

# Standard heading our way

The European Standard for data centres may be adopted by the ISO and eventually by Australia, Patrick Attard explains what it comprises.

The European Standards body CENELEC has published a structured cabling Standard, EN50173-5, specifically for data centres.

The principles are much the same as the familiar structured cabling Standard for commercial premises, such as AS/NZS

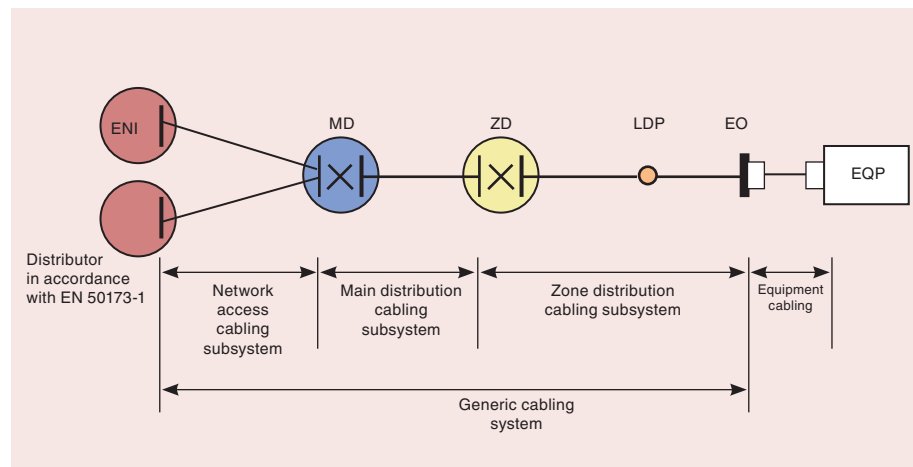
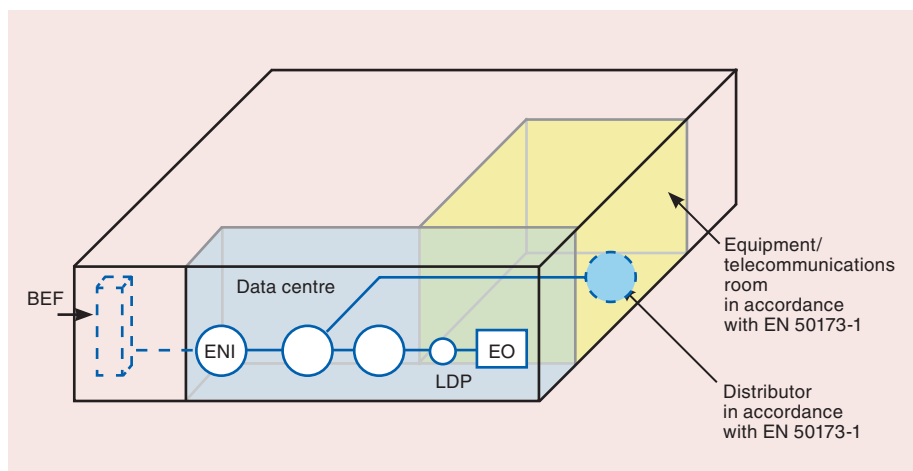
3080:2003 and ISO/IEC 11801:2002. This Standard may be adopted by the ISO and eventually by Australian Standards.

This Standard complements other CENELEC Standards such as:

- generic cabling in premises, EN 50173-1 (AS/NZS 3080:2003)

- quality assurance, installation of information technology cabling, series EN 50174 (AS/NZS 3085.1:2004)
- testing of installed cabling EN 50346:2001 (AS/NZS 3087.1/2/3)
- installation Standards, EN 50174 series (AS/NZS 3084:2004)
- equipotential bonding requirements, EN 50310 (AS/ACIF S009, AS/NZS 3000:2000).

This European Standard in question covers the requirements for cabling data centres in which the maximum distance of communications cabling is 2000m. Safety (electrical safety and protection, fire, optical power, etc) and electromagnetic compatibility (EMC) requirements are outside the scope of this European Standard and are covered elsewhere.



A distributor such as a building distributor in a TR is connected to the data centre cabling using the network access cabling. The cabling subsystems are connected to create a generic cabling system with a structure, as shown above.

## Functional elements

In addition to the distributors specified in EN 50173-1 (AS/NZS 3080:2003), this Standard specifies the following functional elements and interfaces of generic cabling:

- external network interface (ENI)
- network access cable
- main distributor (MD)
- main distribution cable
- zone distributor (ZD)
- zone distribution cable
- local distribution point (LDP)
- local distribution point cable
- equipment outlet (EO)

These functional elements are grouped to form cabling subsystems.

## General structure and hierarchy

Generic data centre cabling systems contain up to three cabling subsystems:

**This article has been reproduced with permission from Cabling Connection magazine, Aug/Sept 2005.**

Connection Magazines does not endorse any manufacturer, product or service nor does it provide any assurances of product or service performance.

network access cabling, main distribution cabling and zone distribution cabling.

**Cabling subsystems**

*Network access cabling subsystem.* This extends from an MD (or ZD) to the ENIs and/or other distributors connected to it. The subsystem includes:

- network access cables;
- mechanical termination of network access cables including connections at the ENI;
- mechanical termination of network access cables at the MD, ZD or other distributors.

In all cases, equipment cords used for connecting transmission equipment to the cabling subsystem are not considered part of the cabling subsystem, as they are application-specific.

*Main distribution cabling subsystem.* This extends from an MD to the ZDs connected

MODEL	MODEL EQUATIONS	
	CLASS E	CLASS E
Interconnect-E0	$Z=107 - 3a - FX$	$Z=107 - 2a - FX$
Cross-connect-E0	$Z=106 - 3a - FX$	$Z=106 - 3a - FX$
Interconnect-LDP-E0	$Z=106 - 3a - FX - LY$	$Z=106 - 3a - FX - LY$
Cross-connect-LDP-E0	$Z=105 - 3a - FX - LY$	$Z=105 - 3a - FX - LY$
<i>Z</i> maximum length of the fixed zone distribution cable (m) <i>F</i> combined length of patch cords, jumpers and equipment cords (m) <i>L</i> length of the LDP cable (m) <i>X</i> ratio of flexible cable insertion loss (dB/m) to fixed zone distribution cable insertion loss (dB/m) <i>Y</i> ratio of LDP cable insertion loss (dB/m) to fixed zone distribution cable insertion loss (dB/m)		
<b>a</b> This length reduction is to provide an allocated margin to accommodate insertion loss deviation		
For operation temperatures above 20°C, <i>Z</i> should be reduced by 0.2% per °C for screened cables and 0.4% per °C (20°C to 40°C) and 0.6% per °C (>40°C to 60°C) for unscreened cables		

Table 1 - Zone distribution channel equations

MODEL	MODEL EQUATIONS	
	CLASS E	CLASS E
Interconnect-interconnect	$M=107 - 3a - FX$	$M=107 - 2a - FX$
Interconnect-cross-connect	$M=106 - 3a - FX$	$M=106 - 3a - FX$
Cross-connect-cross-connect	$M=105 - 3a - FX$	$M=105 - 3a - FX$
<i>M</i> maximum length of the fixed main distribution cable (m) <i>F</i> combined length of patch cords, jumpers and equipment cords (m) <i>X</i> ratio of flexible cable insertion loss (dB/m) to fixed main distribution cable insertion loss (dB/M)		
a This length reduction is to provide an allocated margin to accommodate insertion loss deviation		
For operation temperatures above 20°C, Z should be reduced by 0.2% per °C for screened cables and 0.4% per °C (20°C to 40°C) and 0.6% per °C (>40°C to 60°C) for unscreened cables		

Table 2 - Main distribution channel equations

COMPONENT CATEGORY	CLASS <sup>a</sup>					
	A	B	C	D	E	F
5	2000	$N=250-FX$	$N=170-FX$	$N=105-FX$	-	-
6	2000	$N=260-FX$	$N=185-FX$	$N=111-FX$	$N=105-3b-FX$	-
7	2000	$N=260-FX$	$N=190-FX$	$N=115-FX$	$N=107-3b-FX$	$N=105-3b-FX$
<i>N</i> length of the fixed backbone cable (m) <i>F</i> combined length of patch cords, jumpers and equipment cords (m) <i>X</i> ratio of flexible cable insertion loss (dB/m) to fixed main distribution cable insertion loss (dB/M)						
a Applications limited by propagation delay or skew may not be supported if channel lengths exceed 100m						
b This length reduction is to provide an allocated margin to accommodate insertion loss deviation						
Where channels contain a different number of connections than in the model, the fixed cable length shall be reduced (where more connections exist) or may be increased (where fewer connections exist) by 2m per connection for Cat 5 cabling and 1m per connection for Cat 6 and 7 components - additionally the NEXT, return loss and ELFEXT performance should be verified						
For operation temperatures above 20°C, Z should be reduced by 0.2% per °C for screened cables and 0.4% per °C (20°C to 40°C) and 0.6% per °C (>40°C to 60°C) for unscreened cables						

Table 3 - Network access cabling channel equations

OPTICAL FIBRE TYPE	CLASS	IMPLEMENTATION EQUATIONS <sup>a</sup>		MAXIMUM LENGTH (M)
MULTIMODE		850NM	1300NM	
Cable category OM2/OM3	OF-300	$L=735-145 \times x-90 \times y$	$L=1300-330 \times x-200 \times y$	300
	OF-500	$L=935-145 \times x-90 \times y$	$L=1500-330 \times x-200 \times y$	500
	OF-2000	$L=2435-145 \times x-90 \times y$	$L=3000-330 \times x-200 \times y$	2000
SINGLE MODE		1310NM	1500NM	
OS1	OF-300	$L=1800-500 \times x-300 \times y$	$L=1800-500 \times x-300 \times y$	300
	OF-500	$L=2000-500 \times x-300 \times y$	$L=2000-500 \times x-300 \times y$	500
	OF-2000	$L=3500-500 \times x-300 \times y$	$L=3500-500 \times x-300 \times y$	2000
<i>L</i> length of the channel (m) <i>x</i> total number of mated connection in the channel <i>y</i> total number of splices in the channel				
a These equations assume 0.5dB attenuation per mated connection (as for a two-connection system only 0.25% would exceed that value)				

Table 4 - Optical fibre channel parameters

to it. The subsystem includes:

- main distribution cables
- mechanical termination of main distribution cables including connections at the MD, together with associated patch cords and/or jumpers at the MD
- mechanical termination of main distribution cables at the ZD.

*Zone distribution cabling subsystem.* This extends from a ZD to the EOs connected to it. The subsystem includes:

- zone distribution cables;
- mechanical termination of zone distribution cables including connections

**This article has been reproduced with permission from Cabling Connection magazine, Aug/Sept 2005.**

Connection Magazines does not endorse any manufacturer, product or service nor does it provide any assurances of product or service performance.

- at the EO, ZD;
- an LDP (optional);
- an LDP cable (optional);
- the EO.

Zone distribution cables are continuous from the ZD to the EOs unless an LDP is installed. The diagram below shows how the functional elements may be accommodated in a building.

The MD, ZD and LDP are housed in permanent and accessible locations in the data centre. The ENI is located in permanent and accessible areas either internal or external to the data centre.

### EO

The generic cabling provides for EOs to be installed with a high density and located close to the application-specific equipment to which they are to be connected.

CATEGORY	STANDARD
Cat 5 unshielded	IEC 60603-7-2
Cat 5 shielded	IEC 60603-7-3
Cat 6 unshielded	IEC 60603-7-4
Cat 6 shielded	IEC 60603-7-5
Cat 7	IEC 60603-7-7 or IEC 61076-3-104 a
a In installations where other factors take preference over backward compatibility offered with EN 60603-7-7, also the interface specified in EN 61076-3-104 may be used	

Table 5 - Connecting hardware for balanced cabling used at the ENI

### LDP

These may be installed in the zone distribution cabling between the ZD and the EO. LDPs are useful where frequent additions or movements of equipment are required.

One LDP is permitted between a ZD and

any EO. The LDP shall contain only passive connections. LDPs may be located in ceiling voids and under floors.

### Balanced cabling

The main distribution and zone distribution cabling shall be designed ▶



CATEGORY	STANDARD
Cat 6 unshielded	IEC 60603-7-4
Cat 6 shielded	IEC 60603-7-5
Cat 7	IEC 60603-7-7 or IEC 61076-3-104 a
a In installations where other factors take preference over backward compatibility offered with EN 60603-7-7, also the interface specified in EN 61076-3-104 may be used	

Table 6 - Connecting hardware for balanced cabling used at the EO

to provide a minimum of Class E channel performance for the following parameters:

- return loss
- insertion loss
- near-end crosstalk loss (NEXT)
- power sum NEXT (PSNEXT)
- attenuation to crosstalk ratio (ACR)
- power sum ACR (PSACR)
- pair-to-pair ELFEXT
- power sum ELFEXT (PSELFEXT)
- direct current loop resistance
- direct current resistance unbalance
- direct current power feeding
- operating voltage
- propagation delay
- delay skew
- unbalance attenuation
- coupling attenuation
- alien crosstalk

#### Optical fibre cabling

Multimode optical fibre used in the main distribution and zone distribution cabling shall be a minimum of Class OF-300 channel performance using OM2 or OM3 optical fibre cable.

#### Zone distribution and main distribution cabling

Balanced cabling components shall be a minimum of Cat 6 for Class E channels or Cat 7 for Class F channels. The maximum channel lengths shall not exceed 100m.

The maximum length of the fixed zone distribution cable will depend on the total length of LDP cables and cords to be supported in a channel.

The maximum length of the fixed zone distribution cable will depend on the total length of cords to be supported in a channel.

The maximum length of the fixed main distribution cable will depend on the total length of main distribution cables and cords to be supported in a channel.

#### Network access cabling

Network access cabling may be Cat 5 or higher. This is determined by the channel lengths required and the class of applications to be supported.

#### Optical fibre channel lengths

The total optical fibre channel length shall be determined by the equations shown in Table 4.

#### Connecting hardware for balanced cabling used at the ENI

Balanced cabling connecting hardware should conform to the requirements of Table 5.

#### Connecting hardware for balanced cabling used at the EO

See Table 6 (above).

#### Connecting hardware for optical fibre cabling

ENI and EO requirements. For single mode optical fibre the interface shall have a minimum return loss performance of 55dB provided by an angled face connection. All types of small form factor optical fibre connectors are permissible.

For the termination of more than two optical fibres the interface shall be EN 61754-7 (MPO). ■

*Patrick Attard is technical services and training manager in the Networking Division of AMP NETCONNECT, Tyco Electronics Australia/ New Zealand*

**This article has been reproduced with permission from Cabling Connection magazine, Aug/Sept 2005.**  
Connection Magazines does not endorse any manufacturer, product or service nor does it provide any assurances of product or service performance.

