

Connecting the World: Specifying Structured Cabling for International Markets

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Agenda

- Global Standards Bodies
- Standards comparison
- Cable constructions
- Fire ratings
- Wallplate choices
- Logistics and Business Challenges

Standards and Codes



What is a Standards Body?

- Primary activities are **developing**, coordinating, revising, amending, issuing, or otherwise producing **technical standards** that address the needs of affected adopters
- Driven by the need for interchangeable parts and interoperability (example: **standardization of screw thread sizes**)
- Made up of **committees and subcommittees** that formulate standards that serve the industry and end user
- Participants include representatives from **manufacturers, service providers, engineers** and **ends users**
- Standards usually formulated through a series of proposed and **voting cycles** - Roberts Rules of Order



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Standards Bodies Authoring Cabling* Standards



* Ethernet standards drive cable criteria

Codes vs. Standards

Codes

- Enforced by law and regulatory powers of the AHJ (Authority Having Jurisdiction)
- Address safety, fire hazards and the minimum quality of construction



Standards

- Ensure a minimum level of system performance
- Essential to a well performing structured cabling system
- Assures interoperability of systems
- Provide consistency of design, installation, and conformance to physical and transmission requirements
- May not be enforced by law (e.g. inspectors)



Code Compliance Agencies

Structured Cabling

- NFPA
- EC
- CSA
- NRC
- UL/ETL



Check your Jurisdiction

- Authority Having Jurisdiction (AHJ)
- Independent Testing Laboratory (ITL)



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Let's take a look at the most current Standards

TIA/ISO/CENLEC Standards



Global Structured Cabling Standards

ANSI/TIA

- **568-D** – Series Standards released 2016-2018
 - ANSI/TIA-568.D-0-Generic Telecommunications Cabling for Customer Premises

ISO/IEC

- 11801 Series Standards released Q4 2017

CENELEC

- **EN 50173** - Performance, Design and Premise Cabling Standards

ANSI/TIA

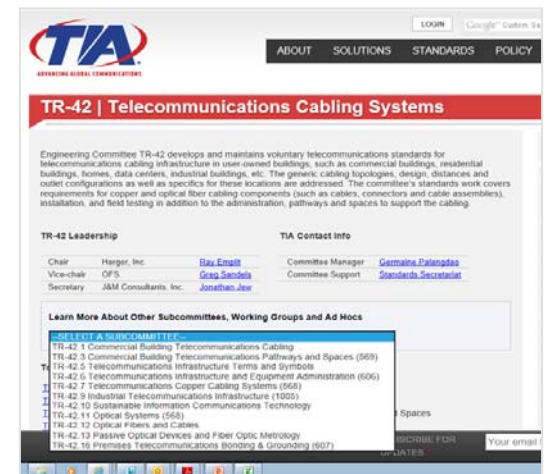


Telecommunications Industry Association

- Primary North American Structured Cabling Standards
- Multiple Technical Committees and Working Groups 42.1, 42.2, 42.3.....
- 568 Series is primary document set
- TR 42 meets 3 times per year

Committee Website:

<http://www.tiaonline.org/all-standards/committees/tr-42>



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TR-42 Committees



Telecommunications Cabling Standards

- 42.1 – Premises Telecommunications Infrastructure
- 42.3 – Telecommunications Administration, Pathways, Spaces, Bonding and Grounding
- 42.5 – Telecommunications Infrastructure Terms and Symbols
- 42.7 – Telecommunications Copper Cabling Systems
- 42.9 – Industrial Telecommunications Infrastructure
- 42.11 – Optical Fiber Systems
- 42.12 – Optical Fibers and Cables
- 42.13 – Passive Optical Devices and Fiber Optic Metrology



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Published Standards — Q2 2018



Common Standards

ANSI/TIA-568.0-D
Generic Premises Cabling

ANSI/TIA-569-D-1
Pathways and Spaces

ANSI/TIA-606-C
Administration

ANSI/TIA-607-C
Grounding and Bonding

ANSI/TIA-758-B
Outside Plant

ANSI/TIA-862-B
Intelligent Building Systems

ANSI/TIA-5017
Security

Premises Standards

ANSI/TIA-568.1-D
Commercial Cabling

ANSI/TIA-570-C
Residential

ANSI/TIA-942-B
Data Center Cabling

ANSI/TIA-1005-A
Industrial Cabling

ANSI/TIA-1179
Healthcare

ANSI/TIA-4966
Education

ANSI/TIA-5018
DAS

Component Standards

ANSI/TIA-568.2-D
Copper Components

ANSI/TIA-568.3-D
Fiber Components

ANSI/TIA-568.4-D
Coaxial Components

ANSI/TIA-1152-A
Field Test Equipment 2GHz

ANSI/TIA-1183-A
Lab Test Equipment



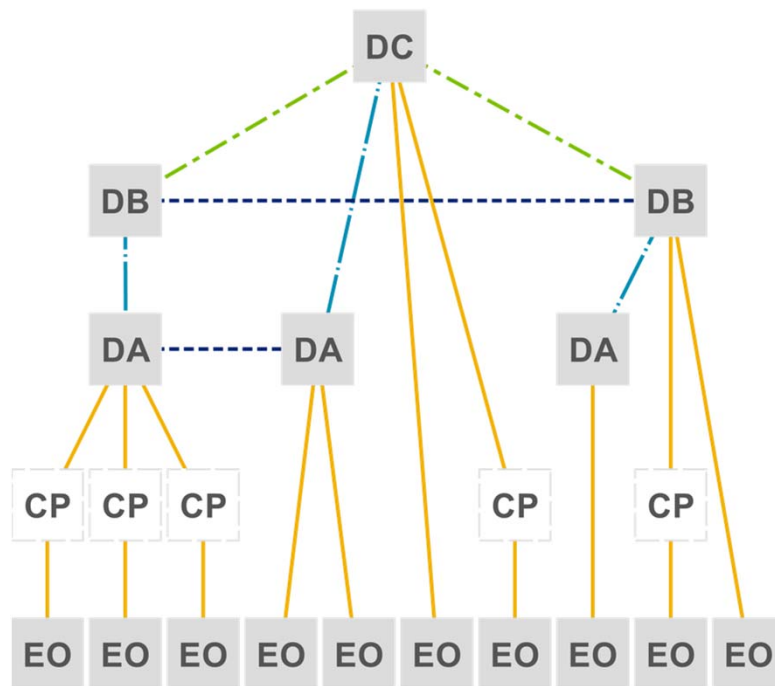
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Topology Model — ANSI/TIA-568.0-D

Generic Topology Structure



LEGEND:

DC	Distributor C		Cabling Subsystem 1
DB	Distributor B		Cabling Subsystem 2
DA	Distributor A		Cabling Subsystem 3
CP	Optional Consolidation Point		Optional Tie Cabling
EO	Equipment Outlet		

- Generic cabling System Structure
- Recognized cabling types
- Minimum and Maximum cabling lengths
- Basic Installation Requirements
- Cabling Transmission Performance and Test Requirements

Copper Performance

ANSI/TIA 568.0-D



Category 5e

- 100Mhz

Category 6

- 250Mhz

Category 6A

- 500Mhz

Category 8*

- 2000Mhz
- *30m channel

TIA Channel Min. Performance	Cat 5e	Cat 6	Cat 6A	Cat 8*
Maximum Defined Frequency	100 MHz	250 MHz	500 MHz	2000 MHz
Insertion Loss (dB)	24.0	35.9	49.3	32.7
NEXT Loss (dB)	30.1	33.1	26.1	9.8
PSNEXT Loss (dB)	27.1	30.2	23.2	7.3
ACRF (dB)	17.4	15.3	9.3	5.9
PSACR (dB)	3.1	15.8	15.8	n/s
PSACRF (dB)	14.4	12.3	6.3	2.9
PSANEXT Loss (dB)	n/s	n/s	49.5	65.5
PSAACRF (dB)	n/s	n/s	23.0	35
Delay Skew (ns)	50.0	50.0	50.0	17

**Cat 8 is 30m 2 connector channel*

Fiber Performance



ANSI/TIA 568.3-D

OM3

- 2000 MHz-Km Bandwidth
- 50 Micron MMF

OM4

- 4700 MHz-Km Bandwidth
- 50 Micron MMF

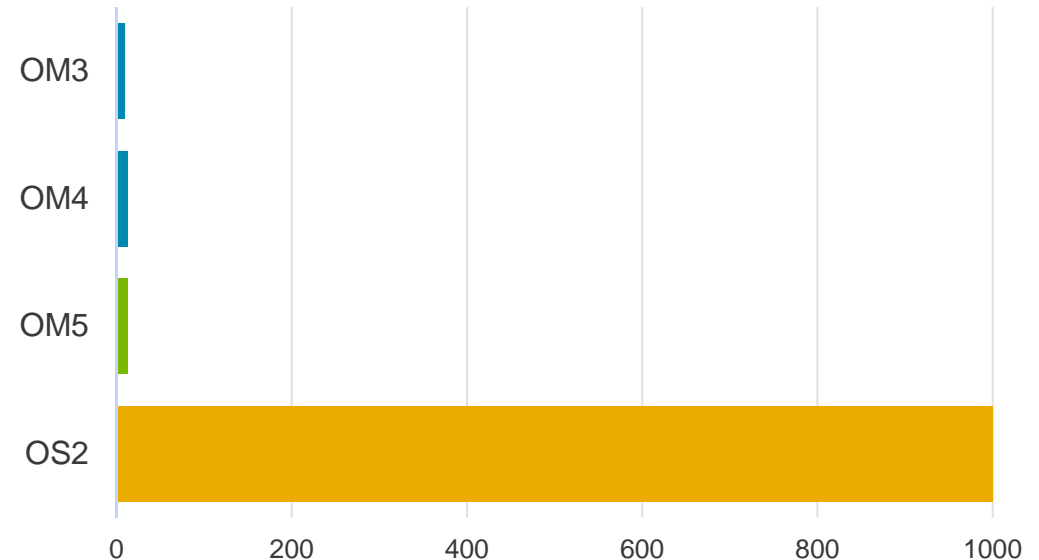
WBMMF-OM5 reference

- Defined in TIA-492AAAE
- 4700/2470 MHz-Km Bandwidth

OS2

- Single-mode

Relative distance
40Gbps SR4/LR4 Technologies



ISO/IEC



- International Organization for Standardization (ISO)
- International Electrotechnical Commission (IEC)
- Headquartered in Geneva Switzerland
- Publish International Structured Cabling Standards
- ISO/IEC Joint Technical Committee 1,
Sub Committee 25, Working Group 3,
All cabling standards
 - ISO/IEC JTC 1/SC 25/WG 3
- ISO/IEC 11801 is Primary SCS Standard

Committee Website:
[ISO/IEC JTC1/SC25 Website](#)



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Cabling Standards



Premises cabling Standards – ISO/IEC-11801 Series

- 11801-1 Part 1: General requirements
- 11801-2 Part 2: Office premises
- 11801-3 Part 3: Industrial premises
- 11801-4 Part 4: Single-tenant homes
- 11801-5 Part 5: Data Centers
- 11801-6 Part 6: Distributed building services

Published Q4 2017



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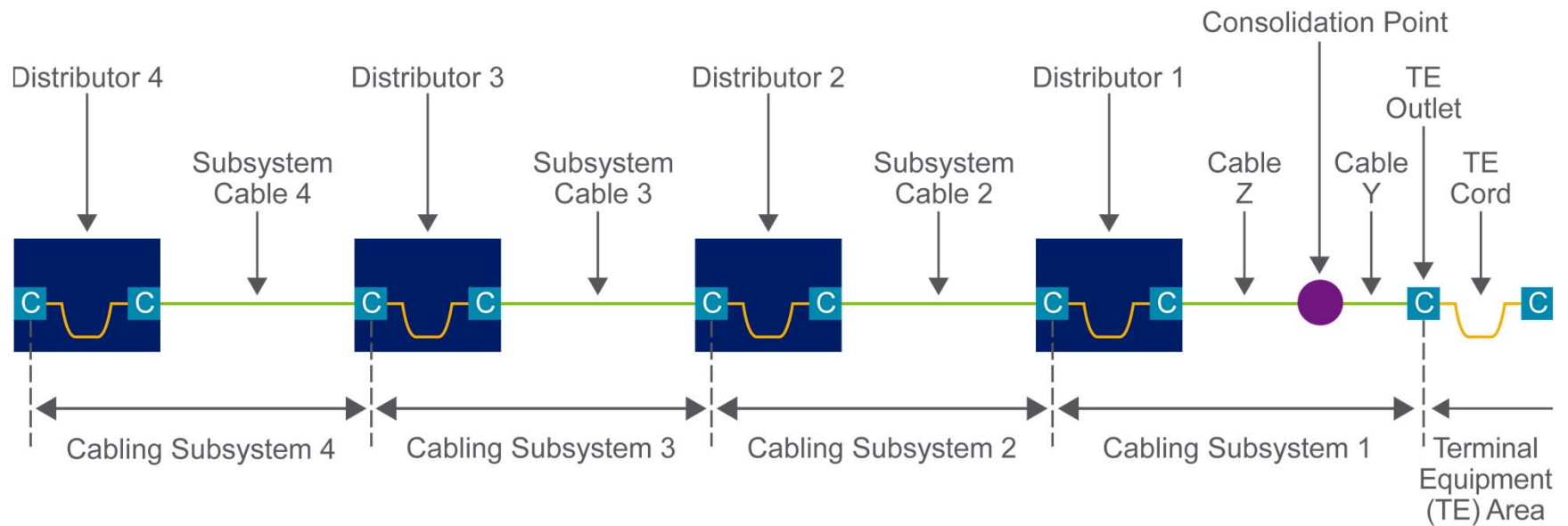
Published Standards Q4 2018

General Design	Technical Reports	Component Standards
ISO/IEC 11801-1 Generic Cabling Systems	ISO/IEC TR 24704 Cabling for WAP's	IEC 60603-7 Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions to 2000 MHz
Premises Standards	ISO/IEC TR 29125:2017 Remote DTE Power (POE)	IEC 60512-99-001 Testing Connectors used in twisted pair cabling with remote power for arcing
ISO/IEC 11801-2 Office Premises Cabling	ISO/IEC TR 11801-9904:2017 2.5G and 5GBASE-T Cabling	IEC 61156 – (1-10)Series Detailed specifications for Twisted Pair cables
ISO/IEC 11801-3 Industrial Cabling	Implementation	IEC 60793 MM Fiber Specifications
ISO/IEC 11801-4 Residential Cabling	ISO/IEC 14763-2 Planning and Implementation	IEC 60874 Fiber Connector Specifications
ISO/IEC 11801-5 Data Center Cabling	ISO/IEC 30129 Grounding and Bonding	Numerous Others!
ISO/IEC 11801-6 Distributed Building Cabling	Testing and Validation	
	ISO/IEC 61935 series Testing Copper Cables	
	ISO/IEC 14763-3 Testing of Optical Fibre	

ISO/IEC Topology Model 11801-1



Generic

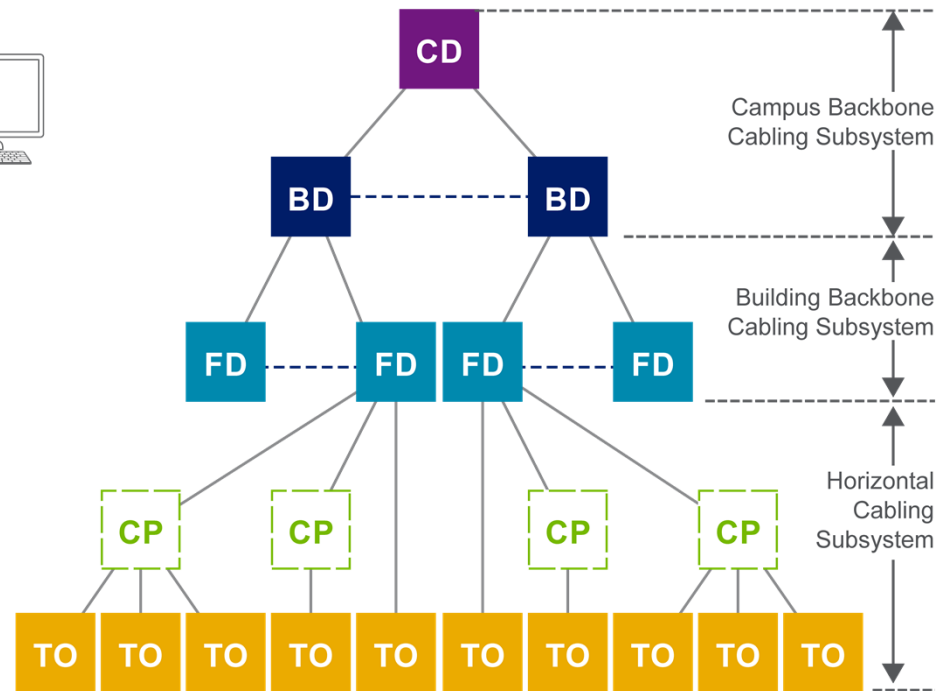
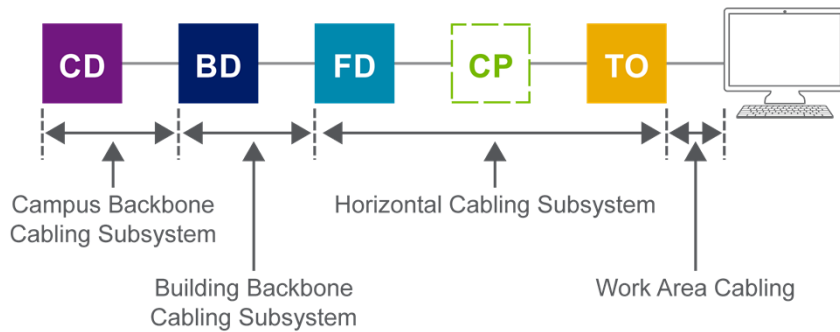


Source: IEC

ISO/IEC Topology Model 11801-2



Office Premises



LEGEND:

- CD Campus Distributor
- BD Building Distributor
- FD Floor Distributor
- CP Connection Point
- TO Telecommunications Outlet
- Optional Cables

Source: IEC

Cabling Standards

ISO/IEC 11801-1 Generic



Balanced Cabling Channel Performance Classes Identified — Generic

Class D: up to 100MHz using category 5e components

Class E: up to 250 MHz using category 6 components

Class EA: up to 500 MHz category 6A components (recommended minimum)

Class F: up to 600 MHz category 7 components

Class FA: up to 1000 MHz category 7A components

Class I up to 2000MHz using category 8.1 components (RJ-45)

Class II up to 2000MHz using category 8.2 components (Non RJ45)

Class **D/Cat 5e** and **Class I/II Cat 8 NOT recognized** for office premises



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Cabling Standards

ISO/IEC 11801-1 Generic



Fiber classes recognized

OM3: Multimode fiber type 50 μm core; minimum modal bandwidth of 2000 MHz*km at 850 nm

OM4: Multimode fiber type 50 μm core; minimum modal bandwidth of 4700 MHz*km at 850 nm

OM5: Multimode fiber identified as applicable for Short Wave Division Multiplexing

OS1a: Indoor Singlemode fiber specification 1.0db/km attenuation

OS2: Outdoor Singlemode fiber specification .4db/km attenuation

- OS2 fiber is manufactured in accordance with ITU-T G.652D, and IEC B1.3 SM fiber standards to reduce or eliminate water absorption loss in the 1383 spectral region, (the water peak)



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IEC 14763 Standards



Implementation and Operation of Premises Cabling

ISO/IEC 14763-2, Information Technology – Implementation and Operation of customer premises cabling – Part 2 Planning and Installation

- Specifies requirements for the planning, installation and operation of cabling and cabling infrastructures (including cabling, pathways, spaces, earthing and bonding)

ISO/IEC 14763-3, Information Technology – Implementation and Operation of customer premises cabling – Part 3 Testing of Optical Fibre cabling

- Specifies systems and methods for the inspection and testing of installed optical fibre cabling designed in accordance with premises cabling standards



IEC Component Standards

Examples, many others available

Standard No.	Name	Description	Status
60603-7-4	Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz	Cat 6 RJ 45 connectors	Published April 2010
60603-7-41	Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz	Cat 6A RJ 45 connectors	Published Mar 2010
60603-7-81	Detail specification for 8-way, unshielded, free and fixed connectors, for data transmissions with frequencies up to 2000 MHz	Cat 8 RJ 45 connectors	Published Dec 2015, Updated 2017
61156-5	Multicore and symmetrical pair/quad cables for digital communications - Part 5: Symmetrical pair/quad cables with transmission characteristics up to 1000 MHz - Horizontal floor wiring	Cat 5e, 6, 6A, 7 and 7A LAN cable	Published Feb 2009, updated 2012
61935-2	Specification for the testing of balanced and coaxial information technology cabling - Part 2: Cords as specified in ISO/IEC 11801 and related standards	Cat 5e, 6, 6A, 7 and 7A Patch cords	Published July 2010

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CENELEC



- **CENELEC** is the European Committee for Electrotechnical Standardization
- **CLC/TC 215 Committee** -Electrotechnical aspects of telecommunication equipment responsible for structured cabling standards
- **EN 50173** and **EN 50174** series are primary documents
- Normalized to but enhanced versions of **ISO 11801** document



Committee Website:
[CENELEC CLC/TC 215 Committee Website](http://www.cenelec.eu/CLC/TC215)

Published Standards

Performance and Design

EN 50173-1
Generic Cabling Requirements

EN 50310:2016
Grounding and Bonding

EN 50667:2016
AIM Management Systems

EN 50174-99-1
Remote Powering (POE)

Component Standards

Follow IEC Standards

Premises Standards

EN50173-2
Commercial Office Premises

EN 50173-3
Industrial Cabling

EN 50173-4
Cabling for Homes

EN 50173-5
Data Center Cabling

EN 50173-6
Distributed Building Systems

Implementation

EN 50174-1
Installation and QA

EN 50174-2
Cabling Installation Inside Plant

EN 50174-3
Cabling Installation Outside Plant

Testing and Validation

EN 50346:2002/A2:2009
Testing of installed cabling

EU Member States adopt these standards, insert appropriate prefix to indicate country
i.e.: **BS** EN 50173-1, **FR** EN 50174-2...



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TIA VS. ISO Differentiators



TIA vs. ISO Differentiator

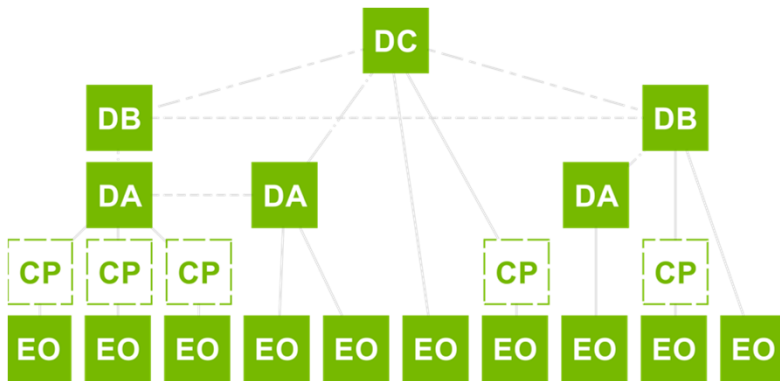
Topology Nomenclature Generic

TIA 568.0-D

Distributor A/B/C

EO - Equipment outlet

CP - Consolidation Point

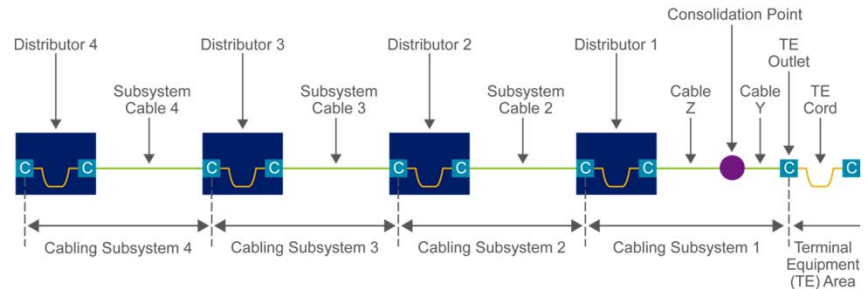


ISO 11801-1

Distributor 1/2/3/4

TE Outlet- Terminal Equipment Outlet

CP - Consolidation Point

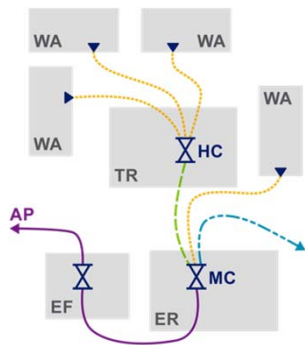


TIA vs. ISO Differentiator — Topology

Nomenclature Commercial Premises

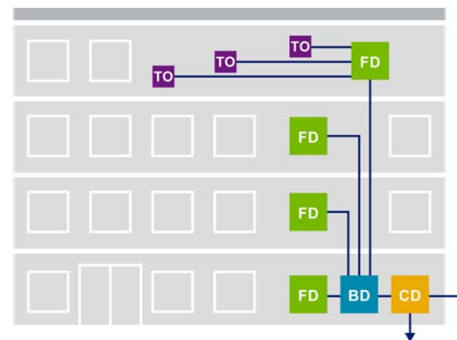
TIA 568.1-D

- Main Cross Connect (MC)
- Intermediate Cross Connect (IC)
- Horizontal Cross Connect (HC)
- Telecommunications Outlet (TO)



ISO 11801-2

- Campus Distributor (CD)
- Building Distributor (BD)
- Floor Distributor (FD)
- Telecommunications Outlet (TO)



TIA vs. ISO Differentiator

Channel Definitions Category/Class

TIA 568.0-D

- Components and channels are **both** categories

ISO 11801 – EN 50173-1

- Components are **categories**
- Channels are **classes**

Max Frequency	TIA Components	TIA Channel	ISO Component	ISO Channel
100 MHz	Category 5e	Category 5e	Category 5e	Class D
250 MHz	Category 6	Category 6	Category 6	Class E
500 MHz	Category 6A	Category 6A	Category 6A	Class EA
600 MHz	n/a	n/a	Category 7	Class F
1000 MHz	n/a	n/a	Category 7A	Class FA
2000 MHz	Category 8	Category 8	Category 8.1	Class I
2000 MHz	n/a	n/a	Category 8.2	Class II

TIA vs. ISO Differentiator

IEEE Base-T Requirements

- No IEEE Ethernet applications for Category 7/7A – 25/40GBase-T requires Category 8

Frequency	Distance	TIA	ISO	Equipment Interface	IEEE 802.3
16 MHz	100 m	Cat 3	Class C	RJ45	10BASE-T
100 MHz	100 m	Cat 5	Class C	RJ45	Up to 100BASE-T
100 MHz	100 m	Category 5e	Class D	RJ45	Up to 1000BASE-T
250 MHz	100 m	Category 6	Class E	RJ45	Up to 1000BASE-T
500 MHz	100 m	Category 6A	Class Ea	RJ45	Up to 10GBASE-T
600 MHz	100 m	Not Recognized	Cat 7/Class F	None	Up to 10GBASE-T
1 GHz	100 m	Not Recognized	Cat 7A/Class FA	None	Up to 10GBASE-T
2 GHz	30 m	Cat 8	Cat 8.1/Class I	RJ45	25/40GBASE-T
2 GHz	n/a	n/a	Cat 8.2/Class II	Non RJ45	25/40GBASE-T

Cat 5e and Cat 6 Performance Benchmarks

Effectively the Same

- ISO and TIA performance requirements are nearly identical for Cat 5e and Cat 6
- Shown limits are at 100MHz for comparison



Channel Parameter	TIA Cat 5e (ISO Class D) Channel (dB)	TIA Cat 6 (ISO Class E) Channel (dB)
Insertion Loss	24	21.3 (21.7)
Return Loss	10	12
NEXT	30.1	39.9
PSNEXT	27.1	37.1
ACRF (ELFEXT)	17.4	23.3
PSACRF (PSELFEXT)	14.4	20.3

Key Differentiator

Component Specs 6A NEXT @500MHZ



Connecting Hardware Parameter	TIA Cat 6A Component (dB)	ISO Cat 6A Component (dB)
Insertion Loss	.45	.45
Return Loss	14	14
NEXT	34	37
FEXT	29.1	29.1
TCL/TCTL	14	14
PSANEXT	56.5	56.5
PSAACRF (PSAELFEXT)	53	53



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Key Differentiator

Crosstalk Channel Specs for Cat 6A



Channel Parameter	TIA Cat 6A Channel (dB)	ISO Class E _A Channel (dB)
Insertion Loss	49.3	49.3
Return Loss	6	8
NEXT	26.1	27.9
PSNEXT	23.2	24.8
ACRF (ELFEXT)	9.3	11.5
PSACRF (PSELFEXT)	6.3	8.5
PSANEXT	49.5	49.5
PSAACRF (PSAELFEXT)	23	23



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Bundle Size Guidance

What do the standards say about bundling?

ANSI/TIA-184-A

Detailed analysis, data, and charts regarding temperature rise in cable bundles

Testing used bundle size of **100** cables, empirical data on other bundle sizes provided

Comparison of heat dissipation of different cable categories provided

Mention of better heat dissipation with cables that have metallic elements (shields, isolation wraps)

No hard recommendation of maximum bundle size

Guidance on methods to reduce heat generation and minimize heat build up listed

ISO/IEC 29125

Detailed analysis, data, and charts regarding temperature rise in cable bundles

Testing used bundle size of **37** cables, empirical data on other bundle sizes provided

Comparison of heat dissipation of different cable categories provided

Mention of better heat dissipation with cables that have metallic elements (shields, isolation wraps)

Maximum bundle size of 24 cables given

Guidance on methods to reduce heat generation and minimize heat build up listed



Cable Choices for International Markets

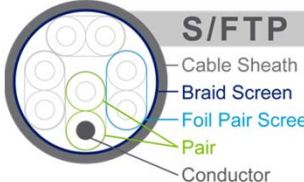
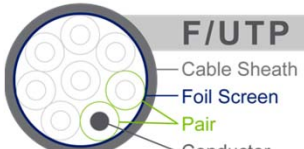
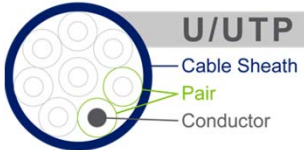


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Understanding Cable Constructions



ACRONYM: **XX / Y ZZ**

ELEMENT
 U = Unscreened
 F = Foil Screened

OVERALL CONSTRUCTION
 U = Unscreened
 F = Foil Screened
 S = Braid Screened
 SF = Braid and Foil Screened

PAIR OR QUAD
 TP = Twisted Pair
 TQ = Twisted Quad

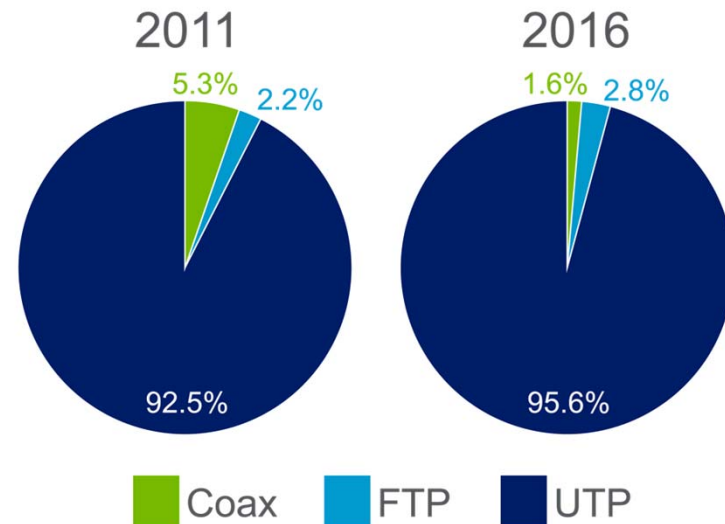
EXAMPLES:	
U/UTP	Overall unscreened cable with unscreened twisted pairs (often referred to as UTP)
F/UTP	Overall screened cable with unscreened twisted pairs (often referred to as FTP)
U/FTP	Overall unscreened cable with individual foil screened twisted pairs (often referred to as PIMF)
S/FTP	Overall braid screened cable with individual foil screened twisted pairs (often referred to as STP)
SF/UTP	Overall braid and foil screened cable with unscreened twisted pairs

U/UTP Dominance in the Market

U/UTP still the dominant choice in global markets

- U/UTP estimated at 95% of total LAN cabling installed
- Shielded LAN cable estimated to grow at a faster pace than U/UTP but still less than 5% of market in the short term (1-2 yrs)
- Acceptance of Category 8 for 25/40GBase-T and 100W POE in future years may drive greater acceptance for Shielded LAN cabling
- Much greater historical market preference for shielded solutions in EU/UK (UK, Germany, France, Switzerland, and Austria)

Copper cable by type trends



Source: FTM Consulting, Inc.

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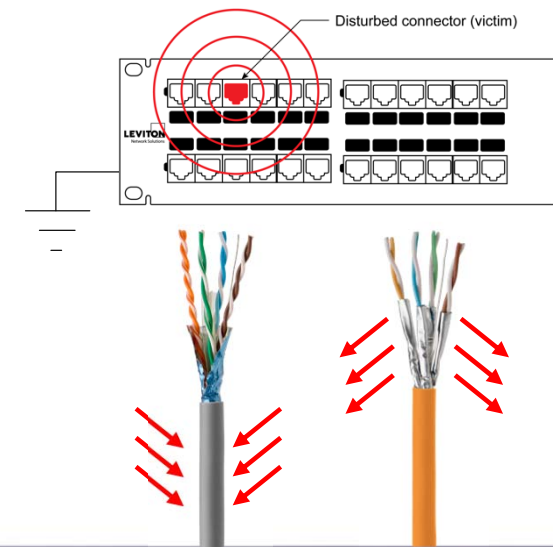
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What does Shielding do?

Why shield your structured cabling system?

- Reduce Alien Crosstalk (ANEXT)- the introduction of an overall shield (F/UTP) around the 4 balanced pairs will improve ANEXT by approximately 20dB as compared to U/UTP
- Reduce susceptibility to EMI/RFI ingress interference
- Reduce EMI/RFI egress from structured cable into surrounding environment
- Reduced diameter of Cat 6a cable as compared to U/UTP construction that introduce larger cable size to control ANEXT
- Better heat dissipation than U/UTP cables



Where to Shield?

Where to shield your structured cabling system?

- In order to meet market preference in countries such as UK, Germany, France, Switzerland, and Austria where shielded cabling solutions have market dominance
- High noise environments where sources of EMI/RFI interference may be common
 - Radiology department at hospital, industrial locations, testing laboratories, broadcast/recording studios
- Military applications where shielded cable is one method of achieving TEMPEST compliance
- Cabling installed in close proximity to high voltage transformers
 - Elevator machine rooms, transportation tunnels, moveable cranes...



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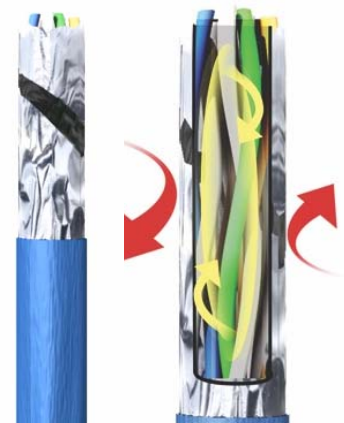
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Isolation wrap UTP construction

An alternative to F/UTP shielded cable

NEW CAT 6A UTP recognized Cable

- Better heat dissipation for POE+ than U/UTP
- Uses metallic Isolation Wrap construction- “discontinuous shield”
- 20% smaller than typical CAT 6A UTP cables
- Exceptional Alien Crosstalk performance compared to U/UTP cables
- Reduces installation complexity, time and cost compared to shielded solutions, no extra grounding or testing
- Better heat dissipation than standard UTP cables



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Cable Fire Ratings

USA Fire, Smoke, and Toxicity Ratings

NFPA-70, the National Electrical Code (NEC)

CMP/OFNP (PLENUM):

- Suitable for use in ducts, plenums, and other spaces used for environmental air

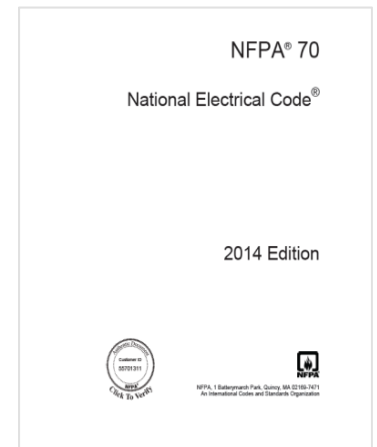
CMR/OFNR (RISER):

- Suitable for use in a vertical run from floor to floor and have fire-resistant characteristics capable of preventing the carrying of fire from floor to floor

CMG/CM (GENERAL PURPOSE):

- Suitable for general-purpose communications use, with the exception of risers and plenums

US Municipalities adopt the NEC, may not all be at same revision



Article 800

Canadian Fire, Smoke, and Toxicity Ratings

National Building Code of Canada(NBC)

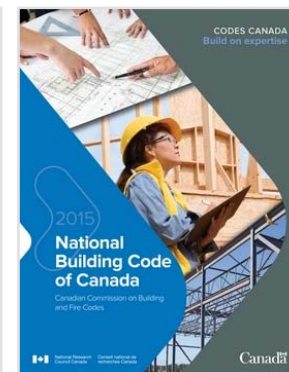
National Fire Code of Canada (NFC)

FT6 (PLENUM): Equivalent to US CMP

- Suitable for use in ducts, plenums, and other spaces used for environmental air

FT4 (General Purpose):

- Suitable for general-purpose communications use
- Most manufacturers submit CMR rated cable for this purpose, CMR exceeds requirements for FT4



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Global Fire, Smoke and Toxicity Ratings – LSZH

Known as Low Smoke Zero Halogen (LSZH, LSOH, HFFR-LS)

Different emphasis than North American codes

- More focused on outgassing of smoke and toxins
- Less stringent flame spreading parameters

3 separate tests for communications cables

- Flame retardancy (IEC 60332)* Multiple variants
- Halogen content (IEC 60754)
- Smoke emission (IEC 61034)

Typically required in **MEA**, **APAC** and certain **LATAM** countries



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Multiple LSZH ratings for fire retardancy

IEC 60332-2-2 Single vertical cable test (LSZH-1)

- Most LSZH cables are rated to this test
- Equivalent to UL VW-1 test

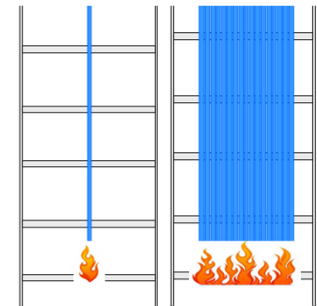
IEC 60332-3-25 Bundled vertical cable test (LSZH-3)

- More stringent testing of bundled cables
- Requires additional flame-retardant doping, more expensive to produce

Other IEC burn tests defined (IEC 60332-3-21,22,23,24)

- May be required by certain local codes

LSZH and CMP are not interchangeable!



EU Fire, Smoke and Toxicity Ratings- CPR

Construction Products Regulation (CPR)

Effective July 2017

- EU law – Compulsory for fixed cable products within buildings
- Member countries responsible for implementing the law
- Defines multiple levels of Fire, Smoke, Toxicity Levels
- Each individual Member State defines the level appropriate for facilities within their Country, not consistent!
- Required level determined by building type, occupancy, safety risks,...
- Compliant products must carry CE mark and appropriate public certification documentation



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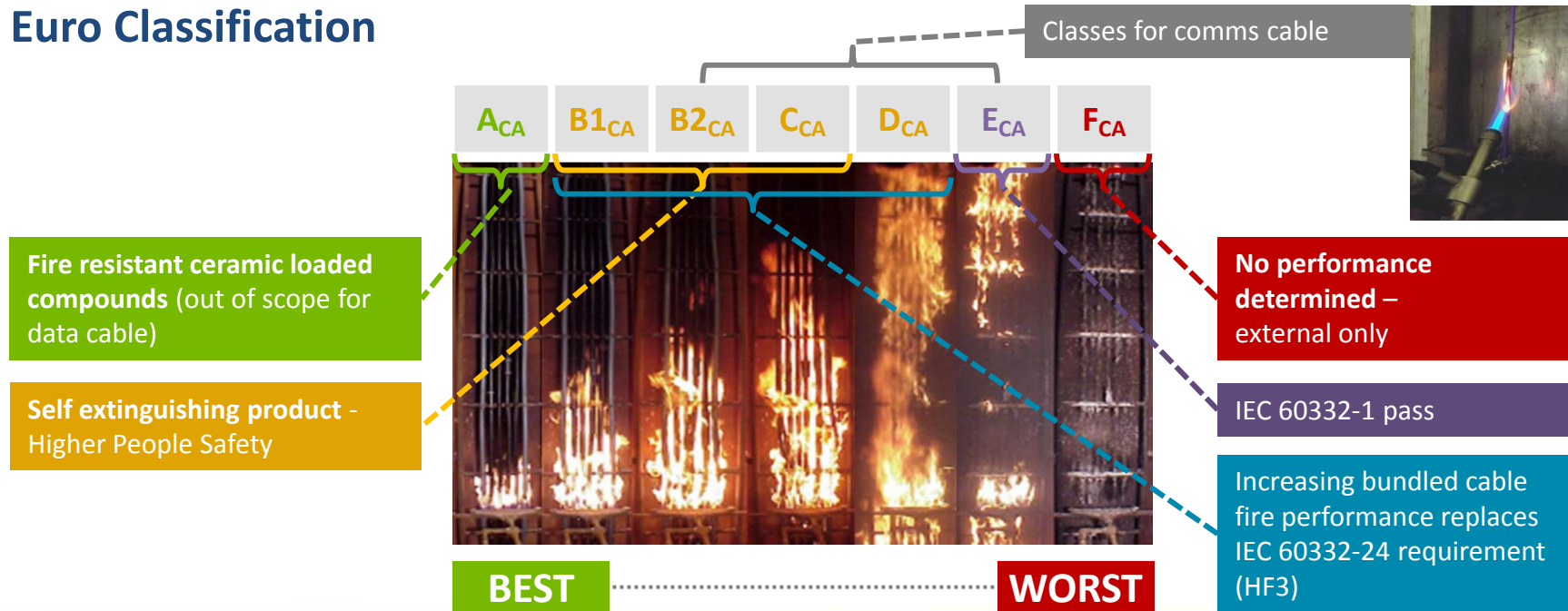
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CPR- Safety in case of fire

How is performance identified?

Euro Classification



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Intended Areas of Use for CPR Classifications

CPR tests each of these factors and enforces a hierarchical system of performance and suggested application.

Euroclass Level	Descriptions	Example Environments
B_{ca}	Very High Fire Protection Self Extinguishing	Hospital ward areas, children's nurseries, above fire exits, escape routes in public buildings, airports, metro, train stations
C_{ca}	High Fire Protection Self Extinguishing	Hospitals, commercial buildings, leisure facilities, hotels, schools, administration and office buildings
D_{ca}	Moderate Fire Protection Limited Emissions	Used as a basic minimum for general installs in some regions.
E_{ca}	Basic Fire Protection	Used as a basic minimum for general installs in some regions.

BEST

Minimum

CPR Compliance

- **CPR requires** that all cables marketed in European Economic Area (EEA) carry a **CE mark** and have a **declaration of performance** (DOP)
- The CE mark indicates the **specific fire performance level** that the cable has been verified to provide
- **Starting 1 July 2017**, manufacturers cannot supply cables unless they have been tested, certified, and marked in accordance with the CPR standards
- **Each country** determines the application of the Law
- **Significant variability in application**
 - Which class do I need to use?



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Faceplate Choices for International Markets

Outlet Box Footprint

Outlet box dimensions and faceplate choices vary by country, must be properly specified

- **USA NEMA** 4" x 1 ¼" (100mm x 28.5mm) single gang box is used globally but not ubiquitous
- **UK box** is 75mm x 75mm with 60mm screw distance, 83mm square faceplate
- Certain **LATAM** countries and **Italy** will orient USA boxes in **landscape** fashion



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Faceplate Compatibility

- **Standard US faceplates** will fit NEMA outlet boxes regardless of region deployed
- Install **landscape faceplates** or install US faceplates sideways in box for LATAM/Italy region
- **UK style faceplates** fit UK outlet box with 60mm screw holes



Outlet Accessories

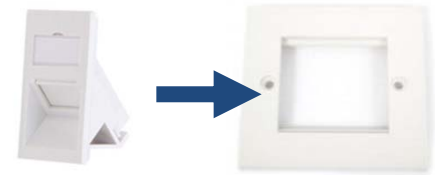
Accessories to support multitude of applications



Faceplate Compatibility

3rd Party Adapter plates

LI150 adapters are **50mm x 25mm** and fit 3rd party wallplates with 50mm x 50mm EU openings



LI145 adapters are **45mm x 22.5mm** and fit 3rd party wallplates with 45mm x 45mm French openings



LJ6C adapters are **37m x 22mm** and fit 3rd party LJ6C wallplates



Regional Business Challenges and Logistics



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Regional Business Challenges and Logistics

Language Differences

- Is your ability to communicate specifications , concepts and applications hindered by language barriers?
- What is the common technical language used? Strand/Fibre/Core as an example
- Is an interpreter needed
- Document translations, proper dialect, can be expensive

Time Zones / Calendar Issues

- Need to conduct project conference calls on a 24hr open clock
- Holidays are regional, need to be cognizant when scheduling meetings
- Monday-Friday business is not always the norm, Sun-Thurs in Middle East



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Regional Business Challenges and Logistics

Tariff / Duty / Excise Taxes / Freight / Customs

- Protective Tariffs/duties need to be calculated if presenting a budget proposal
- Customs issues and delays can hinder productivity
- Are there in country VAT taxes to be considered?
- Need to calculate freight costs into budgets

Cultural / Social Differences

- Pace of business and decision making varies
- Stakeholder roles may be different – Distributors, Integrators, Consultant, VAR...
- How is product purchased and delivered in the sales channel? Multiple sources?
- Who's Who?

Regional Business Challenges and Logistics

Code Enforcement / Standards Compliance

- Adherence to specifications, codes and standards varies
- Should you specify fire rated cables regardless of a lack of code requirement?
- Which standard to reference in a specific region
 - TIA /ISO/CENELEC?
 - Don't mix references

Warranty

- Does the manufacturer offer a warranty in all regions?
- How are claims handled?
- “Feet on the Street” support

Regional Business Challenges and Logistics

Certified Contractors

- Are there sufficient Manufacturer Certified Contractors to perform the work?
- Is the experience level appropriate for the type and size of project?

Product availability

- Is there a viable distribution network in country?
- Multiple distribution sources?
- Local inventory for Day 2 move and change work?

Connecting the World: Specifying Structured Cabling for International Markets

Peter Helfrich RCDD/DCDC Leviton Network Solutions
Specification Engineer International



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