

## I - MAIN APPLICABLE STANDARDS

- I.1** - Standards ISO/IEC 11801 V2 Amd.1 and EN 50173 V2 and EIA/TIA 568 B2  
which define the architecture, structure and performance of cabling components.
- I.2** - Standards ISO/IEC 14763-1 and 2  
which recommend the administration and planning & installation of the cabling (density of distributors and work areas).
- I.3** - Standards ISO/IEC 18010  
which recommend cable and socket supports.
- I.4** - Standards TIA-606  
which recommend the principles for marking cabling components.
- I.5** – Cabling entities defined by standard ISO 11801:
- Telecommunications outlet (TO) for connecting a VDI terminal
  - Work area (WA), a space reserved for the connection of VDI terminals
  - Consolidation point (CP), provides flexibility of modification for TOs (12 WA max. per CP)
  - Floor distributor (FD), node for the TOs of a floor or a zone
  - Horizontal cabling (HC), serving the TOs from the FDs.
  - Vertical intra-building cable (BCB), linking the FDs
  - Building distributor (BD), node between the FDs and the external and/or campus networks
  - Campus distributor (CD), node for the BDs and external networks.
  - Vertical inter-building cabling (CCB), which links BDs to the CD.

## II – ARCHITECTURE

Main applicable cabling architectures according to the required level of redundancy:

Level of Redundancy	No. of incoming roads & services per Campus or Bldg.	No. of op. rooms	No. of CD and/or BD per Campus or Bldg.	No. of VDI service ducts per Bldg.	Vertical Distribution Architecture	No. of FD per Floor or Zone	Horizontal Distribution Architecture
0	1	1	1	1	Star	1	Star
1	1	1	1	1	Meshed star	1	Star
2	2	1	1	2	Double Meshed Star <sup>(1)</sup>	1	Star
3	2	2	2	2	Double Meshed Star <sup>(1)</sup>	2	Double Star

<sup>(1)</sup> optional mesh between FD

It is strongly recommended that the central nodes (CD and BD) and the backbone cables are duplicated in case there is convergence of the systems on one IP network.

Level 0: No redundancy, structured cabling system in star configuration.

Level 1: Structured cabling system in meshed star configuration.

Level 2: If the link connecting the building to the operator network or the link connecting the FD to the building central node is broken, service can be resumed via the other access

Level 3: Same services as level 1, with the additional ability to resume services via the second central node or the second operator node if the first nodes fail.

### III – STRUCTURE

#### III-1 Vertical distribution

IT backbone: Multimode and monomode fibre optic cables.

Telephone backbone: Category 3 multipair cable (for digital telephony only, not useful for telephony over IP).

Multipurpose multimedia backbone: Set of 4-pair cables of the same category as those used for horizontal distribution, to support conventional telephone links and as a backup for optical IT backbones (recommended for ToIP).

#### III-2 Horizontal distribution

Horizontal distribution cable category recommended according to the application class to be supported and the required durability:

Component category	Supported application classes	Bandwidth supported	Most demanding LANs supported	Minimum theoretical operating time before obsolescence
6	A, B, C, D, E	0 to 250 MHz	Gigabit-Ethernet (125 MHz)	15 years
6a	A, B, C, D, E, Ea	0 to 500 MHz	10 G-Ethernet (400 MHz)	20 years

### IV – COMPONENTS AND SYSTEM

#### IV-1 Cables

Max. length of channel using twisted pair cables according to their category and application class:  
Legrand LCS<sup>2</sup> cable or similar.

Media	Classes					
	A	B	C	D	E	Ea
Category 6 Symmetrical pair cables	2 km	260 m	160 m	100 m	100 m	
Category 6a symmetrical pair cable	2 km	260 m	160 m	100 m	100 m	100 m

Level of electromagnetic protection provided by copper cables according to their type

Cable type	Level of electromag. protection
F/FTP	++++
S/FTP	+++++
U/UTP	++

Max. length of channel using fibre optic cables for the most demanding local IP network protocols:  
Legrand LCS<sup>2</sup> cable or similar.

	Gigabit Ethernet ranges			10 Gigabit Ethernet ranges			
	Base SX	Base LX	Base Zx	Base-S	Base-L	Base-E	Base-LX4
	850 nm	1300/1310 nm	1550 nm	850 nm	1310 nm	1550 nm	1300-1310 nm
Type FO-OM 1	275 m	550 m		33 m			300 m
Type FO-OM 2	550 m	550 m		82 m			300 m
Type FO-OM 3	2 km	550 m		247 m			300 m
Type FO-OS1		5 km	70 km		10 km	30 km	10 km

## IV – COMPONENTS AND SYSTEM (continued)

### IV-2 Connectors

Standard connectors recommended for telecommunications outlets or at the consolidation point (CP) and in distributors (BD/FD/CD)

► Copper connectors

- 8-point RJ45 for Legrand LCS<sup>2</sup> or similar category 6 U/UTP 4-pair cables and cords.
- Shielded 9-point RJ45 for Legrand LCS<sup>2</sup> or similar category 6a S/FTP 4-pair cables and cords.

Note: Some work areas (WA) such as classrooms, public areas, etc., may be equipped with LCS<sup>2</sup> Mosaic programme type with controlled access (locking of the flap or the cord using key supplied).

Legrand LCS<sup>2</sup> type patch panel or similar in building (BD) or floor (FD) or campus (CD) distributor

Performance of the Legrand LCS<sup>2</sup> components and of the links with Legrand LCS<sup>2</sup> cables and cords: test conducted by the 3P Third Party Testing independent laboratory in accordance with the requirements of standard ISO 11801 edition 2 amendment 1

		Component measurement			Channel measurement		
		Cat. 6 A S/FTP		Cat. 6 U/UTP	Cat. 6 A S/FTP		Cat. 6 U/UTP
		500 MHz	250 MHz	250 MHz	500 MHz	250 MHz	250 MHz
Network protocol supported		10 gig	1 gig	1 gig	10 gig	1 gig	1 gig
Attenuation (dB) loss of signal	Legrand LCS <sup>2</sup>	0.13	0.06	0.09	35.4	24.1	25.7
	ISO standard	0.45 max <sup>(2)</sup>	0.32 max <sup>(2)</sup>	0.32 max <sup>(2)</sup>	42.1 max <sup>(2)</sup>	28.9 max <sup>(2)</sup>	30.7 max <sup>(2)</sup>
Return loss (dB) noise generated by the reflection of the signal	Legrand LCS <sup>2</sup>	17.05	26.69	29.8	16.4	22.1	38.8
	ISO standard	14 max <sup>(2)</sup>	20 min <sup>(2)</sup>	16 min.	8 min <sup>(2)</sup>	10 min <sup>(2)</sup>	10 min <sup>(2)</sup>
NEXT (dB) noise generated by the signal support on the other pairs in the cable <sup>(3)</sup>	Legrand LCS <sup>2</sup>	37.46	56.93	51.3	38.1	54	53.9
	ISO standard	37 min <sup>(2)</sup>	46 min <sup>(2)</sup>	46 min <sup>(2)</sup>	29.2 min <sup>(2)</sup>	35.3 min <sup>(2)</sup>	35.3 min <sup>(2)</sup>
ACR (dB) actual power supplied at the end	Legrand LCS <sup>2</sup>	37.33	56.87	51.21	2.7	29.9	28.2

<sup>(2)</sup> Value taken from amendment 2 of standard ISO 11801 edition 2 amendment 1

<sup>(3)</sup> Measurements taken on 4 pairs, 3-6 and 4-5

► Fibre optic connectors

- Legrand LCS<sup>2</sup> or similar ST, SC or LC type for fibre optic cable. LC recommended for a better density

A Legrand LCS<sup>2</sup> or similar through-wiring panel must be provided with each patch panel or connector rack.

### IV-3 Containers

► Containers recommended for building (BD) or campus (CD) distributors

Legrand LCS<sup>2</sup> or similar 19" enclosures, on base or plinth according to the installation context: height 42U and minimum dimensions 800 x 600 mm or 800 x 800 mm for greater versatility for enclosures taking cabling and network equipment, and 600 or 800 x 1000 mm for servers.

Possibility of using cable ducts to organise the cables between the network enclosure and the server enclosure while maintaining the bending radius. Automatic equipotential link clip for rear and side panels.

► Containers recommended for floor distributors (FD)

Legrand LCS<sup>2</sup> or similar wall-mounting cabinets, dimensions 600 x 580 mm for distributors serving up to 96 telecommunications outlets (TO), and at least one 19" 42U 800x800 mm enclosure for FDs serving between 97 and 192 outlets, 2 enclosures of the same type for FDs serving between 193 and 384 outlets and 3 enclosures for those serving between 385 and 624 outlets. Above this, create another distributor. Automatic equipotential link clip for rear and side panels.

## IV – COMPONENTS AND SYSTEM (continued)

### IV-4 Supports

Several types of cable support can be used:

- On the work area (WA)
  - Either along the walls using trunking with direct clip-on of Legrand Mosaic programme or similar telecommunications outlets (TO), together with Mosaic programme type red power sockets for uninterruptible power supply.
  - Or via the false floor using floor multi-outlet extensions, desktop multi-outlet extensions, floor boxes or mini-columns with direct clip-on of Legrand Mosaic programme or similar telecommunications outlets (TO), together with Mosaic programme type red power sockets for uninterruptible power supply.
  - Or via the false ceiling using columns with direct clip-on of Legrand Mosaic programme or similar telecommunications outlets (TO), together with Mosaic programme type red power sockets for uninterruptible power supply.
- In false ceilings
  - On Cablofil trays
- In false floors
  - With perforated cable management tile or metallised PVC duct (MSB)

## V – SIZING of VDI cabling for computing/telephony/Internet

Sizing recommendations provided by the main international standards for secure access to telephony, the Internet and the services of private networks

- Work area (WA), 4 to 6 m<sup>2</sup> in open space, or 6 to 10 m<sup>2</sup> in partitioned space.
- Telecommunications outlet (TO), at least two 4-pair 8-contact outlets
- Consolidation point (CP) for greater flexibility: 1 for every 4 work areas/max. 12
- Building distributor (BD) max for a work area of 1000 m<sup>2</sup>
- Floor distributor (FD), distributes over a 60 m radius zone, taking a maximum of 624 telecommunications outlets (TO)
- Optical backbone cable, capacity 6 to 24 strands
- A minimum extension capacity of 30% must be provided for containers and supports.

Possibility of replacing the telecommunications outlets (TO) in work areas (WA) with **Legrand Mosaic programme** LCS<sup>2</sup> 802.11a/802-11 b/g Wi-Fi access points, which can be installed in trunking, columns, floor multi-outlet extensions, and desktop multi-outlet extensions, in particular for meeting rooms or halls.

The connection of Wi-Fi access points is supplied via a PoE Ready injector up to 30 Watts located in the distributors (FD/BD/CD).

## VI – OTHER APPLICATIONS that can be connected to the VDI cabling

- Video surveillance camera
- Local access control and anti-intruder processing unit
- Wi-Fi terminals
- Building management system controller
- Dynamic signalling and TV video monitor (reception area)
- Video projection and video conferencing terminals in meeting rooms.

These are connected to a telecommunications outlet (TO) according to the chosen performance level (6 or 6 A) leading to the floor distributor (FD) then to the building distributors then, if required, the campus distributors, receiving the sources or the central equipment of these applications.

The telecommunications outlets (TO) can be marked using a Mosaic programme LCS<sup>2</sup> or similar coloured flap (red, green, orange) to identify dedicated networks.