

Optical Fibre: In-house or Subcontract?



AGENDA

Introduction

Standards and Support

Cabling Installation

Cables and Connections

Safety Issues

Polarity and Contamination

Installation Options



The Fibreoptic Industry Association

Mike Gilmore



Mike Gilmore

Senior Partner,
The Cabling Partnership

Managing Director
e-Ready Building

Standards Activities



Member:

ISO/IEC JTC1 SC25 WG3: Generic Cabling

ISO/IEC JTC1 SC25 Project Team: SOHO

Convenor:

ISO/IEC JTC1 SC25 WG3 IPTG: Industrial Premises Cabling



Convenor: CENELEC TC215 WG1: IT Cabling

Convenor: CENELEC TC215 WG1 PT Industrial Premises Cabling

Secretary: CENELEC TC215 WG1 PT Data Centre Cabling



Chairman:

BSI TCT7/-/1: IT Cabling

BSI TCT7/-/3: IT Cabling Support Group

**Technical and Standards Director:
Fibreoptic Industry Association**

e-mail: mike.gilmore@btinternet.com

Mobile: +44 (0) 7860 110563

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Agenda

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Planning/Installation Standards: 2002

| | | |
|-----------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------|
|  | BS EN 50174-1 | Information technology - Cabling installation- Part 1: Specification and Quality Assurance |
|  | BS EN 50174-2 | Information technology - Cabling installation- Part 2: Installation planning and practices inside buildings |

| | | |
|------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------|
|  | BS 6701 | Code of Practice for the installation of apparatus intended for connection to certain telecommunications systems |
|  | BS 7718 | Code of Practice for the installation of fibre optic cabling |

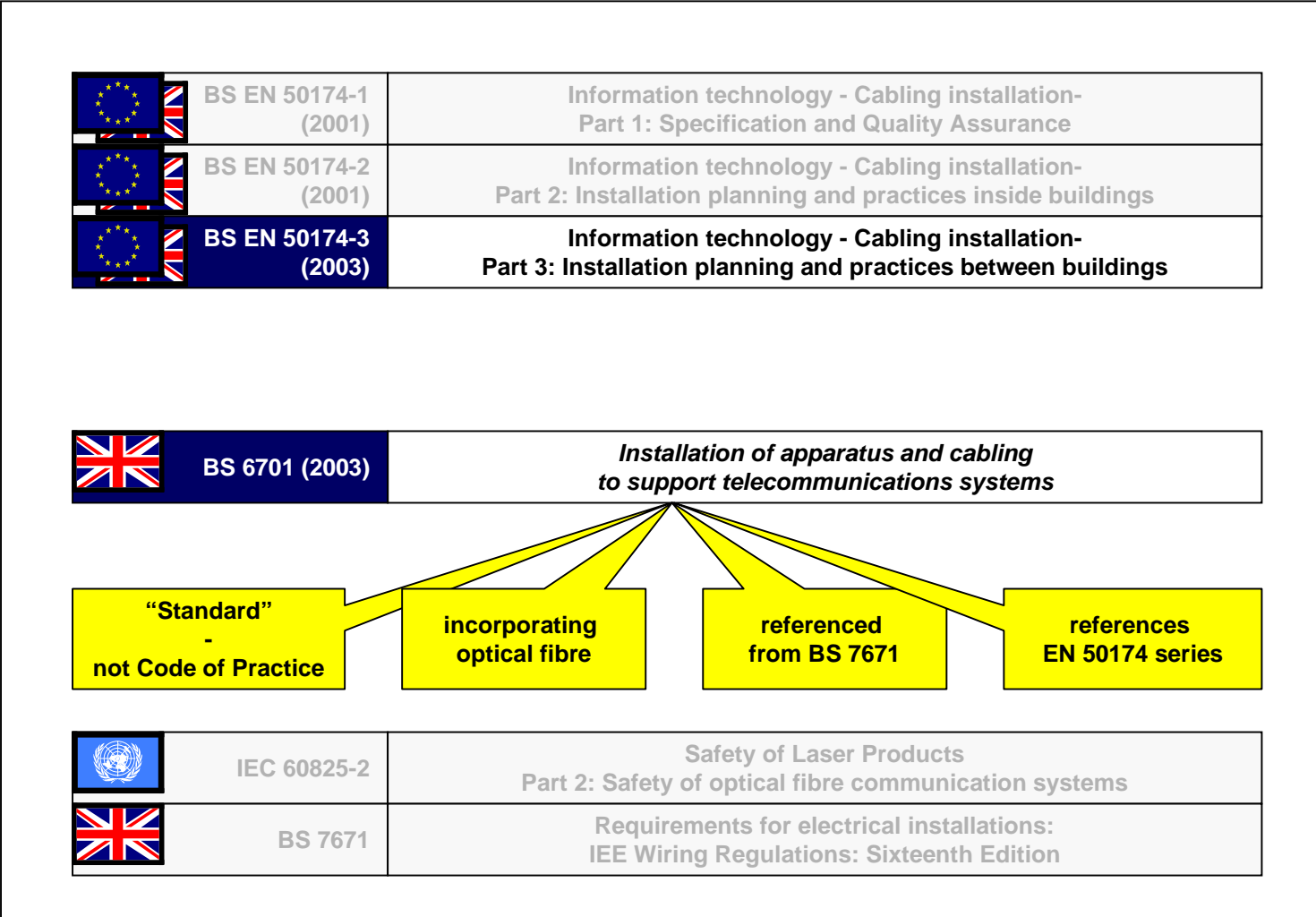
| | | |
|-------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------|
|  | IEC 60825-2 | Safety of Laser Products Part 2: Safety of optical fibre communication systems |
|  | BS 7671 | Requirements for electrical installations: IEE Wiring Regulations: Sixteenth Edition |

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Planning/Installation Standards: 2003



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FIA Technical Support Documents

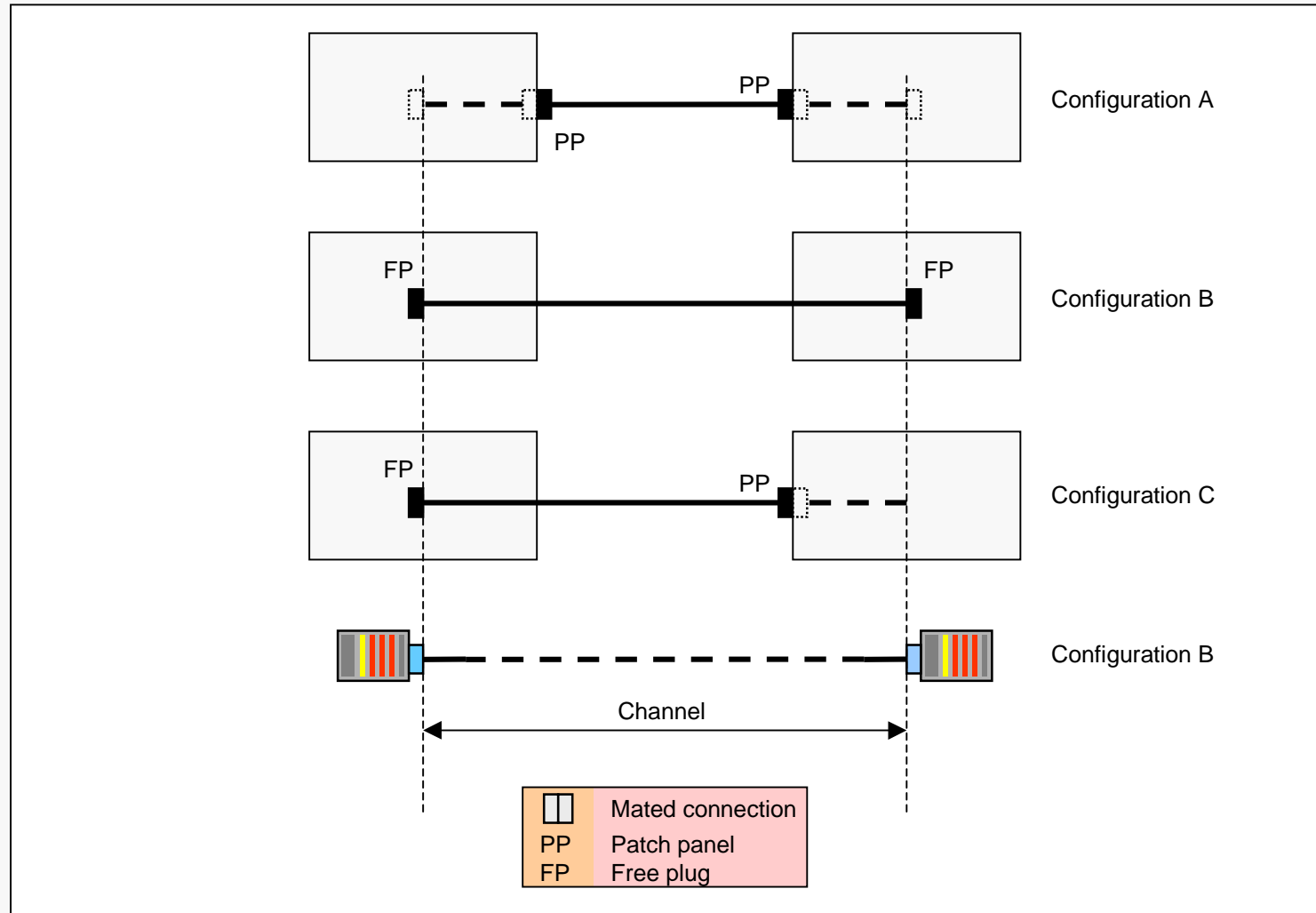
|   | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| THE FIBREOPTIC INDUSTRY ASSOCIATION www.fibreoptic.org.uk | |
| TSD | DESIGN |
| 2000-1-1 | OPTICAL FIBRE CABLING: LAN APPLICATION SUPPORT GUIDE |
| 2000-1-3 | OPTICAL FIBRE CABLING: DARK FIBRE SUPPORT GUIDE |
| TSD | OPERATION |
| 2000-3-3 | POLARITY MAINTENANCE |
| TSD | 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 |
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| 2000-5-1 | OPTICAL POWER: SAFETY LEVELS |
| 2000-5-2 | OPTICAL FIBRE: HANDLING OF PROCESSING CHEMICALS |
| 2000-5-3 | OPTICAL FIBRE: DISPOSAL OF WASTE |
| MODELLING TOOLS | |
| CABLING STRUCTURES COST MODEL | |

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Installation Options



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The Function of Cable

The performance of optical fibre resides within the optical fibre itself

The cabling of optical fibre provides:

- protection against physical damage during storage, installation and operation
- protection against environmental conditions during storage, installation and operation



Constructions and materials used reflect the variety of installation and operating environments

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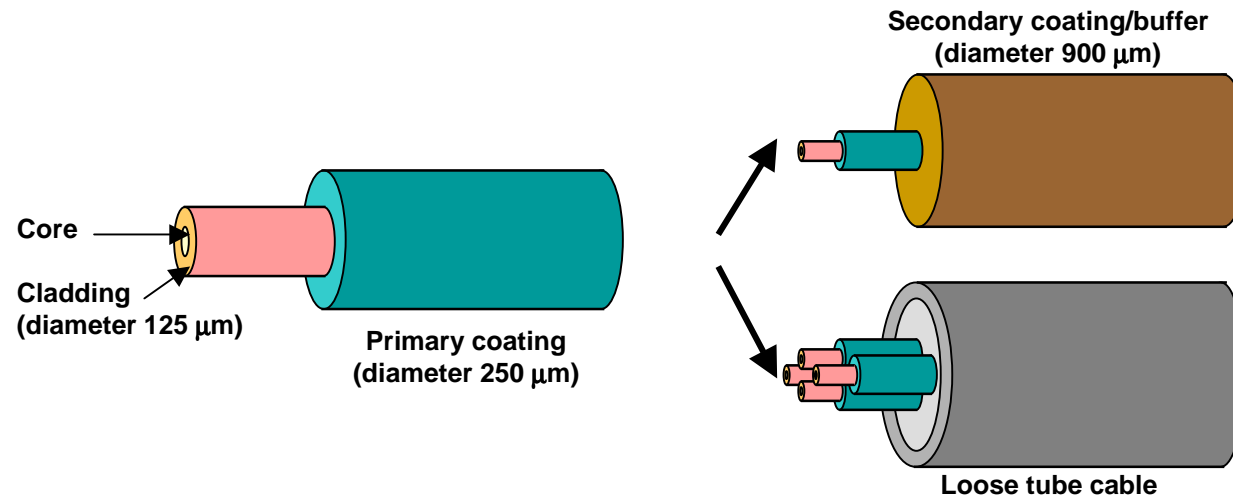
Polarity and Contamination

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Cable Constructions



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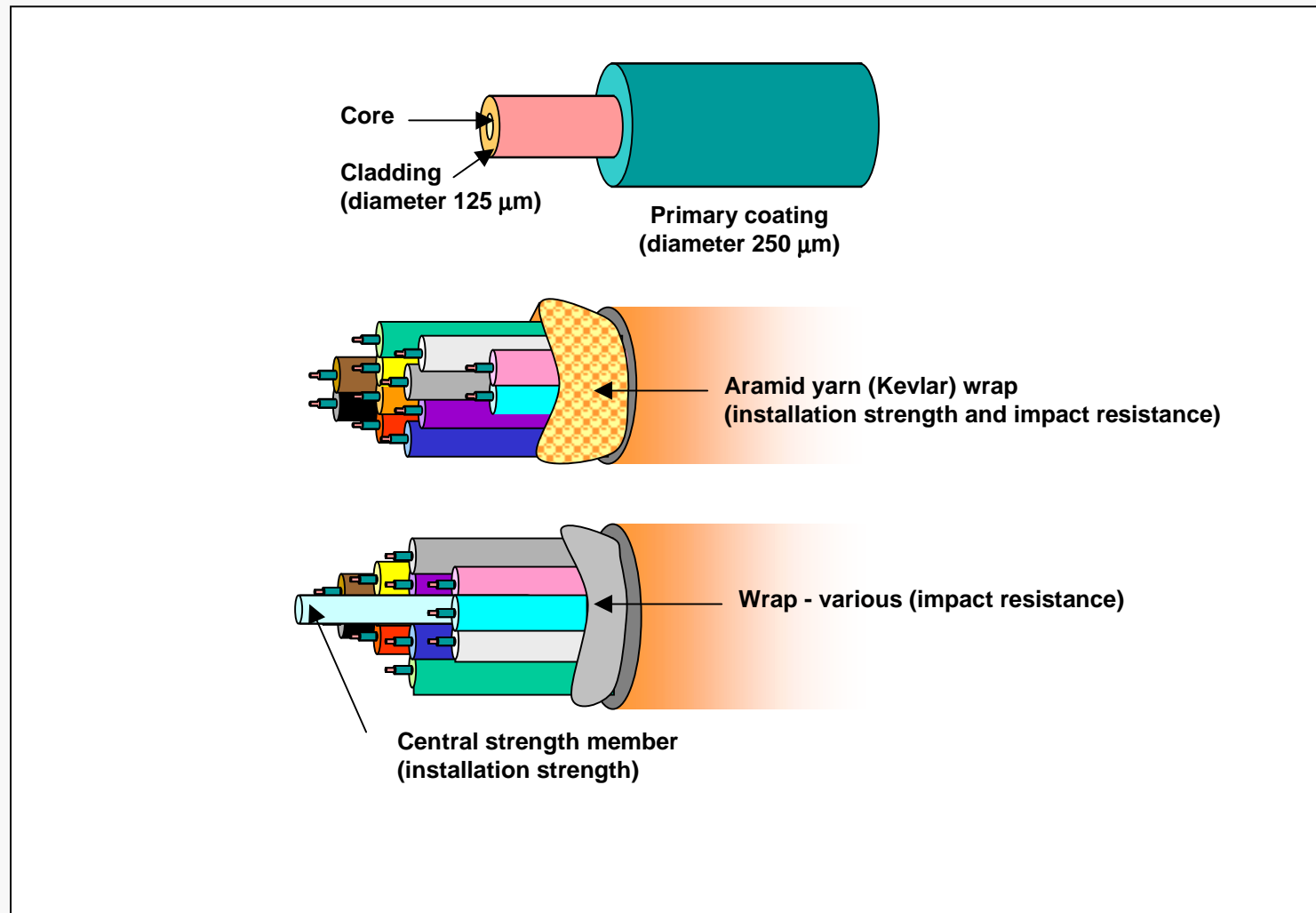
Polarity and Contamination

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Tight Buffered (Tight Jacket) Cables



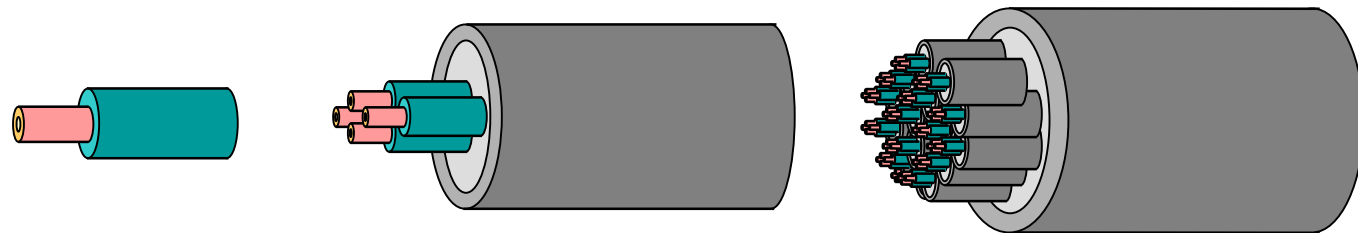
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Loose Tube Cables

| | | |
|-----------------|--------------------|----------------------------------------------------------------------|
| Features | Bend radius | suitable for external cable management systems (duct, burial) |
| | Flexibility | survivability following installation |
| | Diameter | not critical |
| | Termination | within closures, generally via spliced pigtails |
| | Fibre count | 2 - 1600 |

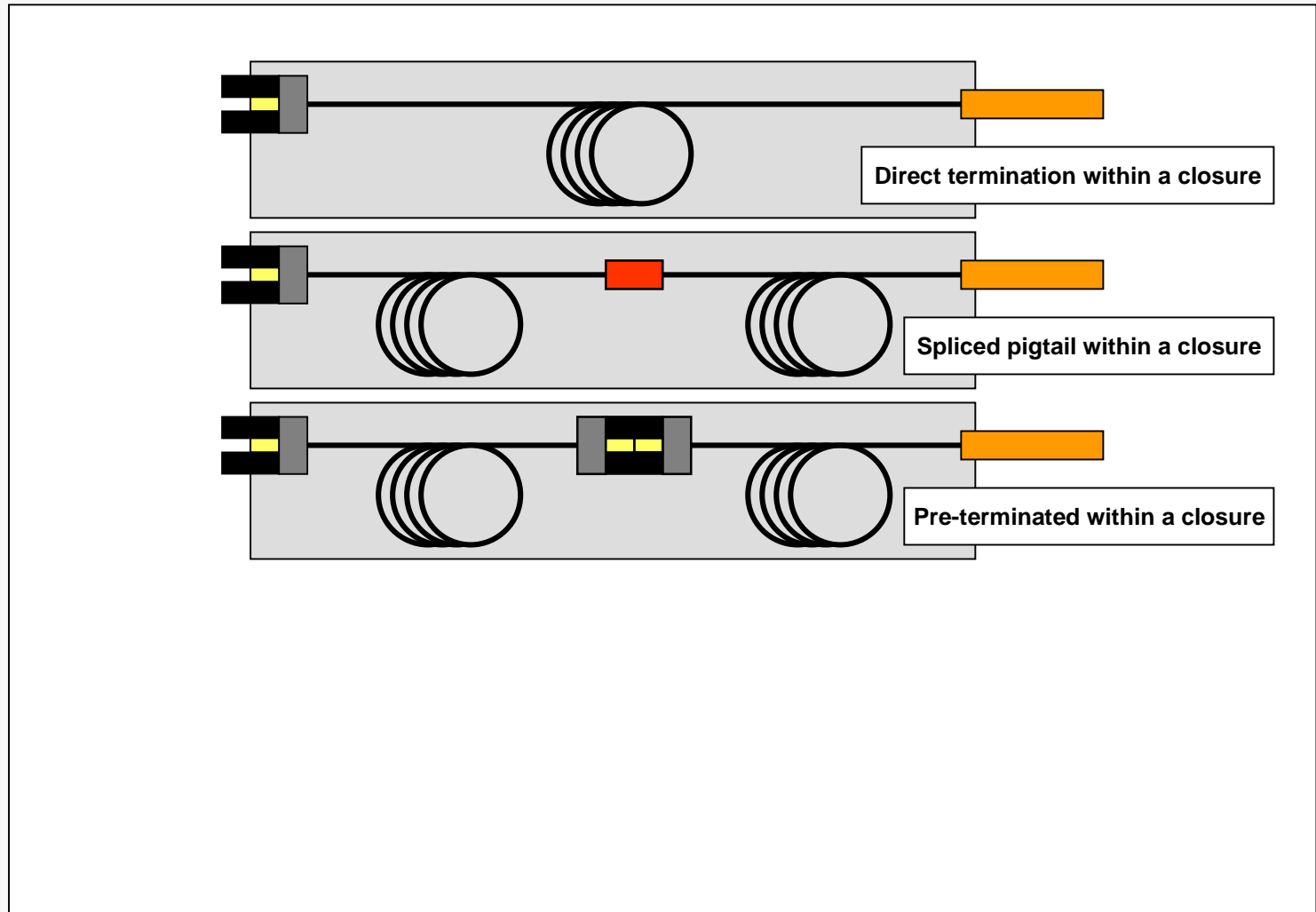


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Cable Termination Options



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Connector Designations

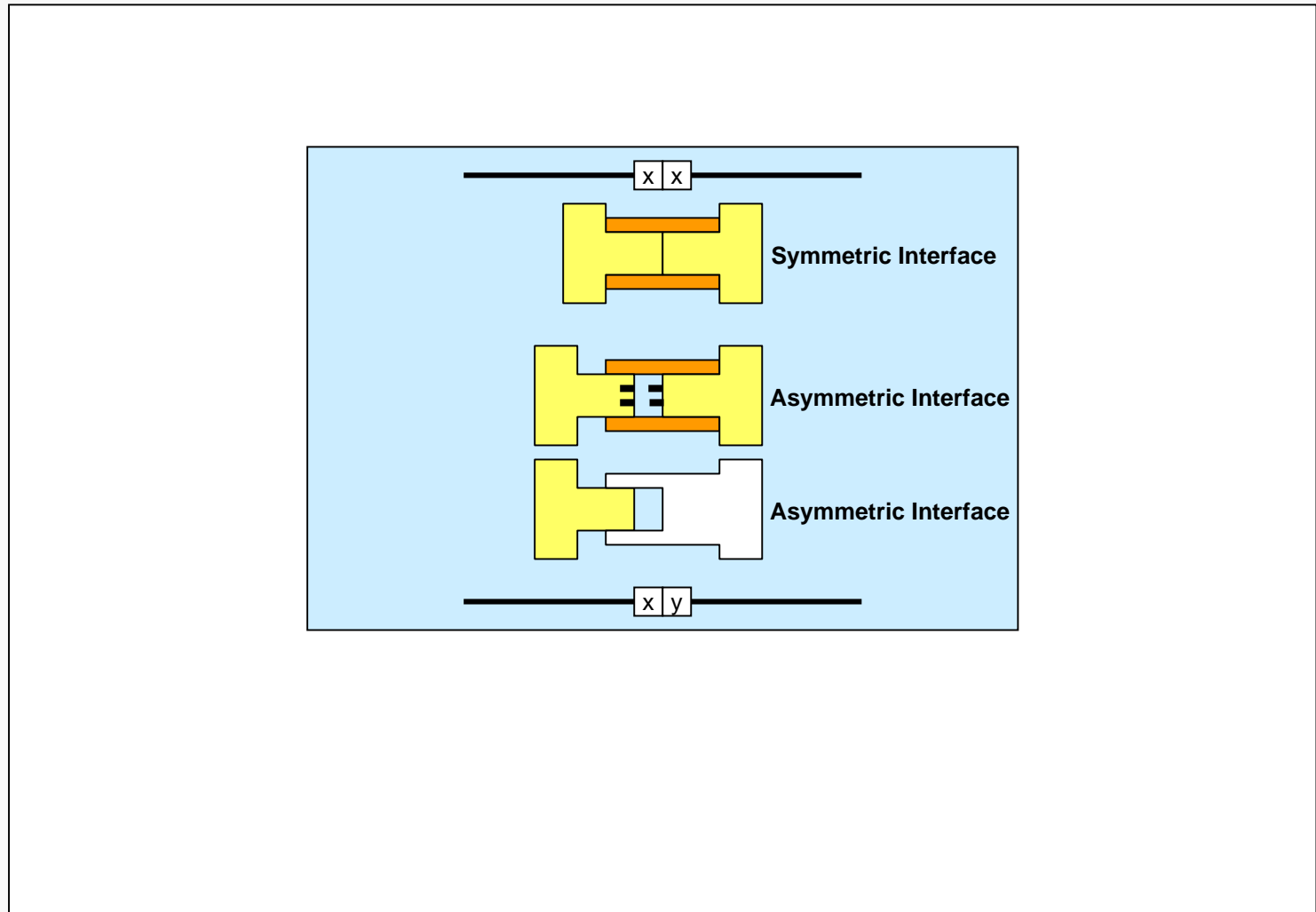
| INTERFACE | Symmetric | Asymmetric | | | |
|---------------|-----------|-------------|----------------|----------|--------------|
| STYLE | BAM | LSA | | | |
| | BFOC2,5 | MPO | | | |
| | CF-03 | MT | | | |
| | CF-04 | MT-RJ | | | |
| | CF-08 | MU | | | |
| | D | OCCA-PC | | | |
| | DS | OCCA-BU | | | |
| | F-05 | OF-2 | | | |
| | FC | SC | | | |
| | F-SMA | SC-D | | | |
| LC | SG | | | | |
| FUNCTIONALITY | Simplex | Duplex | Duplex-able | Array | |
| END-FACE | Flat | Profiled | Angled | | |
| POLISH | Normal | PC | Super PC | Ultra PC | Pre-polished |
| CONSTRUCTION | Unsprung | Sprung body | Sprung ferrule | | |
| OF RETENTION | Adhesive | Crimp | | | |

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Symmetric and Asymmetric Connectors
















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The History of Connectors

| V - groove | Thread | Conic | Bayonet | Push-Pull | SC |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |  |  |  |  |
| Leeds Ferrule | SMA 905 | Biconic | Mini-BNC | ST | |
| | |  |  |  |  |
| | | Stratos 430 (MMF) Stratos 830 (SMF) | ST 1 | FDDI | |
| | | |  | |  |
| | | | ST 2 (II) Metal | | |
| | | |  | | |
| | | | ST 2 (II) Plastic | | |

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Duplex and Duplex-able "SFF" Connectors

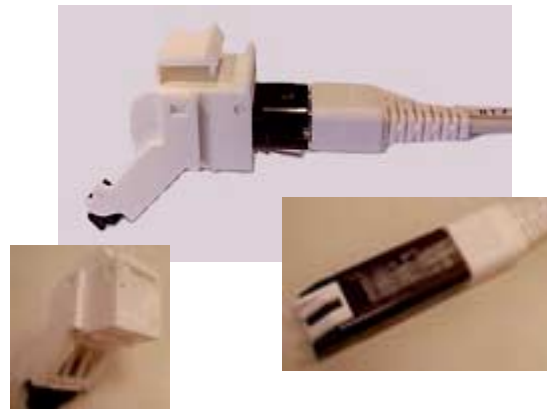
OptiJack



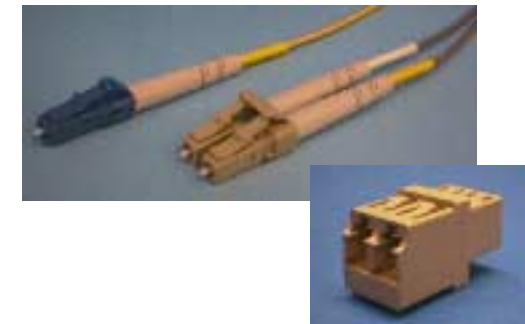
MT-RJ



Volition (3M) - SG



LC (Lucent)



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Array Connectors

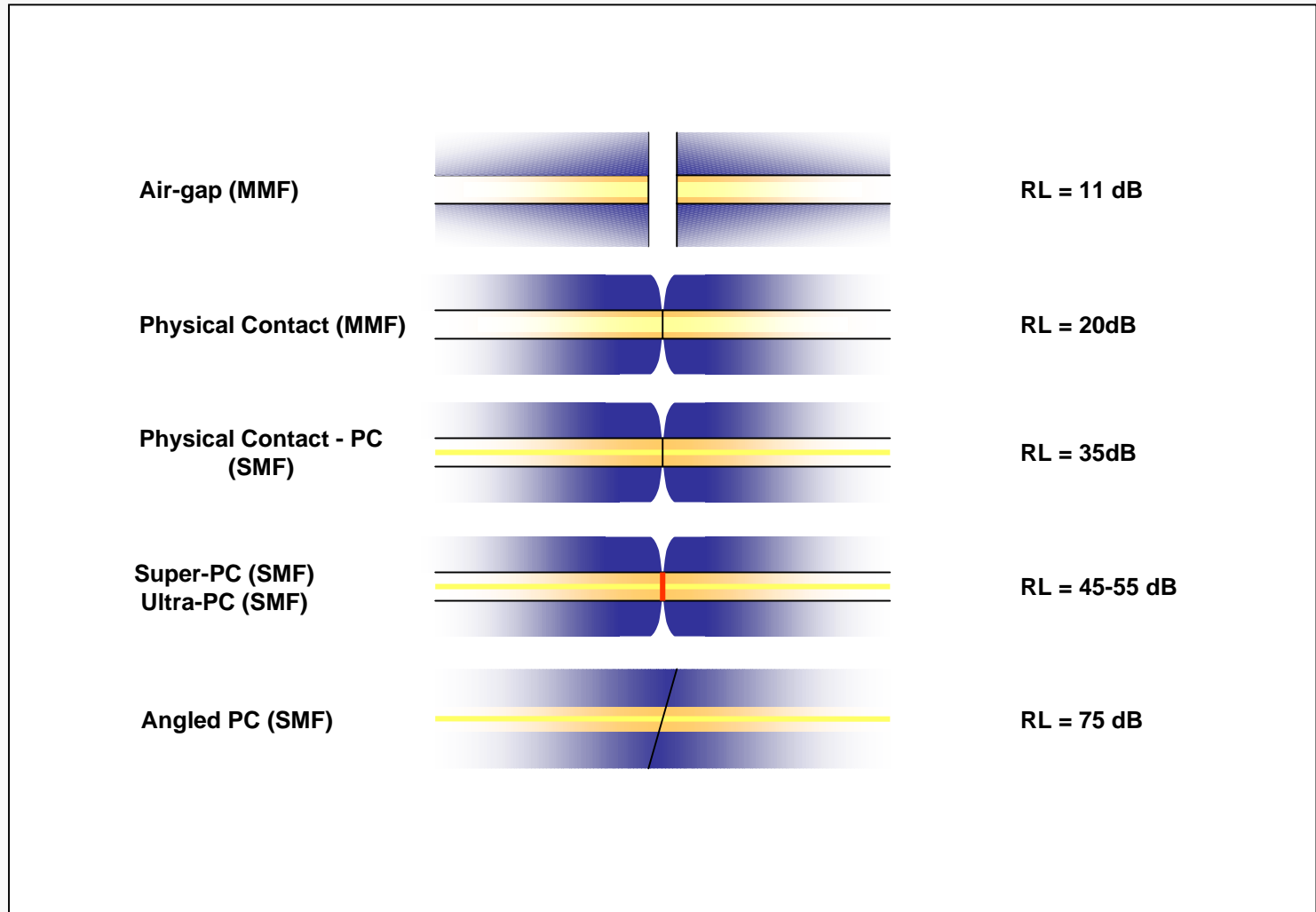


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Return Loss

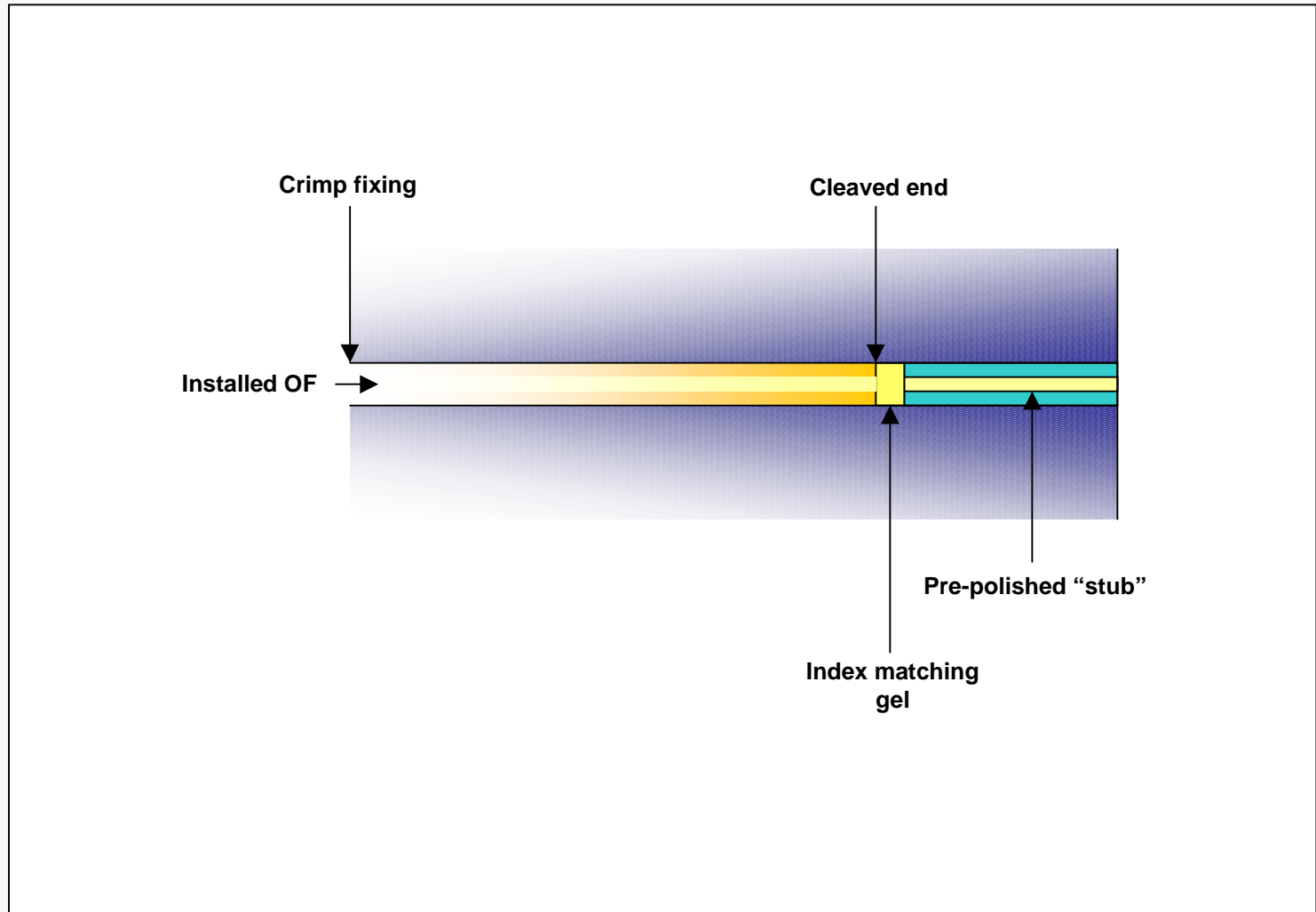


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Pre-polished Connectors

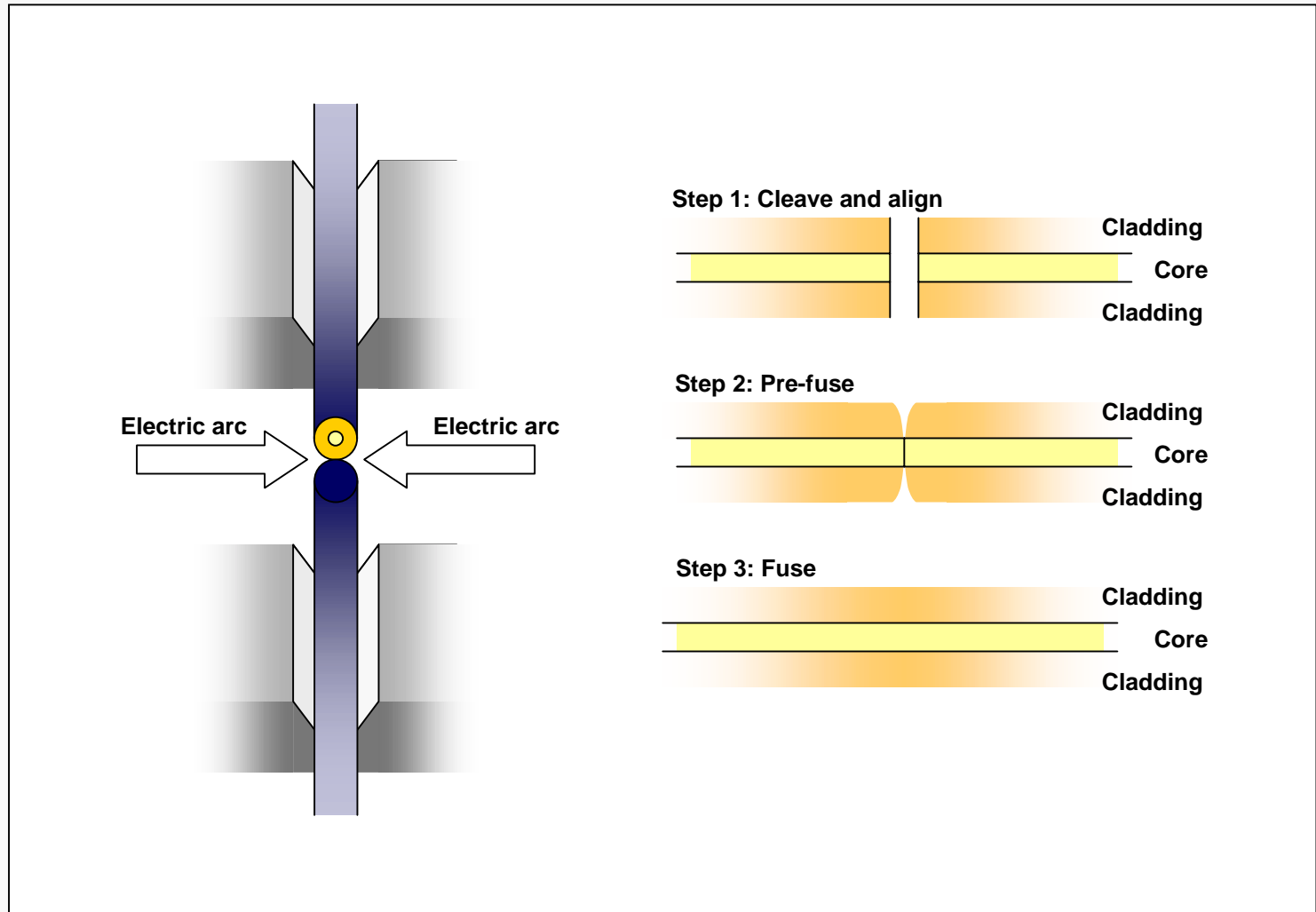


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Fusion Splices

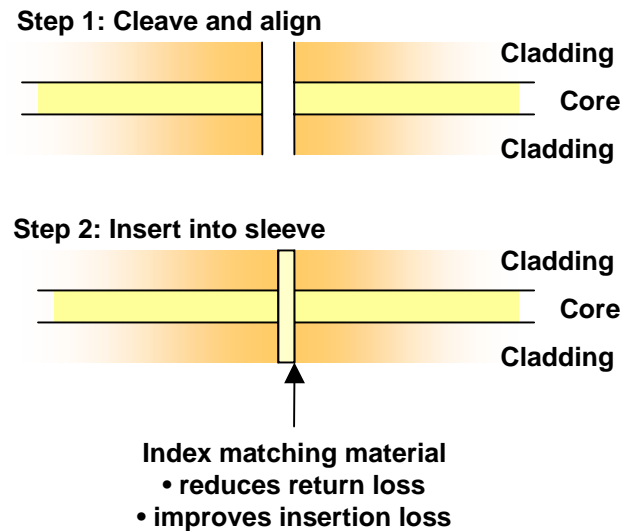


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Mechanical Splices



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Optical Fibre Safety Standards



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|  | BS EN 50174-2 (2001) | Information technology - Cabling installation- Part 2: Installation planning and practices inside buildings |
|  | IEC 60825-1 A.2 (2001) | Safety of Laser Products Part 1: Equipment classification, requirements and users guide |
|  | IEC 60825-2 (2001) | Safety of Laser Products Part 2: Safety of optical fibre communication systems |
|  | BS 7718 (1996) | Code of Practice for the installation of fibre optic cabling |

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Optical Fibre Safety Support Documents

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Optical Fibre Waste Disposal



“SHARPS” CONTAINERS

In the UK the sharps containers shall meet the requirements of BS 7320



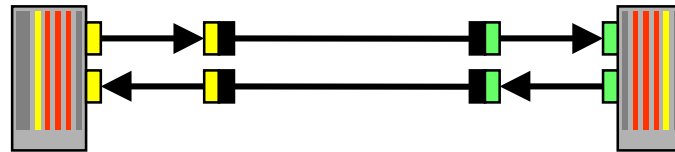
“BIOHAZARD BAGS”

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Polarity Maintenance



- all the major LAN applications adopt simplex transmission
 - two separate optical fibres per communications channel
- polarity maintenance is vital
- cabinet - cabinet has been relatively problem-free
 - authorised access only
- more complex configurations and FTTD (fibre-to-the desk) increase risk
- duplex connectors (SC) have been produced to resolve the issues
- SFF connectors have been introduced to increase patching density

High degree of standardization - interoperable intermatable



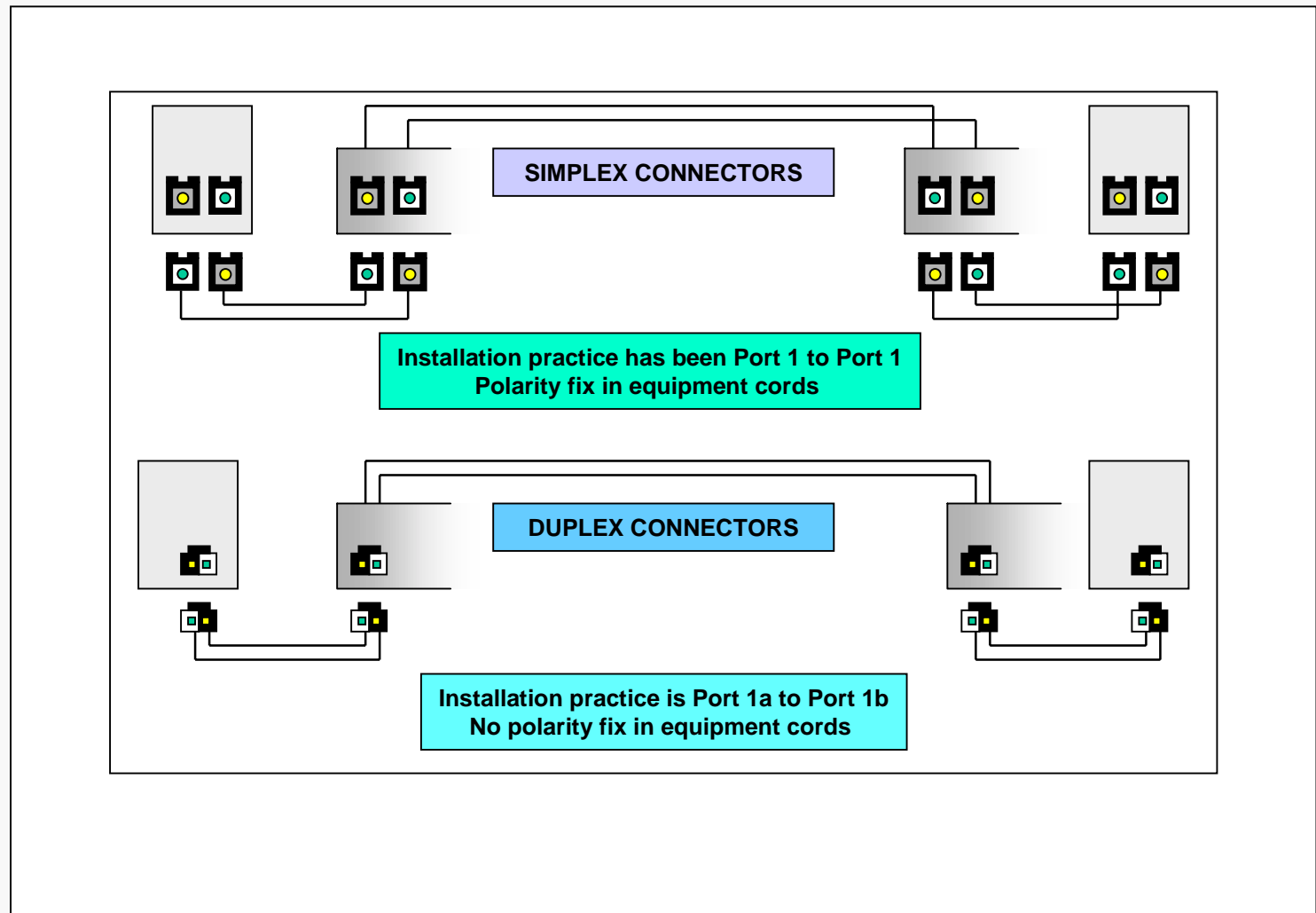
Little standardisation

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Polarity Maintenance



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Contamination

Photographs courtesy of Fluke Networks

Connector end-face

Epoxy adhesive

Core

Cladding

Contamination radius r_1

Contamination radius r_2

Loss (dB)

50 μ m MMF

142 m @ 850 nm

Total contamination radius (microns)

| Total contamination radius (microns) | Loss (dB) |
|--------------------------------------|-----------|
| 0 | 0.0 |
| 5 | 0.2 |
| 10 | 0.8 |
| 15 | 2.0 |
| 20 | 3.0 |

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Inspection Microscopes - I



Priorscope (200x or 400 x)
Fitted with appropriate filters for Class 1M Hazard



Priorscope II (200x or 400 x)
Fitted with appropriate filters for Class 1M Hazard

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Inspection Microscopes - II



**Fluke FiberInspector
(free-standing or
fitted to OTDR OF-500)**

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Termination Process Options

CONVENTIONAL CABLE - DIRECT TERMINATION

| | |
|--------|----------------------|
| XXXXXX | Performance |
| XXXX | Equipment investment |
| XXXXXX | Skills set |
| XXXXXX | Quality risk |
| XX | Cost of solution |
| XX | Installation speed |

CONVENTIONAL CABLE - FUSION SPLICED PIGTAIL TERMINATION

| | |
|--------|----------------------|
| XXXX | Performance |
| XXXXXX | Equipment investment |
| XXXX | Skills set |
| XXXX | Quality risk |
| XXXX | Cost of solution |
| XXXX | Installation speed |

PTMF - PRE-TERMINATED MODULAR FIBRE

| | |
|--------|----------------------|
| XX | Performance |
| XX | Equipment investment |
| XX | Skills set |
| XX | Quality risk |
| XXXXXX | Cost of solution |
| XXXXXX | Installation speed |



THE END