 generally corresponds to a commercial building environment, MICE 2 to a light industrial environment and MICE 3 to a heavy industrial environment.

Each of the parameters, namely M, I, C and E are specified independently. In terms of the available options for cabling in a harsh environment, one approach is to specify an enhanced component (cable, connector or cord) that is designed for these conditions. Another approach is to isolate or separate the component from the environment. This can be achieved, for example, by protecting the component using a suitable enclosure or conduit.

There are different variants that are used in the industry for encapsulating the connector interface. Encapsulation provides a watertight and dust proof seal for I2 and I3 Ingress environments. There has been a lot of debate and controversy in TR 42.9 subcommittee in choosing a method

of encapsulation.

The use of two-pair 100 Ohm cabling is allowed within the automation island if it meets a minimum Category 5e performance. In such cases, the M12-4 D-Coding connector as defined in IEC 61076-2-101 may be used to terminate two-pair cabling. Mixing of two-pair and four-pair cables in a channel is not recommended.

In reading all the clauses, I came to the conclusion that two-pair cabling should only be used when connecting to industrial equipment with two-pair physical interfaces.

The most interesting part of the standard has to do with the pair balance requirements. Pair balance can be directly related to the noise immunity of a channel.

For unshielded twisted-pair (UTP) cabling systems, the transverse conversion loss (TCL) and equal level transverse conversion transfer loss (ELTCTL) is 10 dB more stringent for an E2 environment compared to E1 and 20 dB more stringent for an E3 environment compared to E1. E1 corresponds to the reference electromagnetic noise environment for a commercial building.

For screened twisted-pair (ScTP) cabling systems, there is a new parameter that is defined called "coupling attenuation."

Coupling attenuation is the added attenuation of the radiated field due to the combined effect of pair balance and screening effectiveness. The coupling attenuation limits for screened twisted-pair cabling are 10dB more stringent for an E2 environment and 20 dB more stringent for an E3 environment compared to E1.

The pair balance performance of balanced pair cabling systems is a subject of further study in TIA TR 42.7 Balance Task Group. The most notable results so far, from two manufacturers, indicate that Category 6A UTP cabling meets the balance requirements specified for an E2 environment.

There is a lot of thought, effort and consensus building that went into the development of this standard. It should be published within the next year. It is an important document to be used for planning and installation of the telecommunications cabling infrastructure for industrial facilities. **CNS**



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