

EN 50174-2 -2009: A new data cabling standard for Europe

Barry Elliott

belliot@capitoline.co.uk

The EN 50174 series of standards cover the installation requirements of data cables across Europe, including data centres, and are designed to go hand in hand with the EN 50173 series of cable system design standards. There is now a whole family of EN standards covering the design, installation and testing aspects of data cabling and these are summarised in Diagram 1.

EN 50174 comprises three parts. All three parts support the specification, implementation and operation of information technology cabling. Part 1 deals with general planning and practices, including cable administration requirements; Part 2 is concerned with the planning and installation of information technology cabling using metallic cabling and optical fibre cabling inside buildings. It provides guidance as to the responsibilities of those involved and is intended to be referenced in relevant contracts.

Additional clauses containing normative requirements for specific types of premises will be added as amendments, or as revisions, to this standard. At the time of publication of this European Standard, the following clauses are planned:

- homes;
- data centres;
- operator buildings.

Part 3 of the Standard deals with cabling in between buildings.

In this article we shall consider EN 50174-2, as it was published earlier this year, after many years in the making, and in particular look at clause 6 of the Standard which deals with the subject of separating power and data cables.

The Standard is concerned about all aspects of looking after the cable and gives details on generic bend radii for different classes of cable, types of cable containment and so on. Separating copper data cables from power cables has always been a contentious subject however. This subject will become more and more significant though as LAN speeds get faster and faster. The importance of LAN speeds to cable segregation is caused by the fact that as LAN speeds get faster, on copper cable, then the signal to noise ratio of that signal transmission deteriorates.

This deterioration is caused by the use of multilevel signalling to squeeze more data rate down the limited bandwidth of the copper cable. For example, on 10BASE-T, +1 volt represents a 'one' and -1 volt represents a zero. So at the point of the signal leaving the transmitter there is two volts between the ones and zeroes of the data stream. At the far end of the (up to) 100 metres of copper cable the clean signal leaving the transmitter has been dramatically reduced by the attenuation of the cable and distorted by various noise components both from within and without the cable.

Fast Ethernet, 100BASE-TX, uses three voltage levels, gigabit Ethernet uses five voltage levels and ten gigabit Ethernet, 10GBASE-T, uses sixteen voltage levels. The receiving equipment therefore has to make decisions about the received signal that depends on just a few tens of millivolts between the signal layers and it is this fact that makes faster LANs more

sensitive to noise, especially 10GBASE-T, where the impact of Alien Crosstalk, or noise from outside the cable, has become the limiting factor in this technology.

One of the main sources of noise is adjacent power cables, especially long parallel runs of data and power cables. Maintaining the cable separations is therefore much more important now and most LAN and structured cabling manufacturers only guarantee the operation of their equipment if relevant installation standards such as EN 50174 have been obeyed and implemented.

The first version of EN 50174-2 came out in 2000 and contained a fairly simple table that gave cable separations depending upon whether the cables were screened or unscreened and whether there was any metallic separation, e.g. cable tray, between them. At worst case, with unscreened data and power cables, and nothing between them, the separation could be as far as 200 mm. This has been a useful standard to adopt, i.e. keep data and power cable trays 200 mm apart. One criticism of this standard was that it made no distinction between one single phase low current cable and a large bundle of heavy current three phase cables.

As more metal was added to either the cables, or the space between them, the old standard allowed the cables to move closer together until they touched. It is important to remember though that EN 50174 is mostly concerned about cutting down interference between cables and it is not foremost a safety standard. Most countries have a requirement to keep data and power cables at least 50 mm apart to ensure dangerous high voltages can never appear on data cables.

The new EN 50174-2 standard looks at segregation in much more detail: over six pages of in fact. One can't help but feel that the over-complexity of this standard will work against it in the eyes of most cable installers.

The new standard first defines cables according to their screening ability, measured by Coupling attenuation, Screening attenuation and Transverse Coupling Loss. The cables are then classified from *a* to *d* where *d* is the best, as might be met by the heavily screened Category 7 cable. Category 6 and Category 5 cables may meet class *b* or *c*, presumably depending upon whether they are screened or not.

A minimum segregation between the data and power cables is given from 10 mm for class *d* cables, 50 mm for class *c*, 100 mm for class *b* and 300 mm for class *a*. These distances are reduced if the cables are housed within various types of metallic containment.

The final part of the equation invokes a power cable factor. If there are less than 13 adjacent power cables circuits (a circuit being a single phase conductor up to 20 amps) then the multiplying factor is less than one, down to just 20% of the separation for a single conductor. For greater numbers of power cables then the multiplying factor can be up to 600%. Three phase circuits are regarded as three individual circuits for the purposes of this calculation.

Where the cabling to be installed is in accordance with, and is intended to support the applications listed in, the EN 50173 series the separation requirements for classification "b" in Table 4 represent the minimum requirements of this standard.

This clearly implies that 100 mm is the minimum separation for standard LAN cabling unless mitigated by metallic containment or worsened by excess power cables.

TIA 942, the American data centre standard, also gives a cable separation table, based on the American NFPA requirements. This table does make the separations dependent upon the quantity of power cables and, for example, 16-30 20 amp cables a 50 mm separation is required if all cables are shielded. The distances are doubled if unshielded power cables are used. If all the cables are in grounded metal cable trays then they can all be treated as

shielded. The standard goes up to 300 mm (600 mm for unshielded) for proximity to three phase cables.

So we have a number of very complex standards that expect designers to calculate the screening efficiency of their data cables, the effects of the metallic cable containment, if any, and the number and current ratings of adjacent power cables. I invite the reader to buy the standards and make their own calculations, but if you want a simple rule of thumb that will work in nearly every circumstance:

For single phase power cables, keep the data and power cable trays at least 200 mm apart.
For three-phase power cables, keep the data and power cable trays at least 600 mm apart.

Diagram 1

CENELEC data cable standards

