

# “DOTTING THE i’s and CROSSING THE t’s”

## Cabling Standards 2005

Mike Gilmore  
Managing Director, e-Ready Building  
The Cabling Partnership

# Mike Gilmore



**Mike Gilmore**  
Managing Director  
e-Ready Building

## Standards Activities



*Member*  
JTC1 SC25 WG3: Generic Cabling



*Convenor*  
JTC1 SC25 WG3 IPTG: Industrial Premises Cabling



*Convenor*  
TC215 WG1: IT Cabling  
TC215 WG1 PT Industrial Premises Cabling



*Secretary*  
TC215 WG1 PT Data Centre Cabling



*Acting Chairman*  
TCT7: Telecommunications - Installation Requirements



*Chairman*  
TCT7/-/1: Cabling infrastructure design, planning and commissioning  
TCT7/-/3: Cabling: Infrastructure standards - UK implementation panel

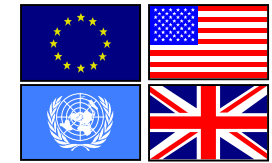
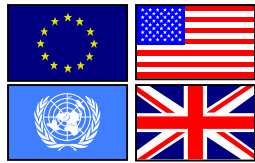
**FIA**  
[www.fia-online.org](http://www.fia-online.org)

*Technical and Standards Director*  
Fibreoptic Industry Association

Mobile: +44 (0) 7860 110563

e-mail: [mike.gilmore@btinternet.com](mailto:mike.gilmore@btinternet.com)

# Agenda



## DESIGN STANDARDS

ANSI/TIA/EIA-568-B

ISO/IEC 11801

EN 50173-1

10GBASE-T

TECHNICAL REPORTS  
REVISIONS OF STANDARDS

## TESTING STANDARDS

ISO/IEC 14763-3

EN 50346

FIA TECHNICAL SUPPORT GUIDES

## INSTALLATION STANDARDS

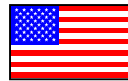
BS 6701

EN 50174-X

USEFUL ADDITIONAL REFERENCES

## USING THE STANDARDS

# ANSI/TIA/EIA Design Standards



REFERENCE

TITLE

TIA/EIA-568-B

Commercial Building Telecommunications Cabling Standard

TIA/EIA-570-A

Residential Telecommunications Cabling Standard

# ANSI/TIA/EIA-568-B

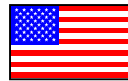


REFERENCE	TITLE		
TIA/EIA-568-B.1	General Requirements		
	Balanced Cabling	Categories 3 and 5e Links and channels	
	OF Cabling	Links and channels	
Addendum 1	Cabling	Components	Patch cable bend radius
Addendum 2	Cabling		Grounding/bonding of screened cabling
Addendum 3	Cabling		Application support - hi-bandwidth MMF (50/125µm)
Addendum 4	Cabling		Category 6 and hi-bandwidth MMF (50/125µm)
Addendum 5	Cabling		Telecommunications enclosures
Addendum 6	Cabling		DTE Power
Addendum 7	Cabling		OF Array CH Polarity

TIA/EIA-568-B.2	Balanced Twisted-pair Cabling		
	Components	Categories 3 and 5e	
Addendum 1	Cabling	Components	Category 6
Addendum 2	Components		Corrections to B.2
Addendum 3	Cabling	Components	IL and RL Pass/Fail determination
Addendum 4	Components		Reliability of connecting hardware
Addendum 5	Components		Corrections to B.2
Addendum 6	Components		Cat. 6 test procedures
Addendum 7	Components		Reliability of connecting hardware
Addendum 8	Components		DTE Power
Addendum 9	Components		Additional balance requirements
Addendum 10	Cabling	Components	"Augmented" Category 6
Addendum 11	Components		Increased cable diameter

TIA/EIA-568-B.3	Optical Fibre Cabling		
	Components		
Addendum 1	Components		Hi-bandwidth MMF (50/125µm)

# ANSI/TIA/EIA Design Standards - The Future



REFERENCE	TITLE	
TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard	TIA/EIA-568-C
TIA/EIA-1005	Telecommunications Infrastructure Standard for Industrial Buildings	
TIA/EIA-570-A	Residential Telecommunications Cabling Standard	TIA/EIA-570-B
TIA/EIA-942	Telecommunications Infrastructure Standard for Data Centers	
TIA/EIA-862	Building Automation Cabling Standard for Commercial Buildings	

# ISO/IEC Design Standards



REFERENCE	TITLE
ISO/IEC 11801 Ed.2 (2002)	Information Technology - Generic Cabling for Customer Premises
ISO/IEC 15018	Information Technology - Generic Cabling for Homes
ISO/IEC TR(2) 24704	Information Technology - Customer Premises Cabling for Wireless Access Points

# ISO/IEC Design Standards - The Future



REFERENCE	TITLE
ISO/IEC 11801 Ed.2 (2002)	Information Technology - Generic Cabling for Customer Premises
ISO/IEC 24702	Information Technology - Generic Cabling for Industrial Premises
ISO/IEC 15018	Information Technology - Generic Cabling for Homes
ISO/IEC TR(2) 24704	Information Technology - Customer Premises Cabling for Wireless Access Points

# CENELEC Design Standards



REFERENCE

TITLE



EN 50173-1  
(2002)

Information Technology - Generic Cabling Systems -  
General Requirements and Office Areas

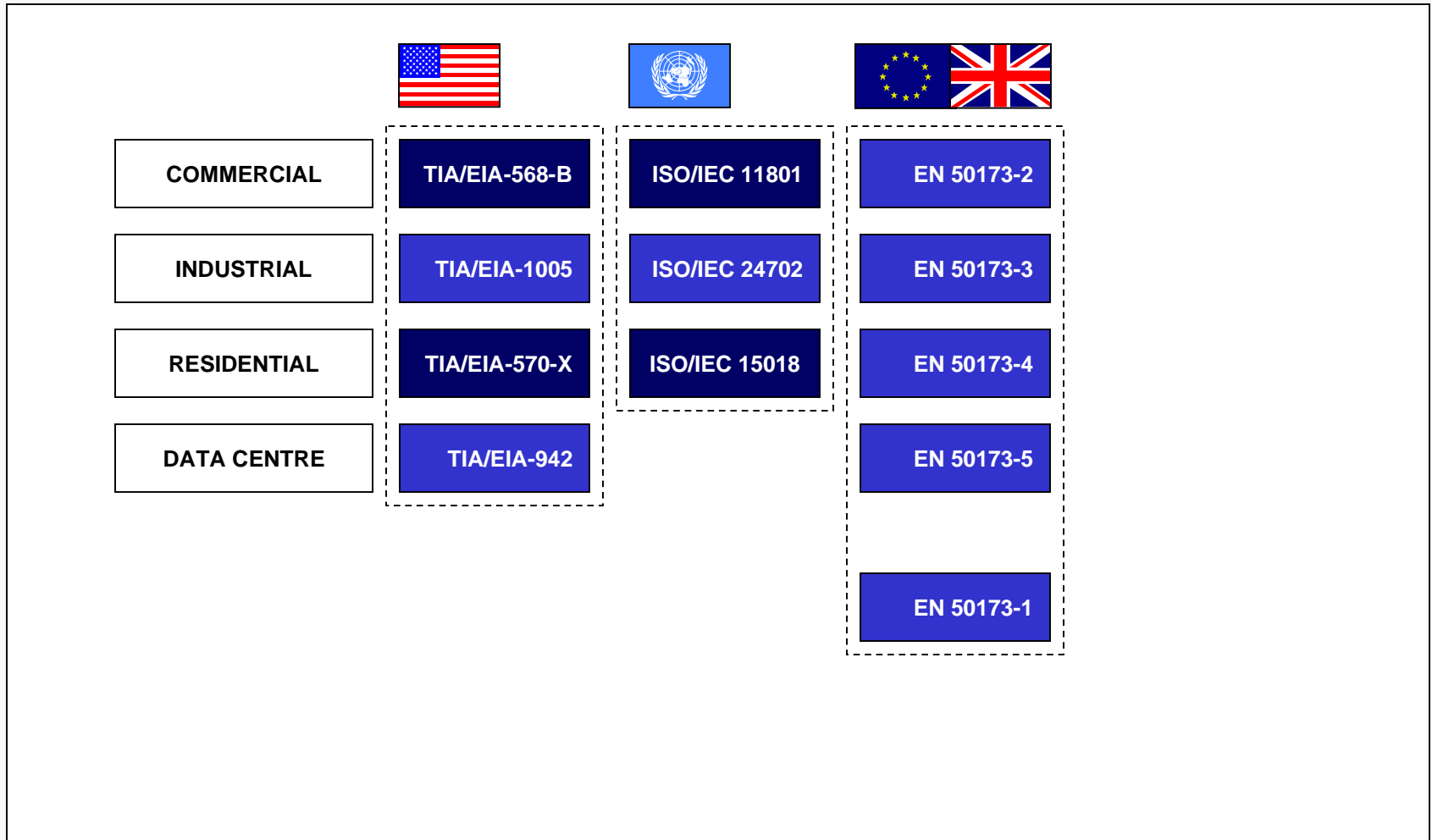
# CENELEC Design Standards - The Future



REFERENCE	TITLE
EN 50173-1 (2005)	Information Technology - Generic Cabling Systems - General Requirements
EN 50173-2 (2005)	Information Technology - Generic Cabling Systems - <b>Office Areas</b>
EN 50173-3 (2006)	Information Technology - Generic Cabling Systems - Industrial Premises
EN 50173-4 (2006)	Information Technology - Generic Cabling Systems - Homes
EN 50173-5 (2006)	Information Technology - Generic Cabling Systems - Data Centres

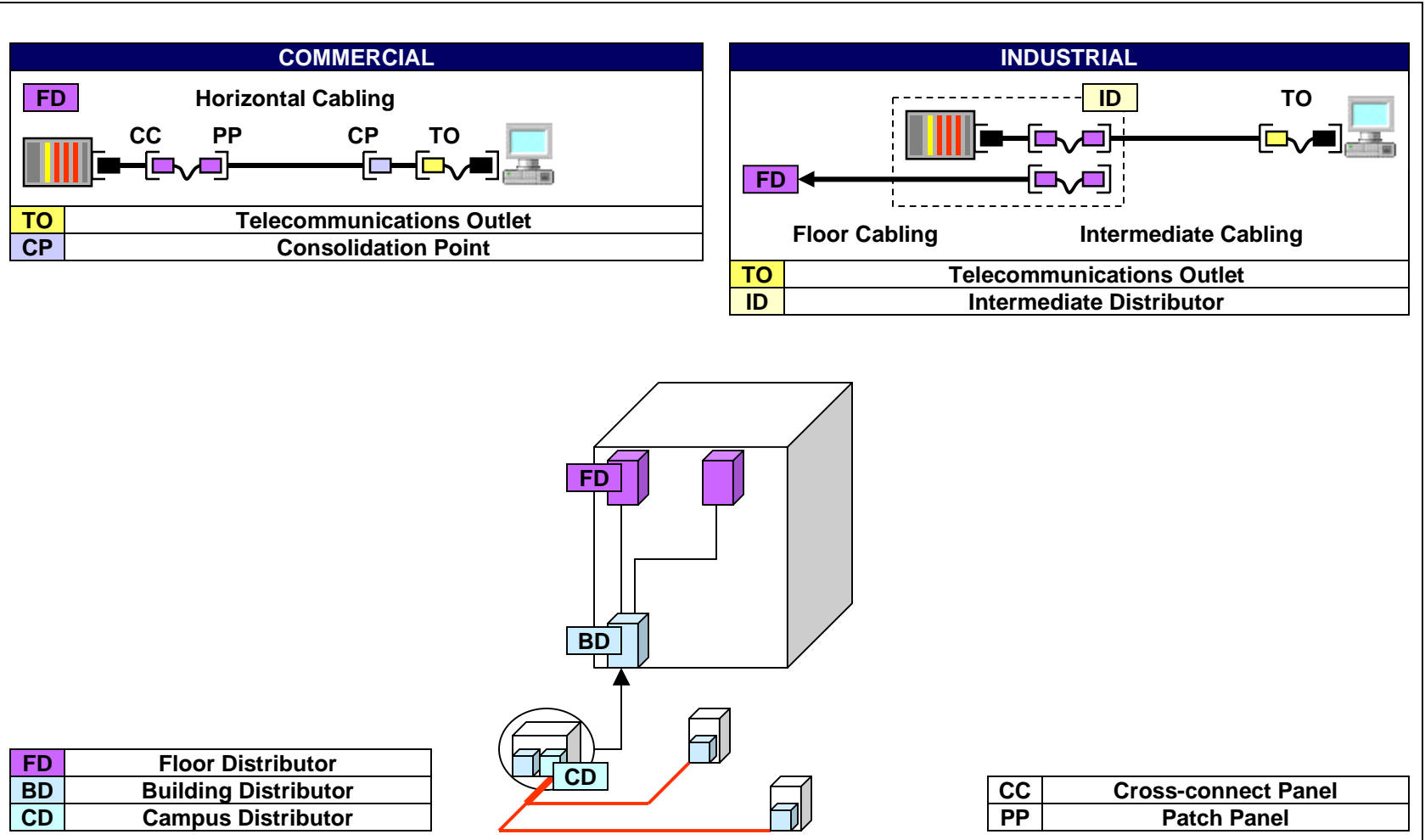


# Generic Cabling For All



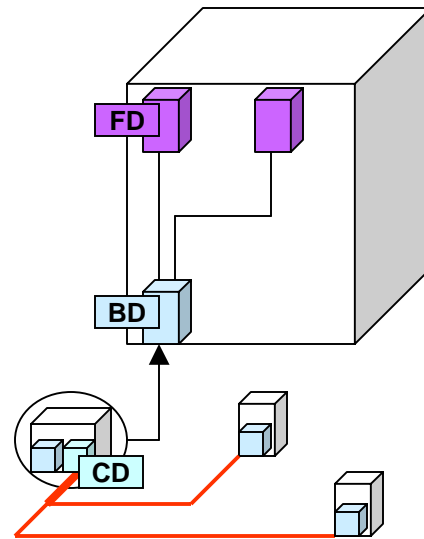
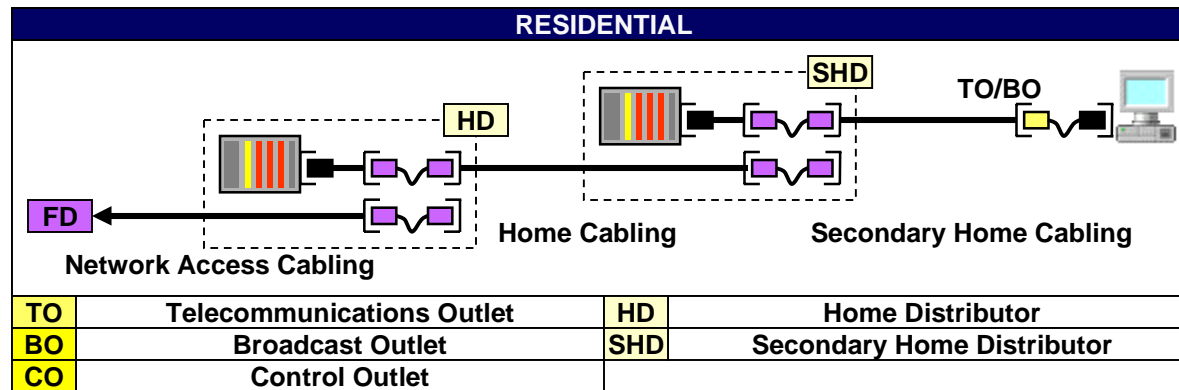


# Structure





# Structure



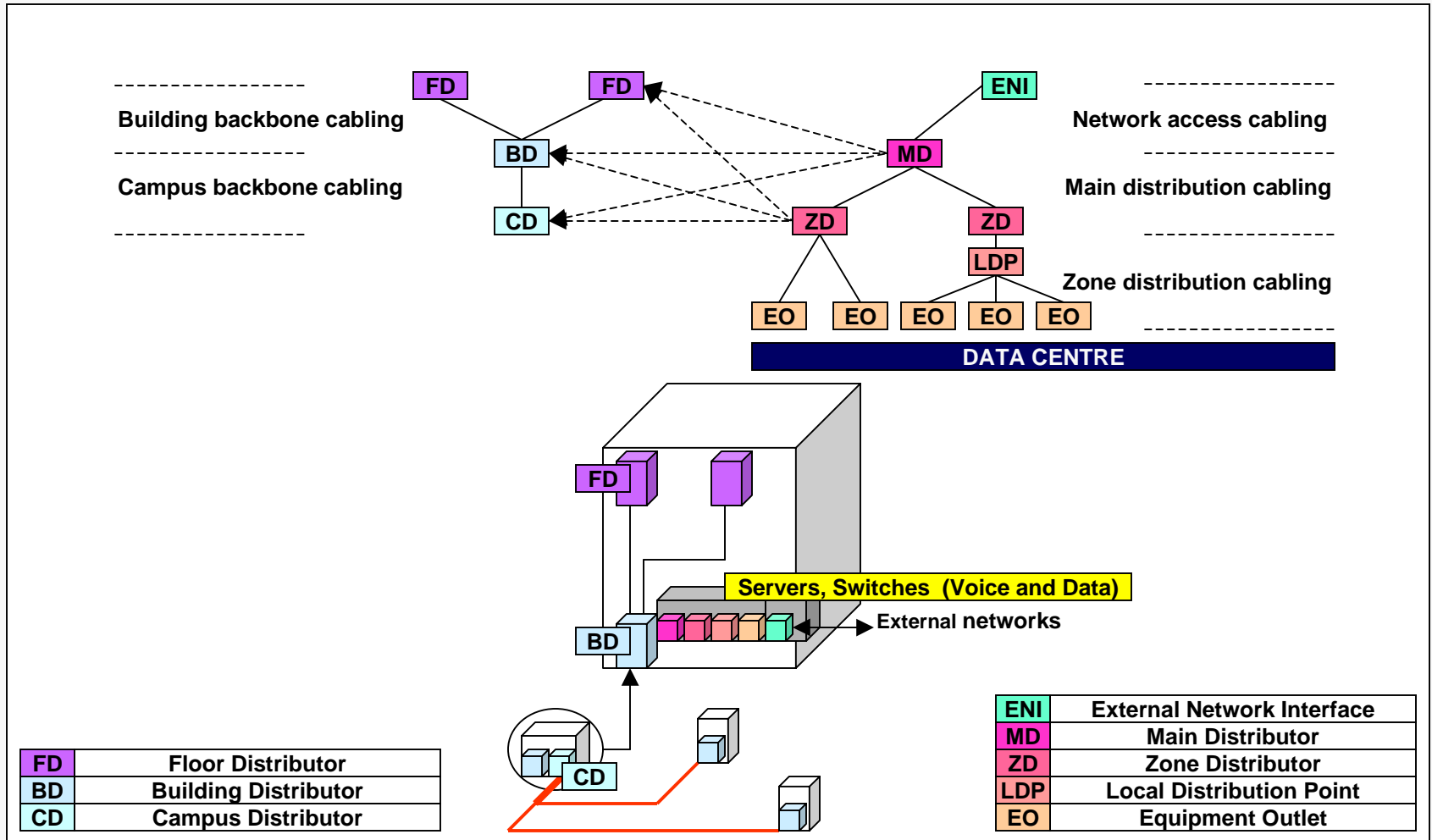
FD	Floor Distributor
BD	Building Distributor
CD	Campus Distributor

CC	Cross-connect Panel
PP	Patch Panel





# Structure



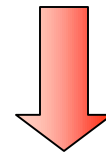


# MICE Environments

<b>EN 50173-3</b>	<b>Information Technology - Generic Cabling Systems - Industrial Premises</b>
<b>ISO/IEC 24702</b>	<b>Information Technology - Generic Cabling for Industrial Premises</b>
<b>TIA/EIA-1005</b>	<b>Telecommunications Infrastructure Standard for Industrial Buildings</b>

Increasing severity

	CLASS		
<b>Mechanical</b>	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>
<b>Ingress</b>	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>
<b>Climatic</b>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>
<b>Electromagnetic (Immunity)</b>	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>



<b>EN 50173-1: 2006</b>	<b>Information Technology - Generic Cabling Systems - General Requirements</b>
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# Components

COMMERCIAL	INDUSTRIAL	RESIDENTIAL	DATA CENTRES
<b>COPPER</b>			
Category 5: 2002			Network access only
Category 6			
Category 7			
		Balanced BCT	
		Coaxial BCT	
TO interface			
IEC 60603-7-X	IEC 60603-7-X	IEC 60603-7-X	EO/ENI interface
IEC 61076-3-104	IEC 60176-3-106-? housing	IEC 61076-3-104	IEC 60603-7-X or 61076-3-104
	IEC 61076-2-101 (2 pair)	IEC 61169-2 (BO only)	
		IEC 61169-24 (BO only)	
<b>OPTICAL FIBRE</b>			
MMF		MMF	
50/125 µm or 62.5/125 µm		50/125 µm or 62.5/125 µm	
Category OM1		Category OM2	
Category OM2		50/125 µm	
50/125 µm		Category OM3	
Category OM3		SMF	
SMF		Category OS1	
Category OS1		Category OS2	
Category OS2		POF/HCS	
POF/HCS		Category OP1	
Category OP1		Category OP2	
Category OP2		Category HCS	
Category HCS		EO interface	
TO interface		2 OF: any IEC SFF	
SC Duplex	???	>2 OF: IEC 61754-7	
		ENI interface	
		2 OF: any IEC SFF	
		APC termination 55dB RL	

# 10GBASE-T



REFERENCE	TITLE
TIA/EIA-568-B-2	Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-pair Cabling
TIA/EIA-568-B-2.10	"Augmented" Category 6
TIA/EIA-TSB-155	Balanced cabling performance ... for 10GBASE-T applications



REFERENCE	TITLE
ISO/IEC 11801 Ed.2 A.1	Information Technology - Generic Cabling for Customer Premises
Amendment 1	New Class E and Class F
TR	Balanced cabling performance ... for 10GBASE-T applications

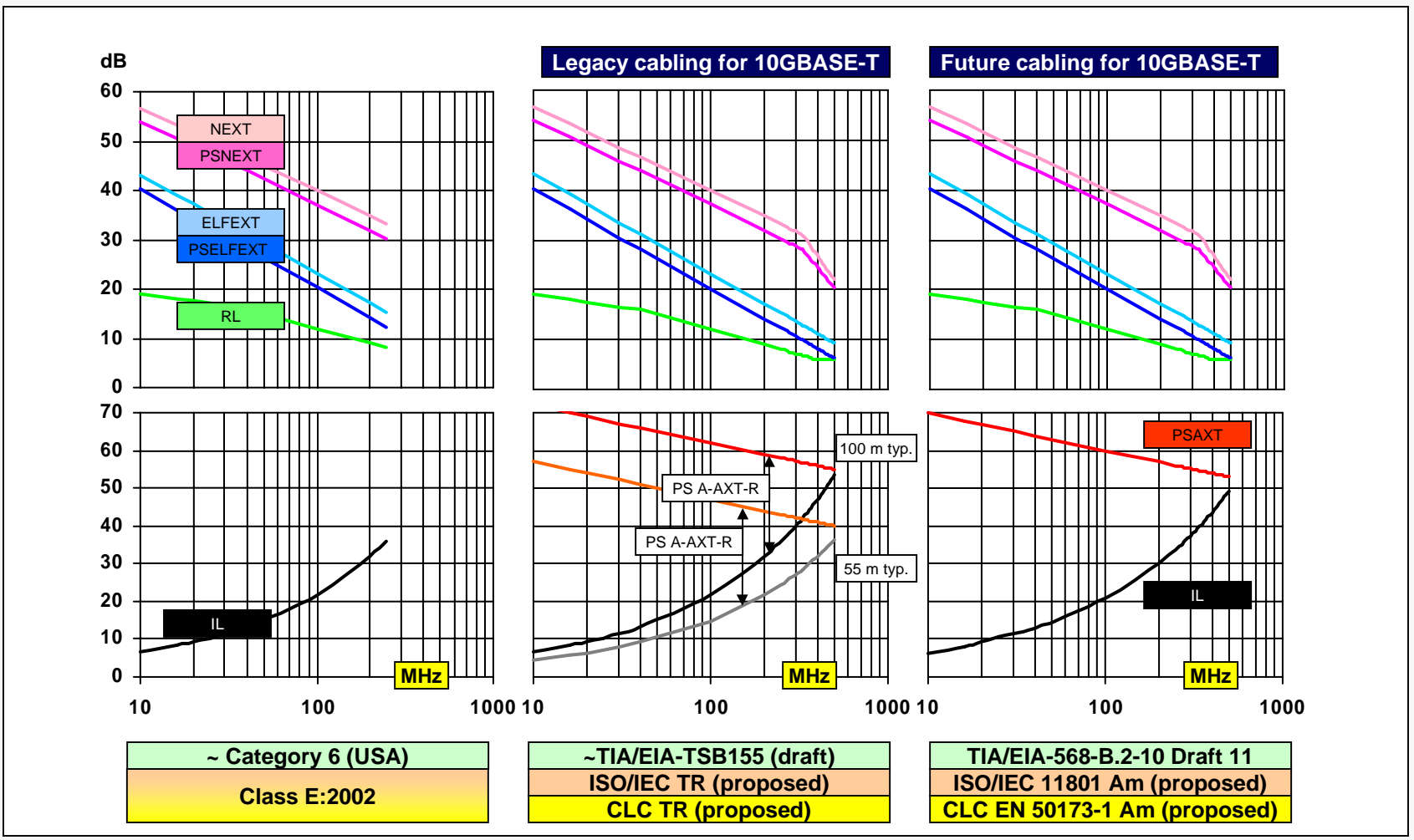


REFERENCE	TITLE
EN 50173-1: 2006	Information Technology - Generic Cabling Systems - General Requirements
Amendment 1	New Class E and Class F
TR	Balanced cabling performance ... for 10GBASE-T applications

# 10GBASE-T: The Objective

<b>TARGET DATE</b>	PUBLISHED STANDARD: JULY 2006
<b>IMPLEMENTATION</b>	100 m CHANNEL, 4 CONNECTIONS
<b>MARKET</b>	DATA CENTRES WITH MIGRATION TO PREMISES DISTRIBUTION
<b>ARGUMENTS</b>	<p>EXTENSION OF CHARACTERISATION FREQUENCY TO BEYOND 250MHz</p> <p>CHANNEL RE-SPECIFICATION</p> <ul style="list-style-type: none"> <li>• Class D (2002) - Category 5e, Class E - Category 6</li> <li>• equipment vendors wishing to support installed base</li> <li>• cabling vendors wishing to focus on new products</li> </ul> <p>SPECIFICATION OF ALIEN XTALK (power sum parameter)</p> <ul style="list-style-type: none"> <li>• key noise source which cannot be cancelled by DSP</li> </ul>
<b>AGREEMENT</b>	<p>PROJECT IEEE 802.3an</p> <ul style="list-style-type: none"> <li>• 500 MHz cabling characterisation</li> <li>• attenuation vs. PSAXT critical to application support</li> </ul>

# The Channel Specification

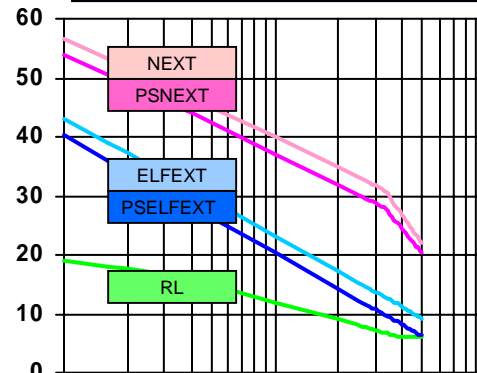


# The Grey Areas

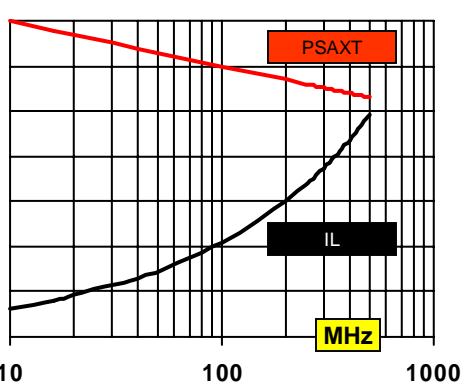
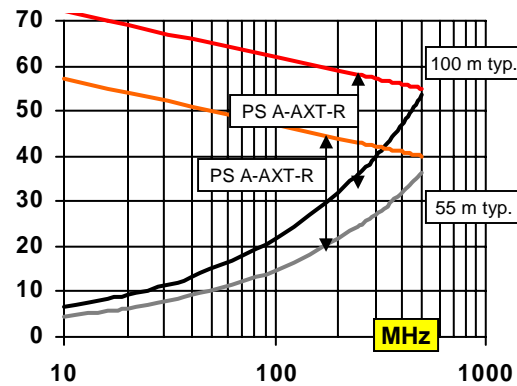
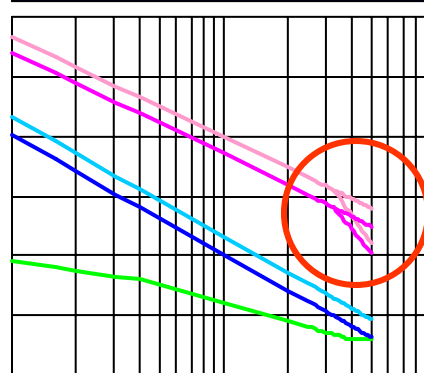
<b>PSAXT</b>
No field measurement
<b>PS-A-AXT-R seems critical</b>
For legacy (unscreened): • mitigation needed > 55m
For legacy (screened) • <u>should</u> improve PSAXT • by 15dB • 100 m channels

<b>FUTURE CABLING</b>
NEXT above 330MHz
Suppliers are divided • maintain legacy relaxation • retain existing formula

Legacy cabling for 10GBASE-T



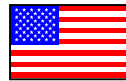
Future cabling for 10GBASE-T



~TIA/EIA-TSB155 (draft)  
ISO/IEC TR (proposed)  
CLC TR (proposed)

TIA/EIA-568-B.2-10 Draft 11  
ISO/IEC 11801 Am (proposed)  
CLC EN 50173-1 Am (proposed)

# ANSI/TIA/EIA Testing Standards



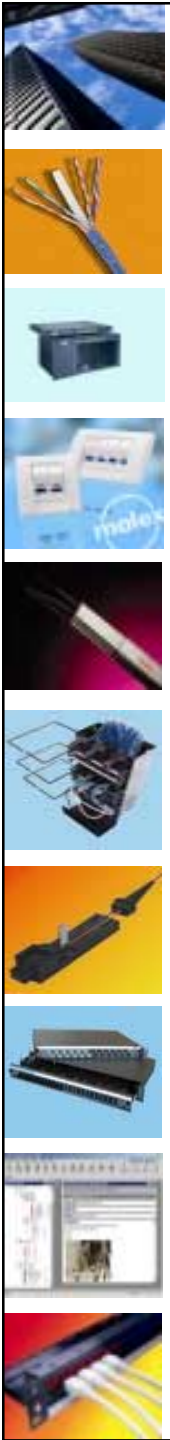
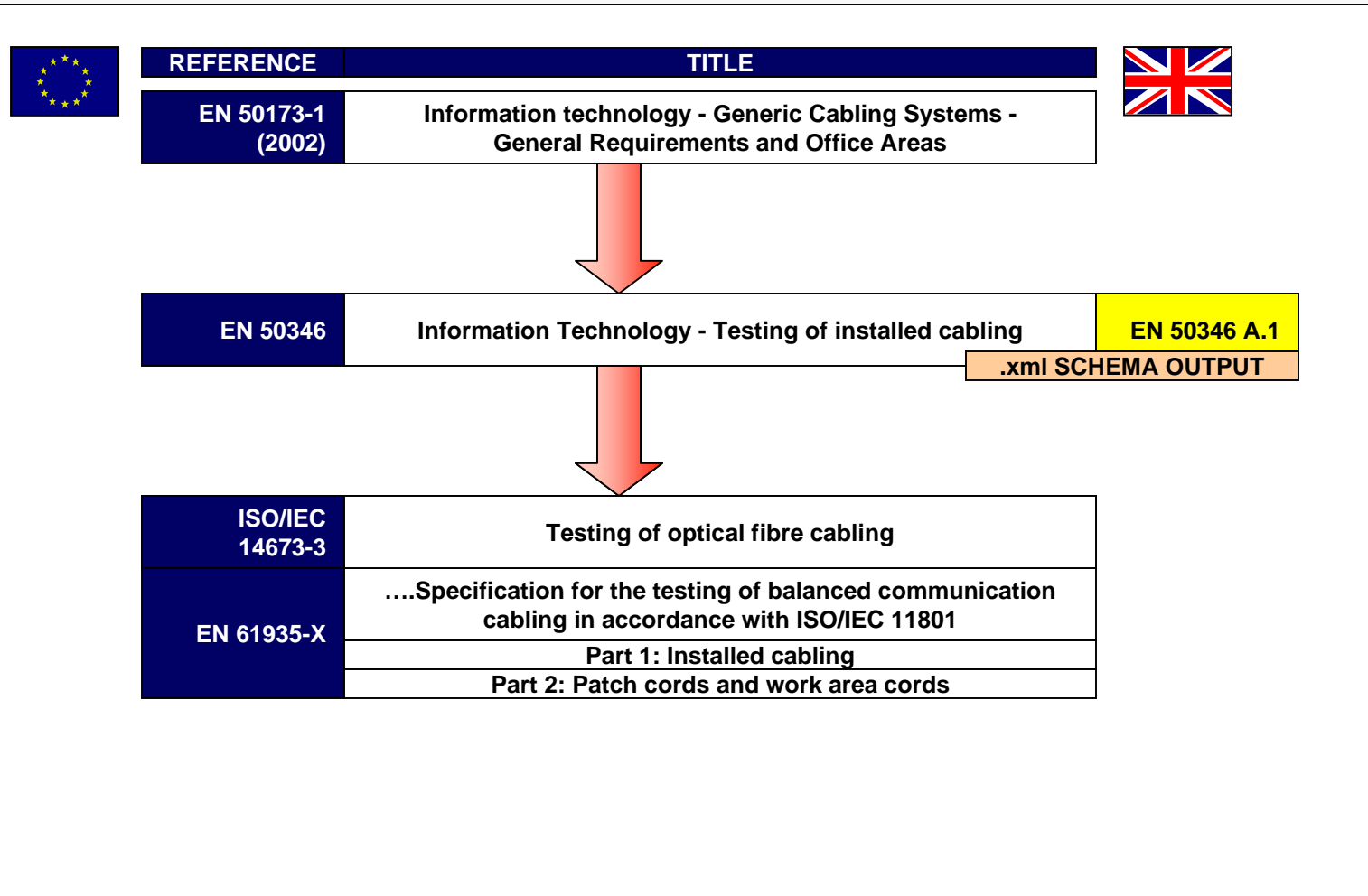
REFERENCE	TITLE
TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-526-7	Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
TIA/EIA-526-14-A	Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant
TIA/EIA-TSB-140	Additional Guidelines for Field- Testing Length, Loss and Polarity of Optical Fiber Cabling Systems

# ISO/IEC Testing Standards



REFERENCE	TITLE	
ISO/IEC 11801 Ed.2 (2002)	Information Technology - Generic Cabling for Customer Premises	
	↓	
IEC 61935-X	....Specification for the testing of balanced communication cabling in accordance with ISO/IEC 11801 Part 1: Installed cabling Part 2: Patch cords and work area cords	
	↓	
ISO/IEC TR3 14763-3	Testing of optical fibre cabling	ISO/IEC 14763-3
	↓	
IEC 61280-4-1	Fibre optic cable plant - Multimode fibre optic cable plant attenuation	
IEC 61280-4-2	Fibre optic cable plant - Single-mode fibre optic cable plant attenuation	

# CENELEC Testing Standards

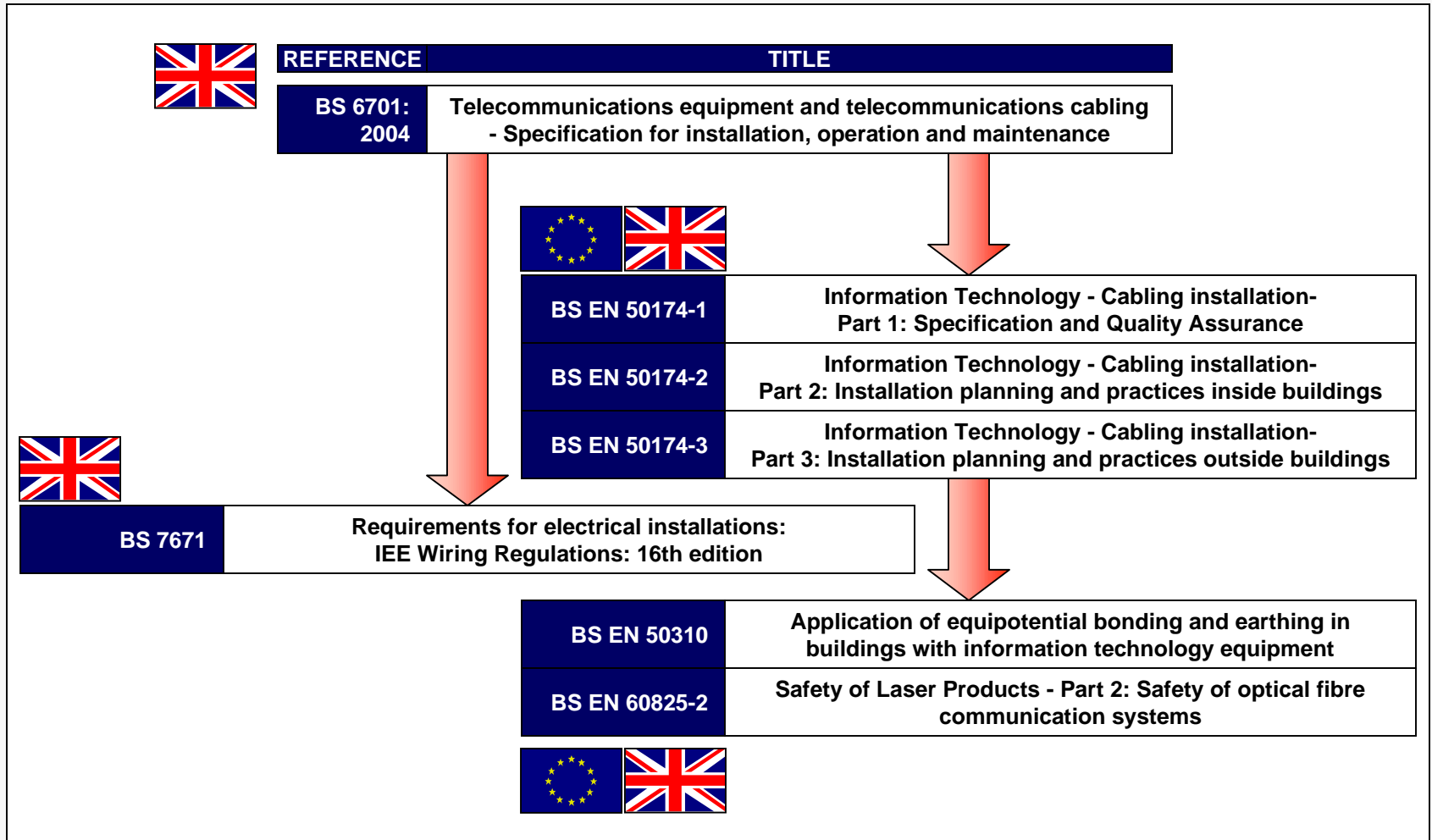


# FIA Testing Standards



INSTALLATION	2000-4-2-1	TESTING OF INSTALLED CABLING: ATTENUATION USING LSPM EQUIPMENT
	2000-4-2-2	TESTING OF INSTALLED CABLING: ATTENUATION USING OTDR EQUIPMENT

# UK Installation Standards



# BS 6701: Requirements and Responsibilities



## IMPLICIT IN ALL CONTRACTS ASSOCIATED WITH BS 7671

	<b>BS 6701:2004</b>	<b>Telecommunications equipment and telecommunications cabling - Specification for installation, operation and maintenance</b>
	<b>Foreword</b> <b>1 Scope</b> <b>2 Normative references</b> <b>3 Terms, definitions and abbreviations</b> <b>4 Requirements for installers of telecommunications equipment and telecommunications cabling</b> <b>5 Requirements for owners of premises housing telecommunications systems</b> <b>Bibliography</b>	

REQUIREMENTS	Clear, unambiguous
	Verifiable
RESPONSIBILITIES	Clear, unambiguous
	Verifiable

<b>INSTALLER</b>	the person/organization undertaking the physical installation of the cabling
<b>OWNERS OF PREMISES</b>	may delegate the responsibilities specified to authorized persons e.g designers, specifiers, operators and maintainers of the telecommunications systems.

# Changes to CENELEC Installation Standards

	REFERENCE	TITLE						
	BS 6701:2004	Information Technology - Cabling installation- Part 1: Specification and Quality Assurance	EN 50174-1 A.1					
	<table border="1"> <tr> <td>DTE Power</td> </tr> <tr> <td>Wireless Access Points</td> </tr> </table>			DTE Power	Wireless Access Points			
DTE Power								
Wireless Access Points								
	BS 6701:2004	Information Technology - Cabling installation- Part 2: Installation planning and practices inside buildings	EN 50174-2 A.1					
		<table border="1"> <tr> <td>Main body</td> </tr> <tr> <td>Annex: Office Areas</td> </tr> <tr> <td>Annex: Industrial Premises</td> </tr> <tr> <td>Annex: Homes</td> </tr> <tr> <td>Annex: Data Centres</td> </tr> </table>	Main body	Annex: Office Areas	Annex: Industrial Premises	Annex: Homes	Annex: Data Centres	
Main body								
Annex: Office Areas								
Annex: Industrial Premises								
Annex: Homes								
Annex: Data Centres								
	BS 6701:2004	Information Technology - Cabling installation- Part 3: Installation planning and practices outside buildings	EN 50174-3 A.1					

## Useful Additional Guides

REFERENCE	TITLE
TIA/EIA-606-A	Administration Standard for Commercial Telecommunications Infrastructure
TIA/EIA-TSB-125	Guidelines for Maintaining Optical Fiber Polarity Through Reverse- Pair Positioning



OPERATION	2000-3-3	POLARITY MAINTENANCE
SAFETY	2000-5-1	OPTICAL POWER: SAFETY LEVELS
	2000-5-2	OPTICAL FIBRE: HANDLING OF PROCESSING CHEMICALS
	2000-5-3	OPTICAL FIBRE: DISPOSAL OF WASTE

# Using the Standards

PROCESS	REFERENCE	
Design	<b>Selection from:</b> <ul style="list-style-type: none"> <li>• ISO/IEC 11801</li> <li>• BS EN 50173-1</li> <li>• ANSI/TIA/EIA-568-B</li> </ul>	
Planning Specification Installation	BS 6701:2004	
Testing	<b>2004</b>	<b>Q4, 2005</b>
	<b>Limits from design standard</b>  <b>Copper: Methods from BS EN 50346</b> <b>Optical fibre: Methods from FIA-TSD</b>	<b>Limits from design standard</b>  <b>Methods from BS EN 50346 A.1</b>
Handover	BS 6701:2004	