CORNING

Fiber Optic 101 and Cable Selection

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Title Sr. Sales Engineer
Date 02/08/2017

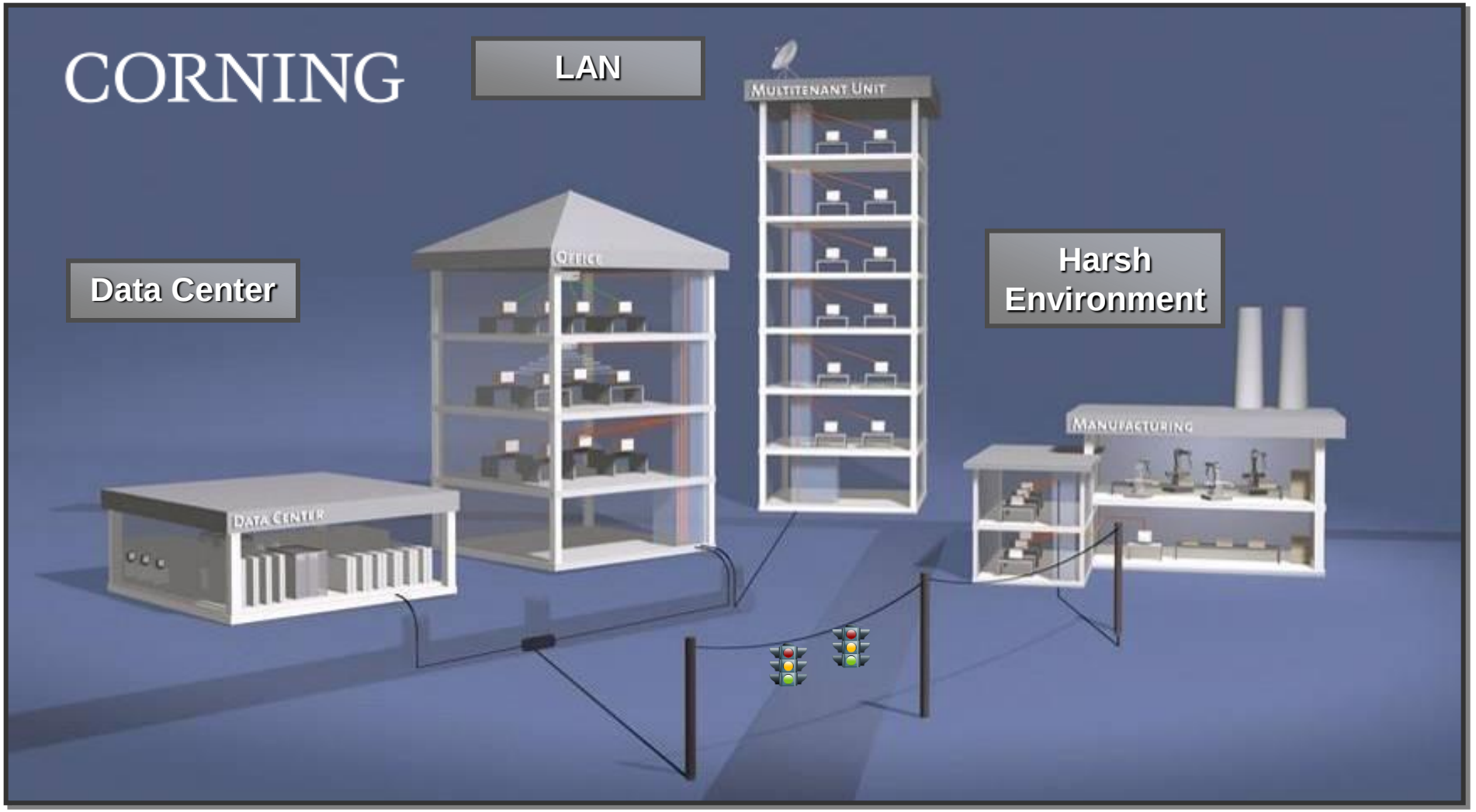
Agenda

What Are We Going To Learn Today?

- ➢ Overview of Corning Cable Systems
- Fiber Optic Technology 101
  - What is it?
  - How does it work?
  - Fiber Types
  - Fiber Performance
  - Benefits
- Fiber Optic Cable 101
  - What is it?
  - Cable Construction
  - How to Pick a Fiber Optic Cable
  - Pulling Best Practices
- Fiber Optic Termination Methods
- Installing a Fiber Optic System
  - Components of an installation
- Review of Corning Cable Systems Offerings

Overview of Corning Cable Systems

Enterprise Networks: Solutions for Your Application



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What *Is* Fiber Optics?

General Definition

Transmitting information in the form of light, through a transparent **medium**, typically high-purity glass

Medium

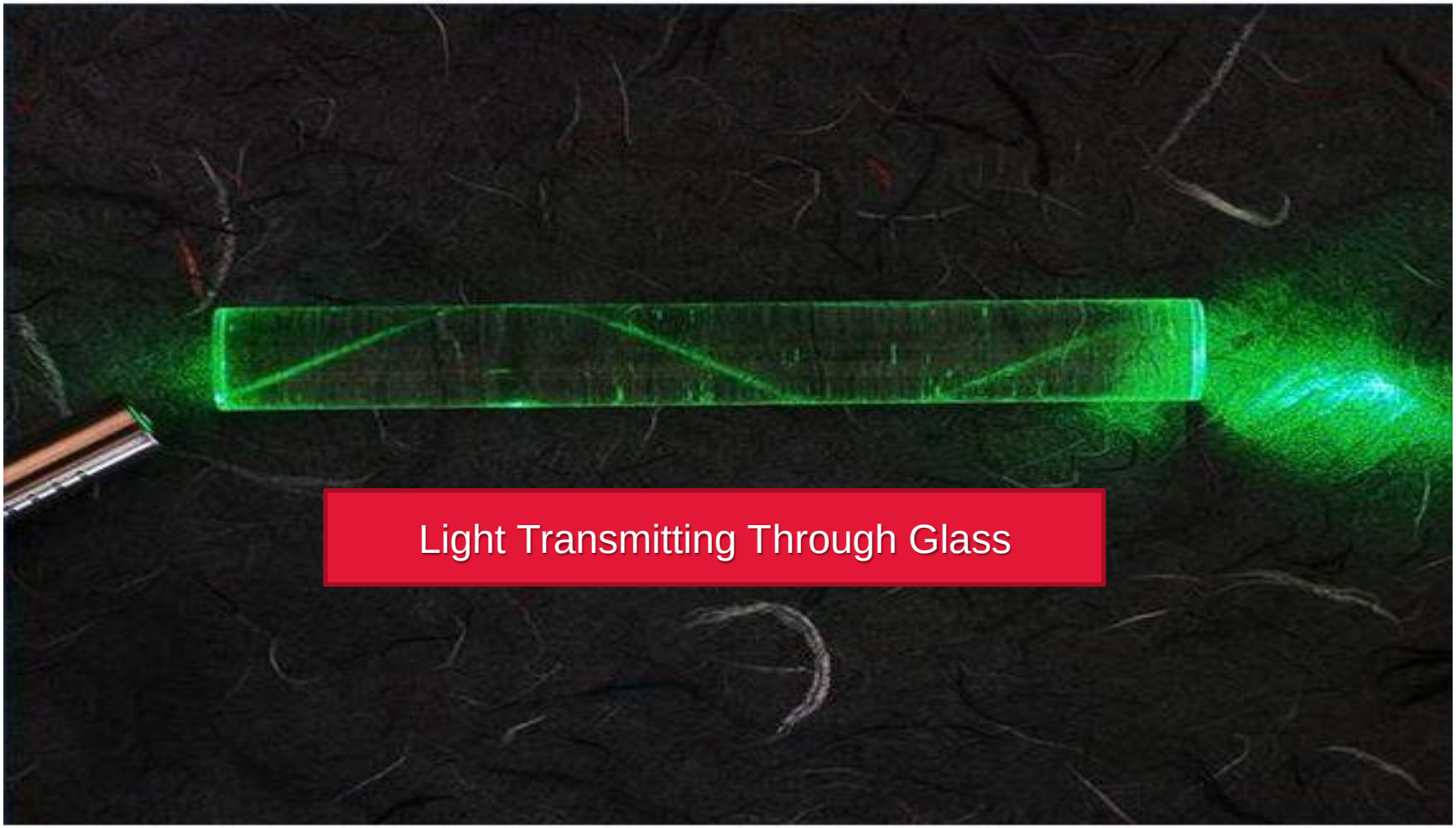
Any material through which energy moves, over a distance

Examples:

- Sound through water
- Radio Signals through air
- Light through high-purity glass

Fiber Optics 101

What *Is* Fiber Optics?

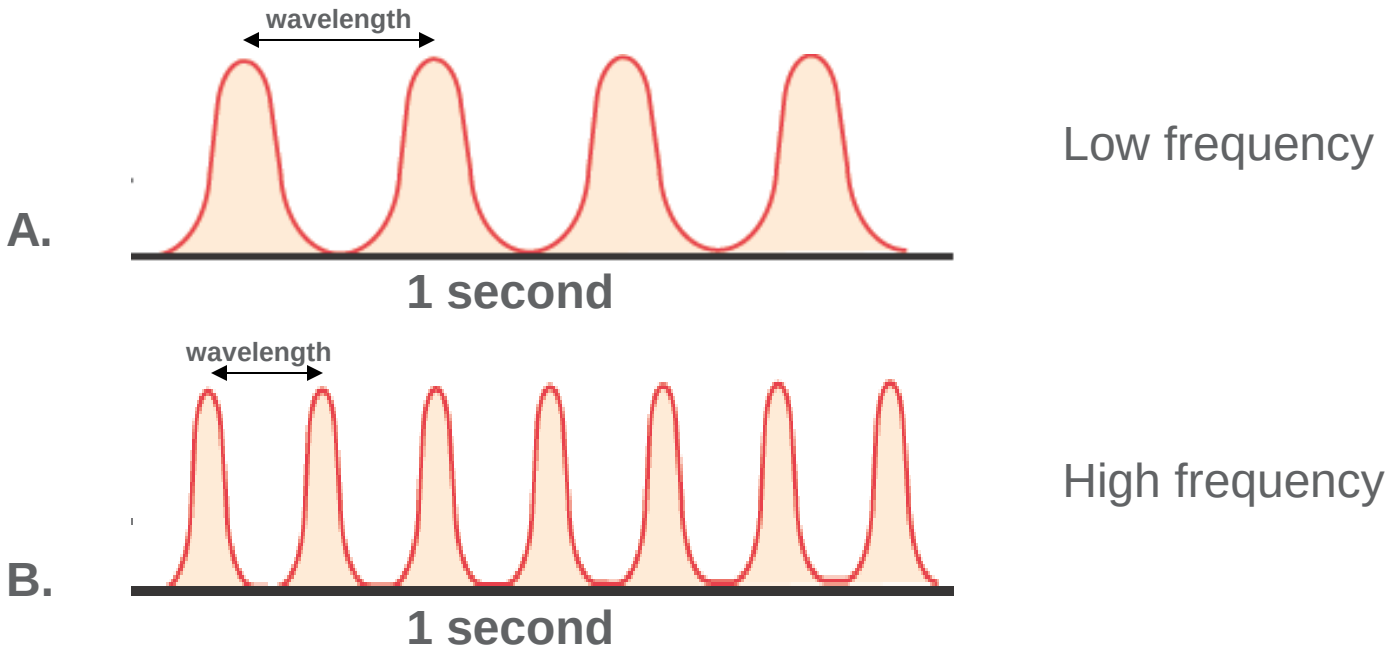


- Reference: http://scienceray.com/physics/fiber-optic-cables/

Properties of Electromagnetic Signals

Wavelength

The distance between identical points on a wave
(typically expressed in nanometers or “nm”)



Low frequency

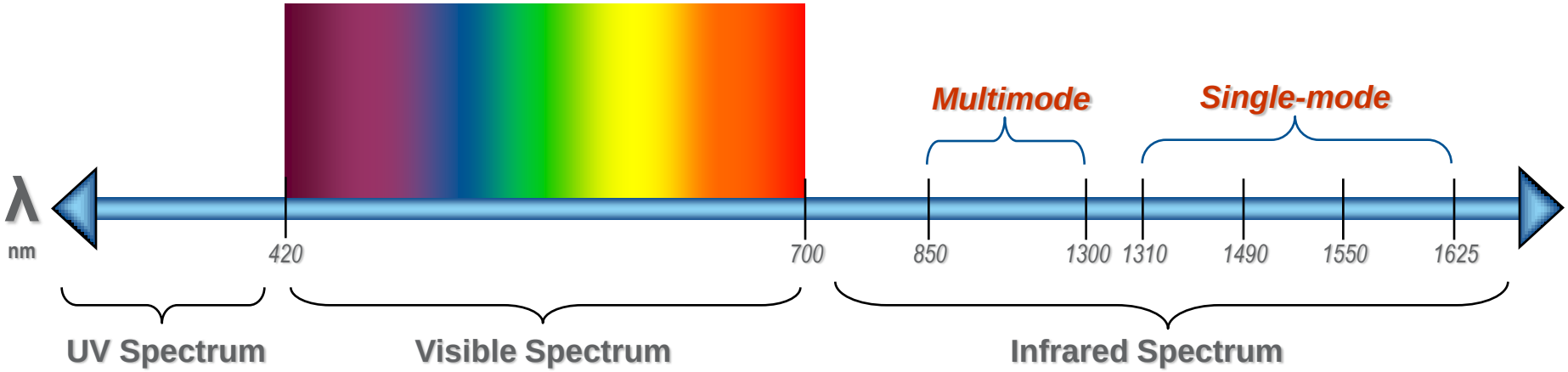
High frequency

“B” represents a shorter wavelength than “A”

Fiber Optics 101

Electromagnetic Spectrum

Wavelength



Operating Wavelengths:

- 850 nm = Short Wave Multimode
- 1300 nm = Long-Wave Multimode
- 1310 nm = Traditional Standard Single-mode
- 1490 nm = FTTx (Downstream Data/Voice)
- 1550 nm = Long-Wave Single-mode
- 1625 nm = Extra Long-Wave Single-mode (WDM)

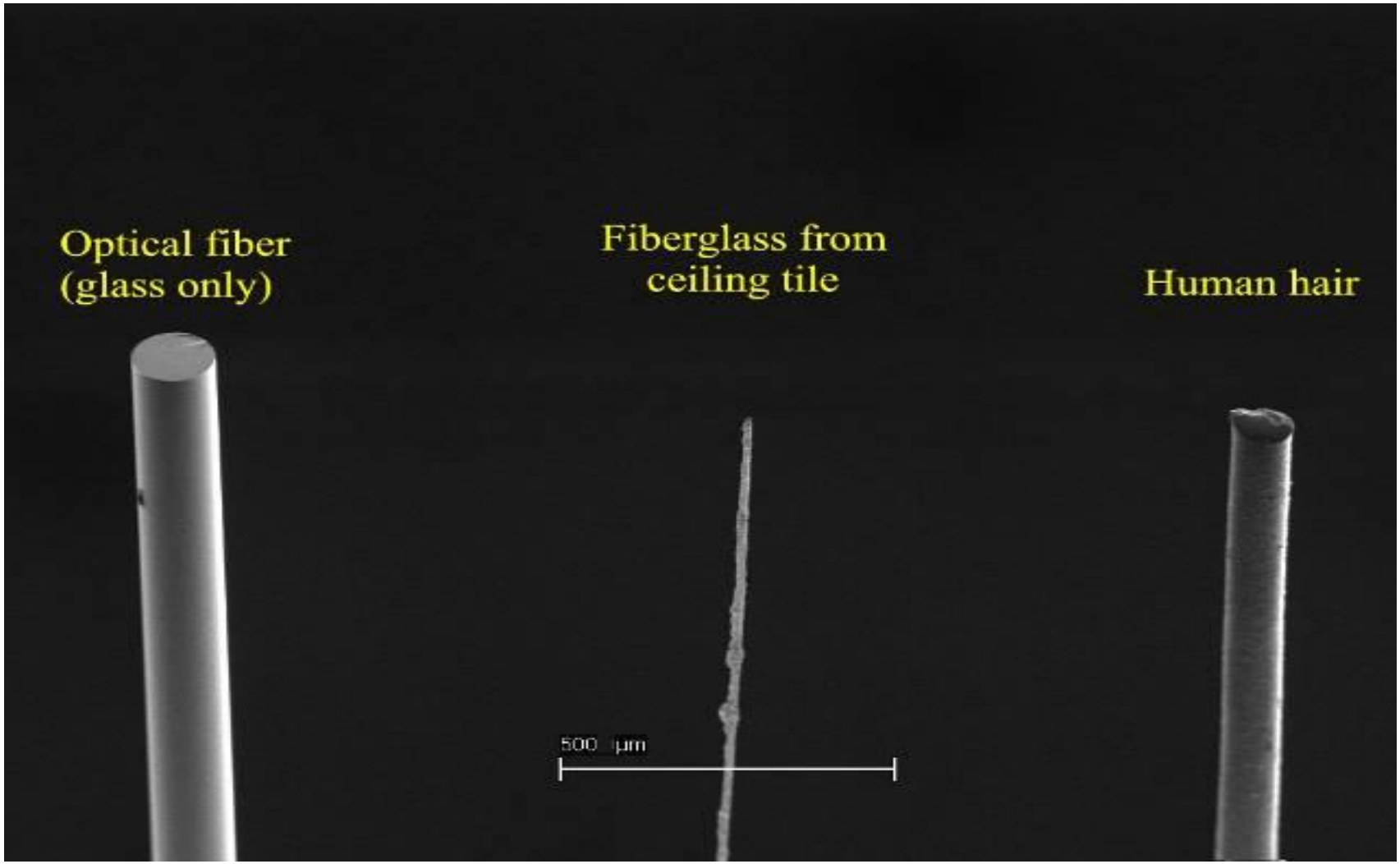
Measuring Fiber Optics

- A micrometer, or **micron** (μm), is a metric measurement used to measure the diameter of a fiber.
  - One micron = 1 x 10^{-6} meters, one millionth of a meter.
  - One micron = 0.000039 inches
  - One human hair is ~ 80 microns

- A coated optical fiber is about 250 μm in diameter
- The light carrying region of an optical fiber can be as small as 10 μm or less.
- In optical fiber, some specifications are as tight as 0.5 μm!

Fiber Optics 101

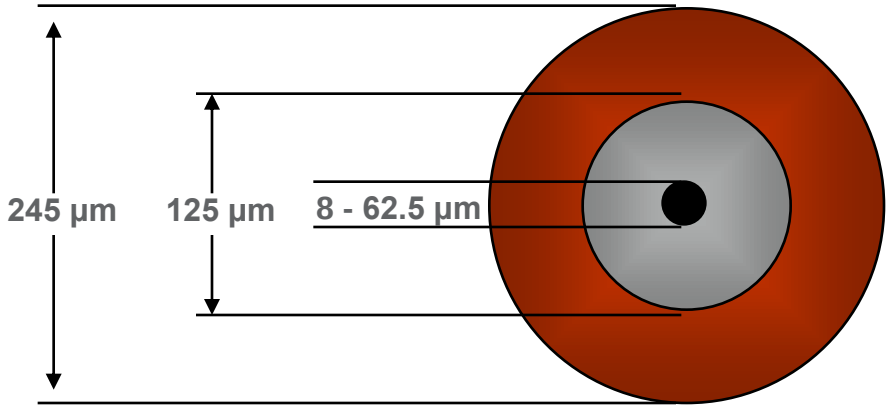
Relative size of optical fiber

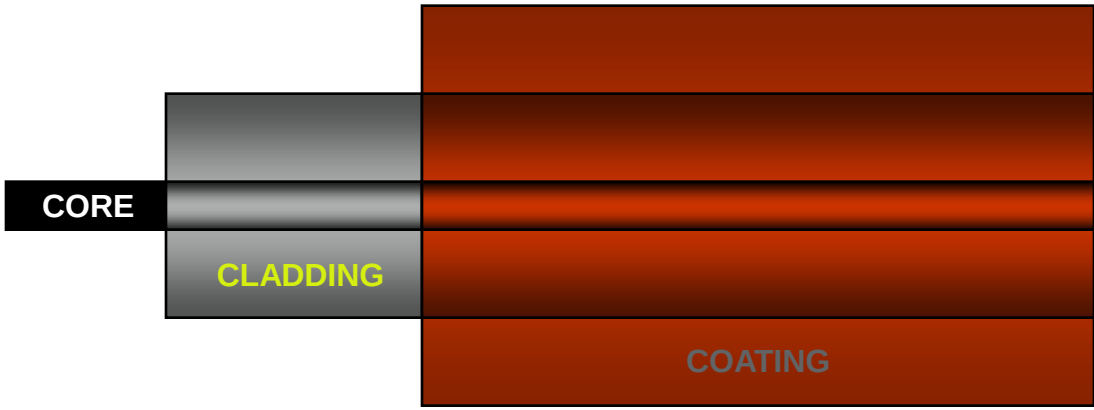


Principles of Operation — Theory

Cross section of a typical fiber

- **Core**
  - Carries the light signals
- **Cladding**
  - Keeps the light in the core
  - Can not be separated from the Core
- **Coating**
  - Protects the glass
  - Acrylate (plastic)





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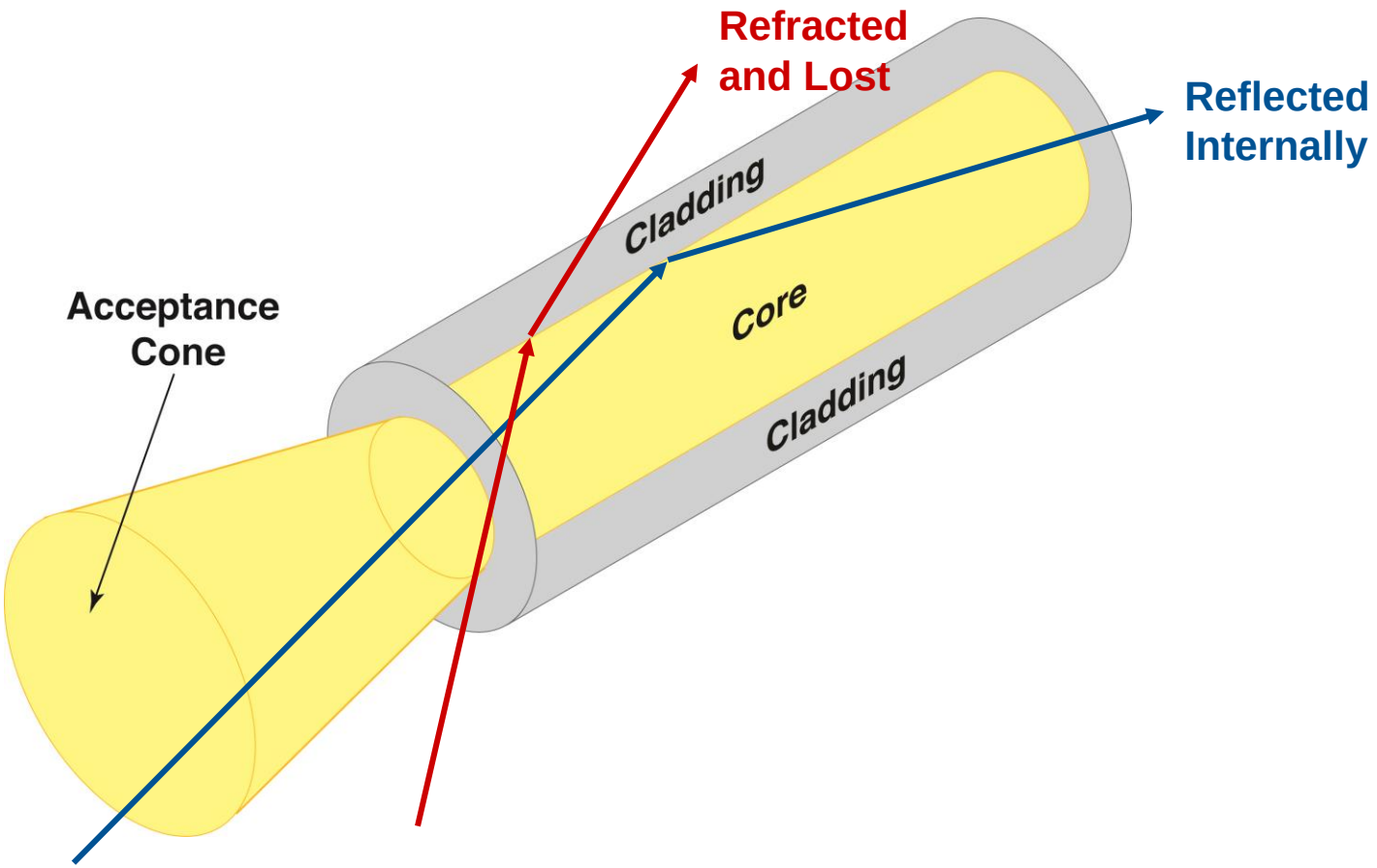
How Does It Work?

Couple the light into the fiber and keep it there:

"Total Internal Reflection"



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Fiber Performance is Measured in Bandwidth

Bandwidth

The capacity of a medium to carry information over a distance without loss of data

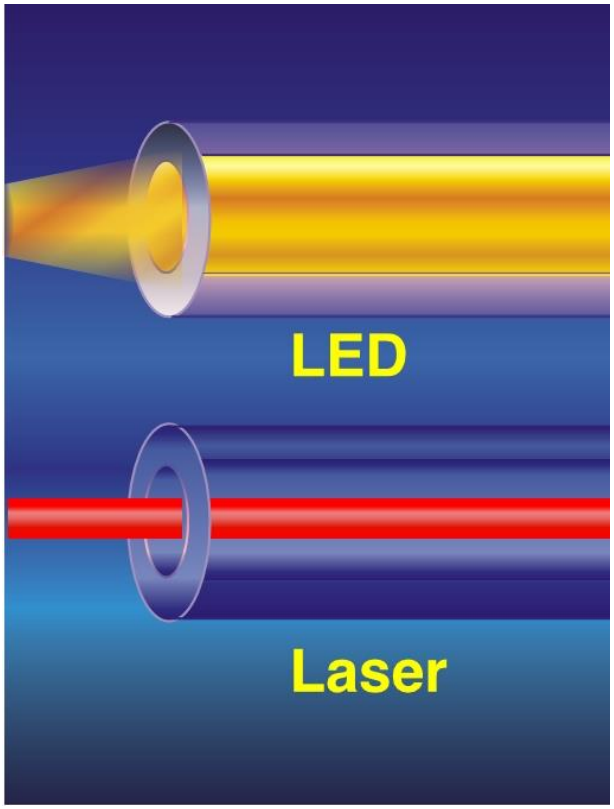
(How much data can I carry and how far?)

- Affected by
  - Source/Transmitter (the LASER, VCSEL, or LED)
    - Nominal wavelength, Spectral Width, Time Delays
  - Waveguide (the fiber)
    - Attenuation*
    - Dispersion*

*Both are affected by distance traveled

Optical Sources

- Types
  - **LED**
    - **L**ight **E**mitting **D**iode
    - Low cost (850nm, 1300nm)
  - **LASER**
    - **L**ight **A**mplification from the **S**timulated **E**mission of **R**adiation
    - High cost (1310nm, 1550 nm, 1625nm)
  - **VCSEL**
    - **V**ertical **C**avity **S**urface **E**mitting **L**aser
    - Lower cost laser (850nm)
- Characteristics
  - Time Delay - Lag time of source to power up and power down
  - Spectral Width

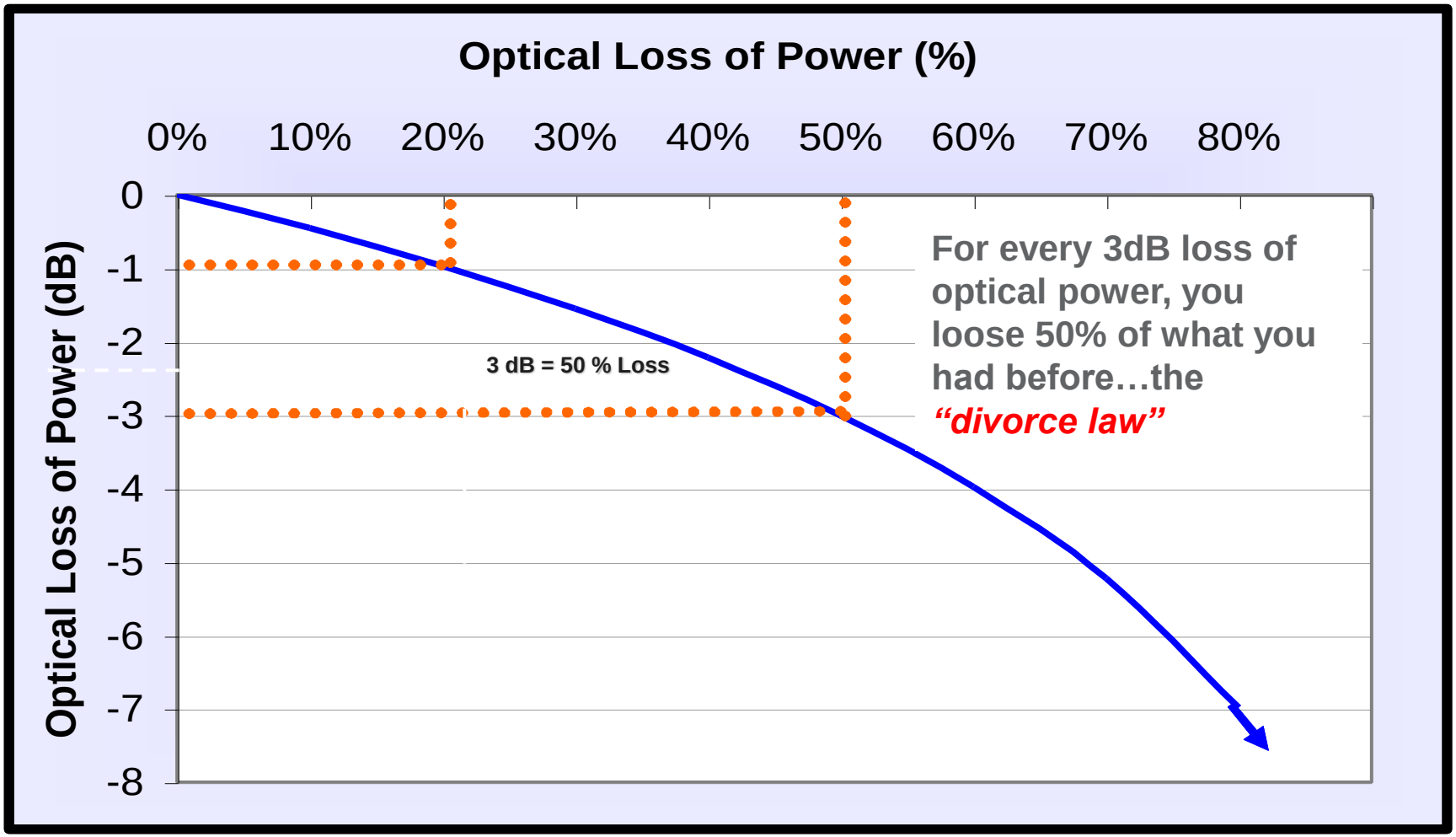


Waveguide (*the* Fiber) Effects

- **Attenuation – loss** of signal strength
  - Expressed in decibels of power lost (dB)
  - Intrinsic Attenuation
  - Extrinsic Attenuation
  - Impacts ability to reach the receiver with sufficient power
  - A 3dB loss in power equates to a 50% loss from what you started with

- **Dispersion – spreading** of signal pulses
  - Modal Dispersion
  - Chromatic Dispersion
  - Impacts the ability to distinguish discreet signal pulses

Impact of dB Loss



Intrinsic Attenuation

Intrinsic Attenuation

Loss of signal energy due to interaction between the photons and inherent physical properties of the fiber

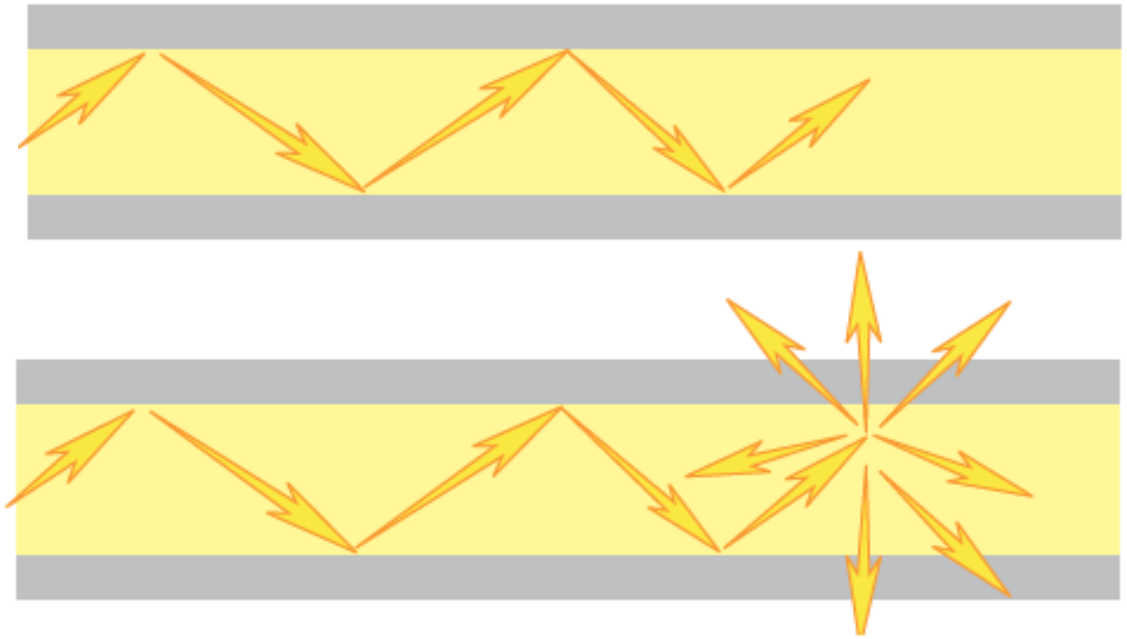
(Internal - Can't be affected by outside influences)

- Absorption

  Photons give up kinetic energy to subatomic particles

- Scattering

  Photons bounce off subatomic particles



Extrinsic Attenuation

Extrinsic Attenuation

Loss of signal energy due to change in dimensional properties of the fiber

(External - Caused by outside influences)

- Macrobends
- Microbends
- Imperfect Junctions
  - Splices
  - Fiber endfaces

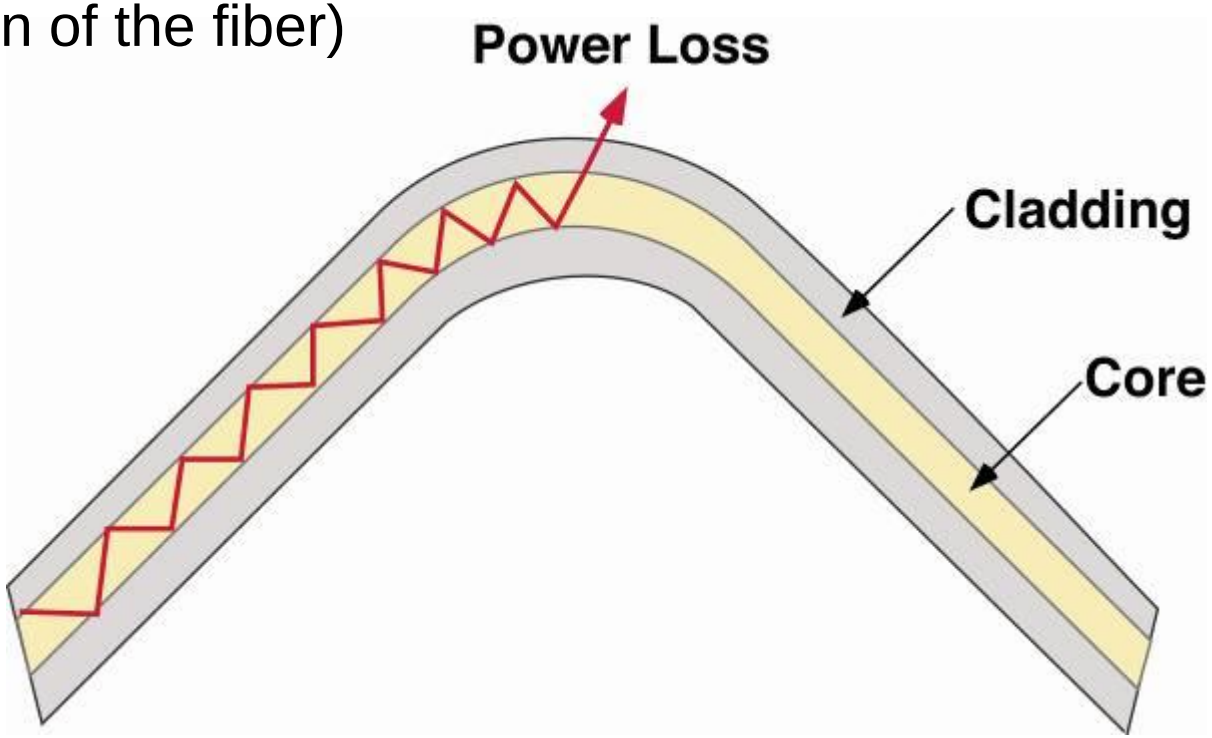
Extrinsic Attenuation

Macrobend

Large-scale bend of the waveguide, which changes the angle of incidence of previously reflecting modes

(Generally across entire

cross-section of the fiber)

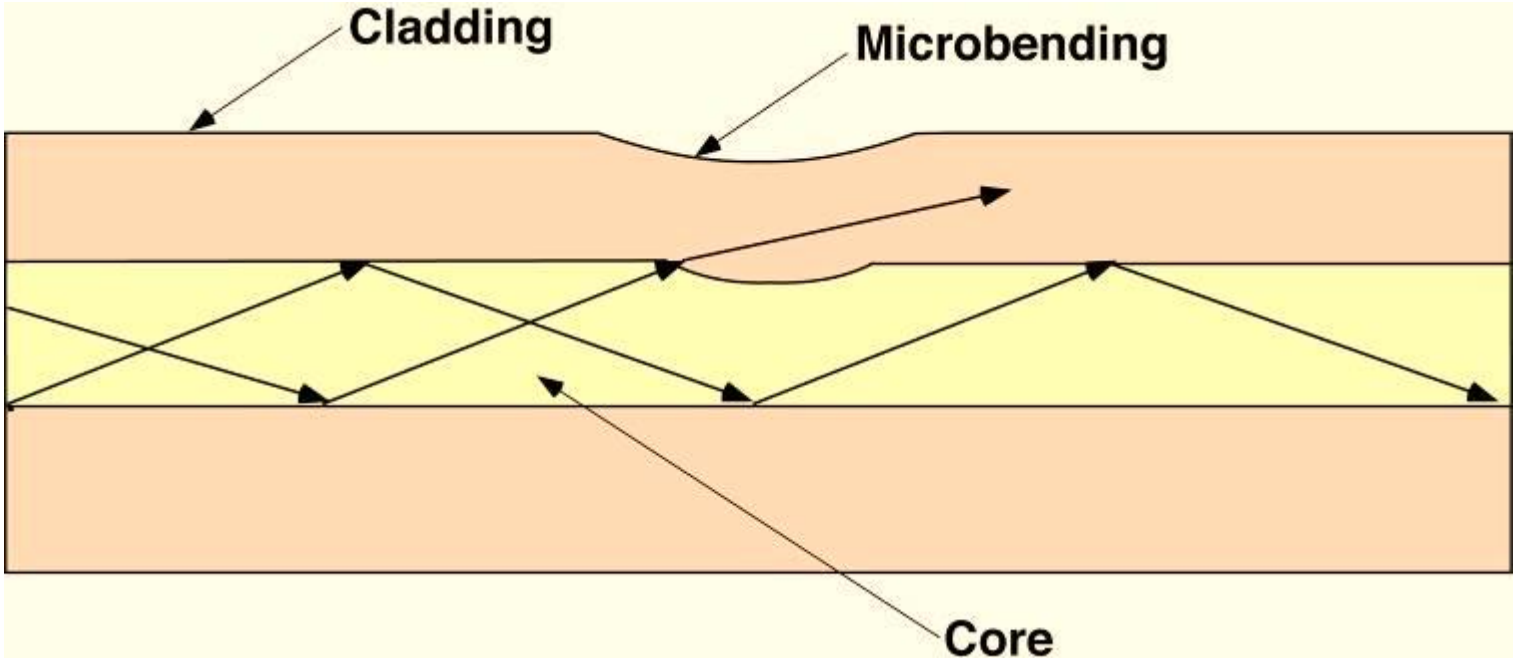


Extrinsic Attenuation

Microbend

Small-scale distortion of the waveguide, which changes the angle of incidence of previously reflecting modes

(Might affect only one side of the core)

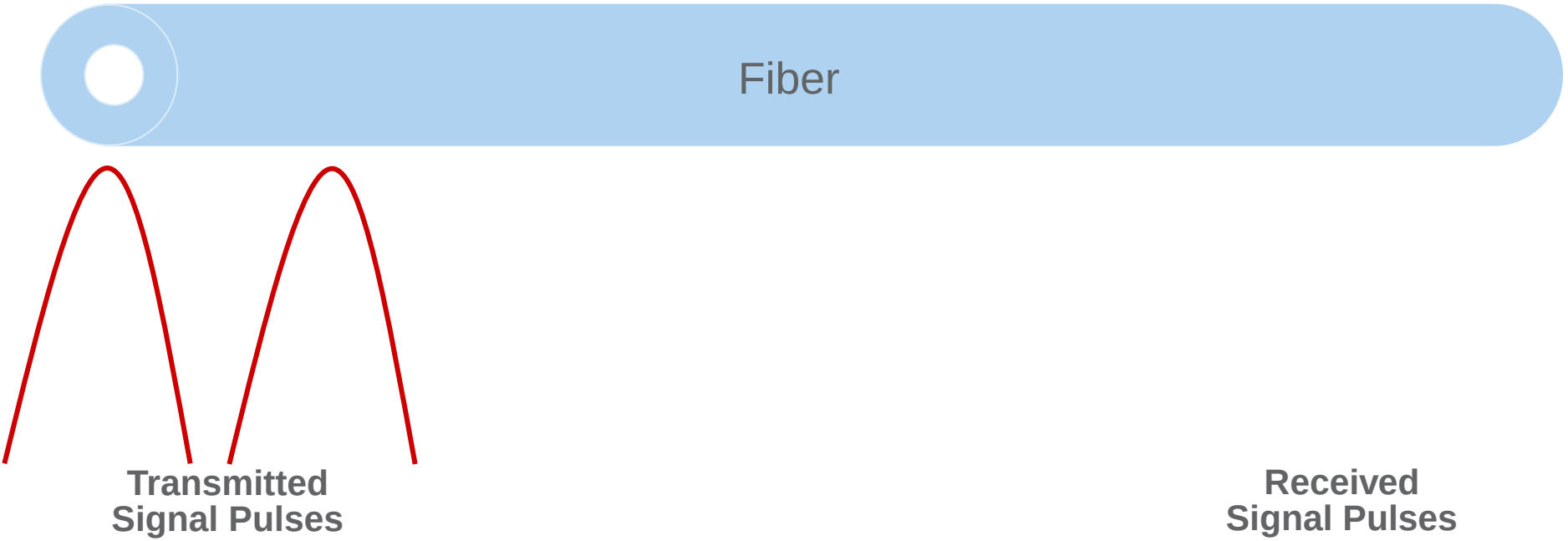


Dispersion

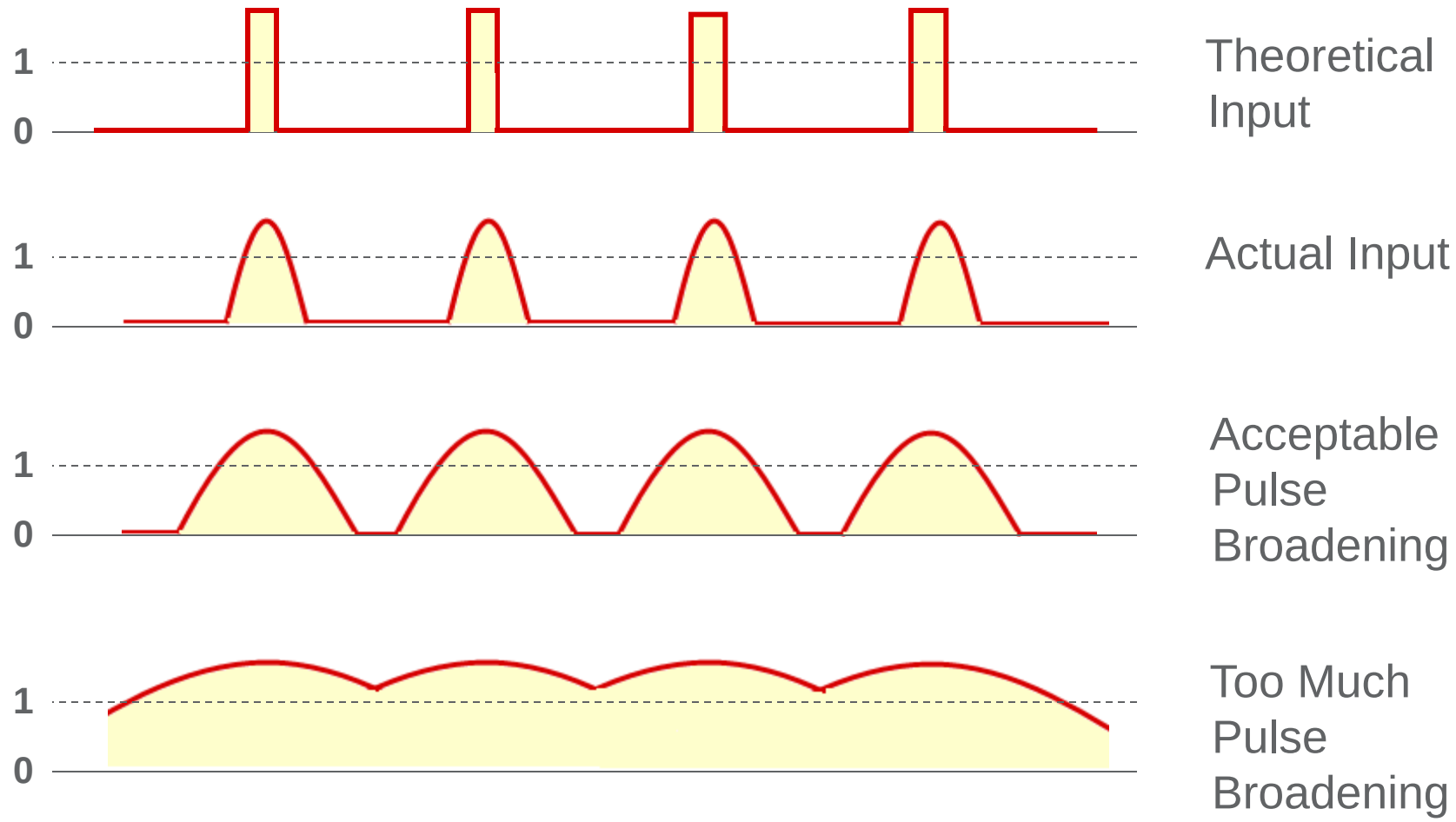
Dispersion

Spreading of signal pulses as they travel down the fiber

(May cause pulses to overlap as they arrive at the receiver, and cause bit errors)



Dispersion – Bit Error



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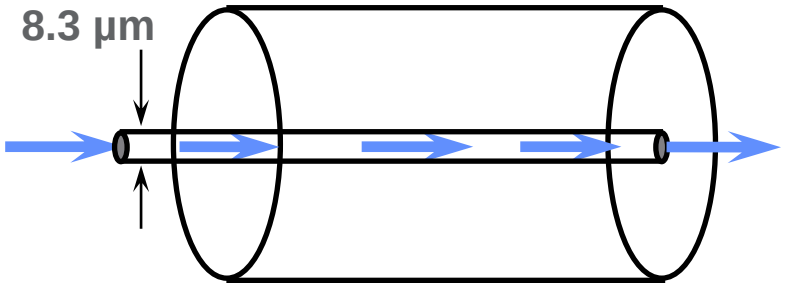
Basic Types of Fiber

Mode

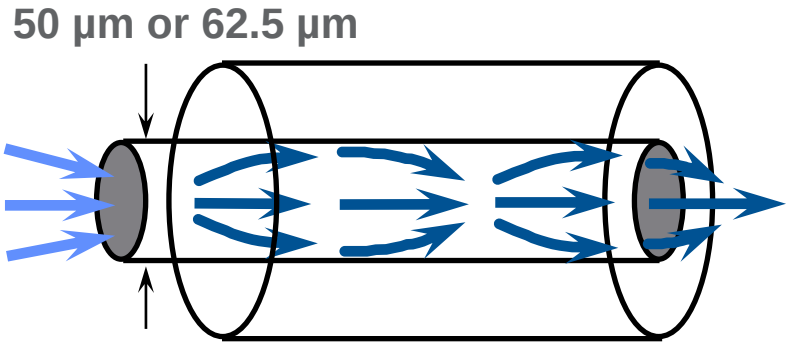
A single stream of photons that travels in a straight line unless acted upon by the environment

A ray of light

- Single-mode (SM)
  - Narrow Core (~8.3µm)
  - Supports only one ray / mode



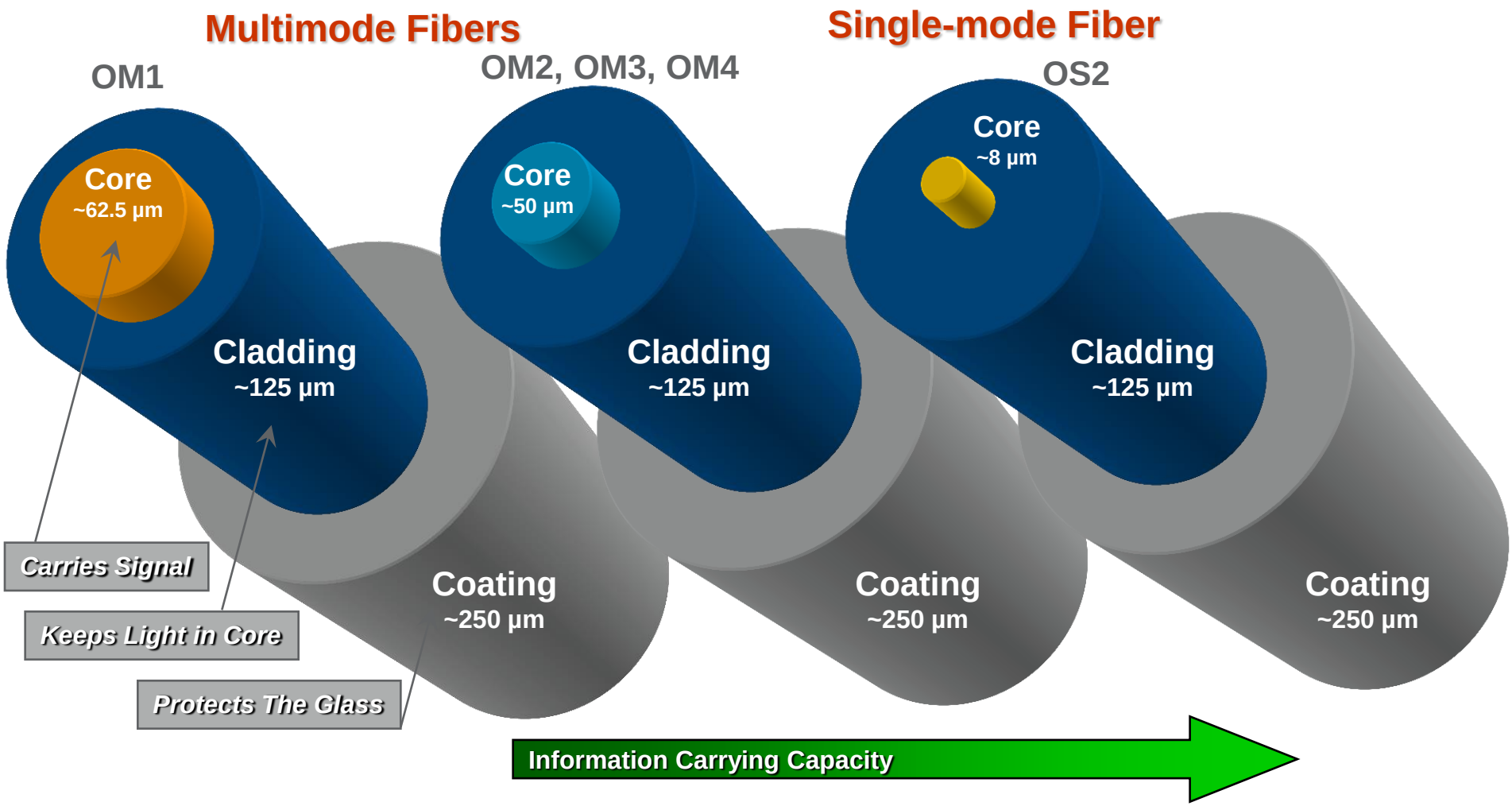
- Multimode (MM)
  - Broader Core (50-62.5µm)
  - Supports many rays / modes



Note: More Modes ≠ More Bandwidth

Fiber Optics 101

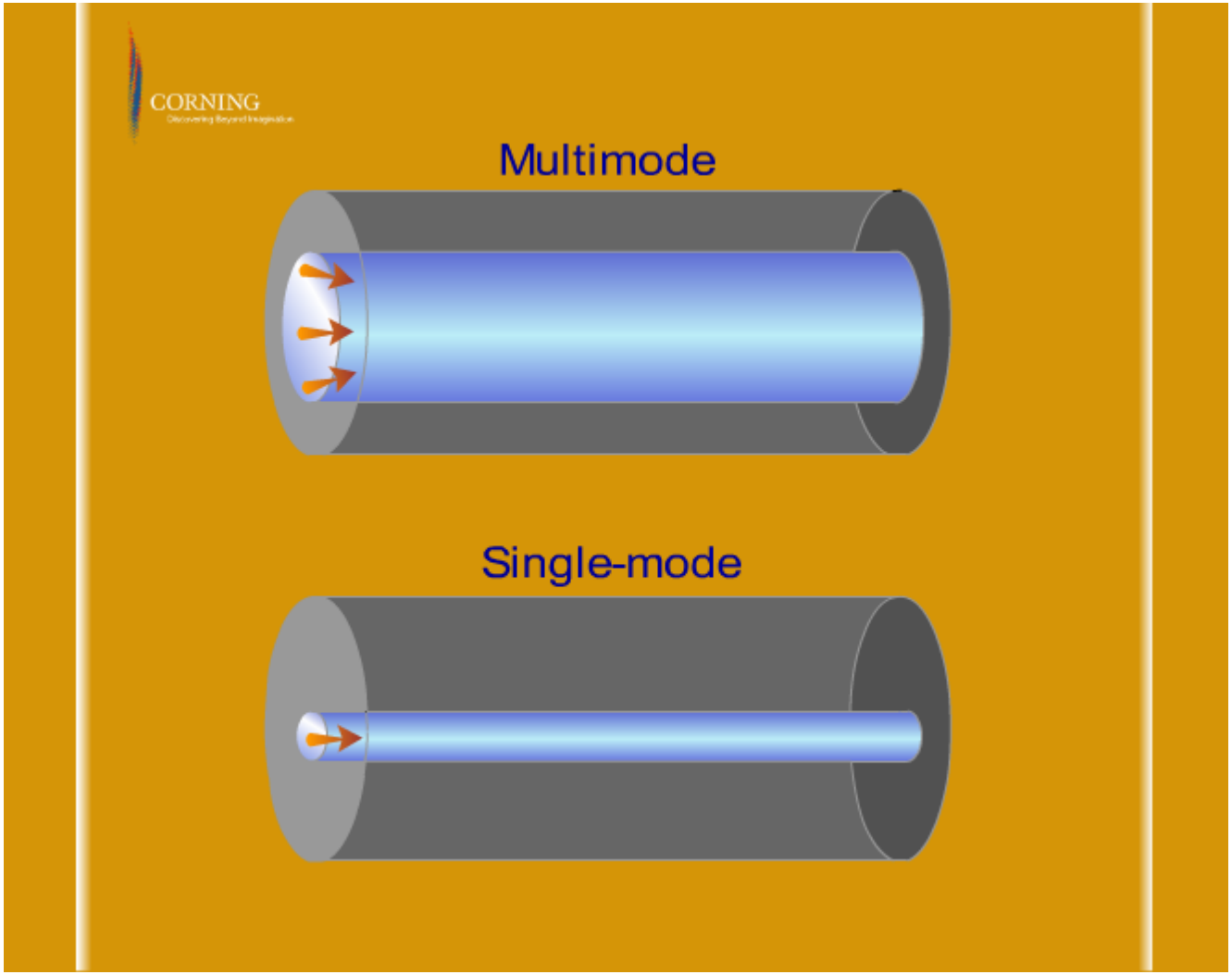
Basic Types of Fiber



Basic Types of Fiber

Multimode Fiber
- 62.5 µm
- 50 µm

Single-mode Fiber
- ~9 µm



Comparing Single-mode and Multimode Fibers

Single-mode

- Core Size (8.3 µm)
- Sources
  - Lasers
    - 1310, 1550, 1625nm
- Attenuation (typical)
  - 0.35/0.25 dB/km (1310/1550)
- Dispersion
  - No Modal Dispersion
  - **Bandwidth:**
    - Limited by electronics only

Multimode

- Core Size (62.5 or 50 µm)
- Sources
  - LED or VCSEL
    - 850 or 1300nm
- Attenuation (typical)
  - 3.5/1.5 dB/km (850/1300)
- Dispersion
  - Dominated by Modal Disp.
  - **Bandwidth:** Limited
    - Distance
    - Fiber Type
    - Source Type

Types of Single-mode and Multimode Fibers

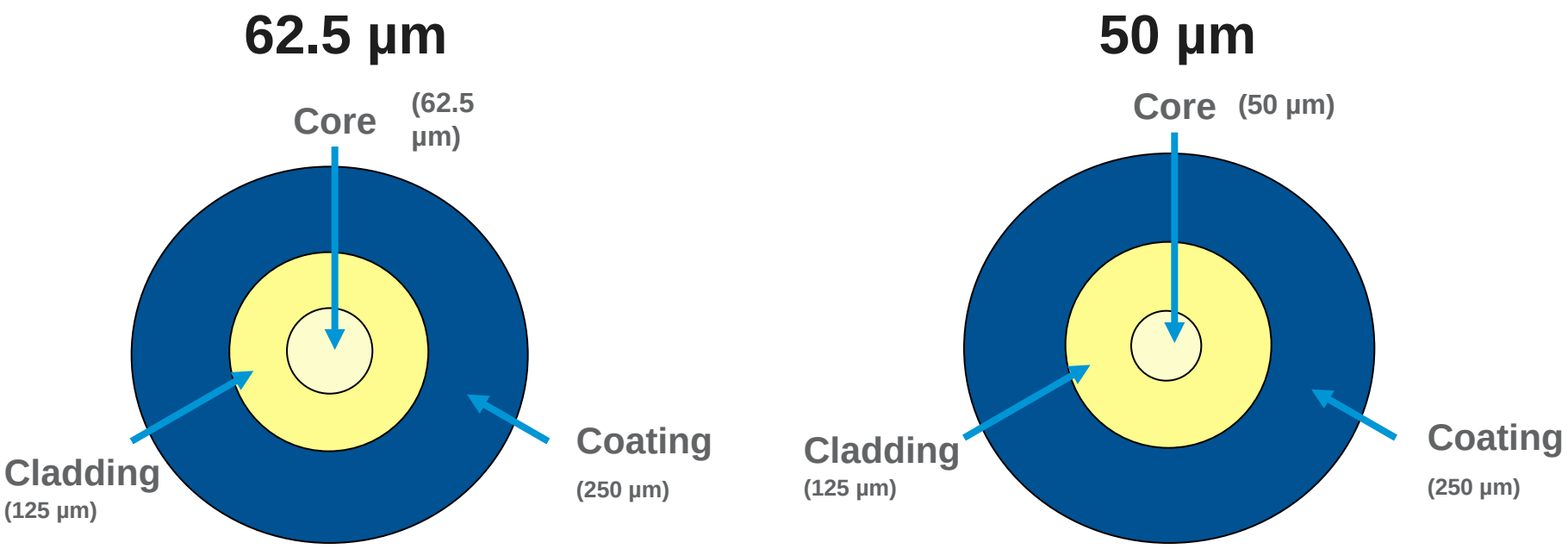
Single-mode

- OS2 – SMF28e+®
- NZ-DSF – LEAF
- Corning® ClearCurve®
  - 5 mm bend radius
  - Compatible with current SM fibers, equipment, & procedures

Multimode

- OM1 – LANscape® 62.5µm
- OM2 – LANscape® Pretium 150 (50µm)
- OM3 – LANscape® Pretium 300 (50µm)
- OM4 – LANscape® Pretium 550 (50µm)
- Corning® ClearCurve®
  - Industry leading macrobending performance below 10 mm radius
  - Available in OM2, OM3, & OM4

Comparing Multimode Fibers



Only evident physical difference is core size:

- 50 µm has greater bandwidth due to smaller core
- 50 µm has fewer modes ➔ less modal dispersion

Comparing Multimode Fibers

50 µm

- Greater bandwidth
- Extended GigE and Fiber Channel range
- Accepted by TIA/EIA-568C
- We see more 50 µm in data centers
- Industry moving toward 50-micron fiber for bandwidth

62.5 µm

- Lower bandwidth
- Decreased range at 850nm
- Accepted by TIA/EIA-568C
- Greater installed base
- Previously the only MM fiber accepted by TIA/EIA-568C

Note: MM fiber types should not be not mixed within the same LAN

Choosing Single-mode vs. Multimode Fibers

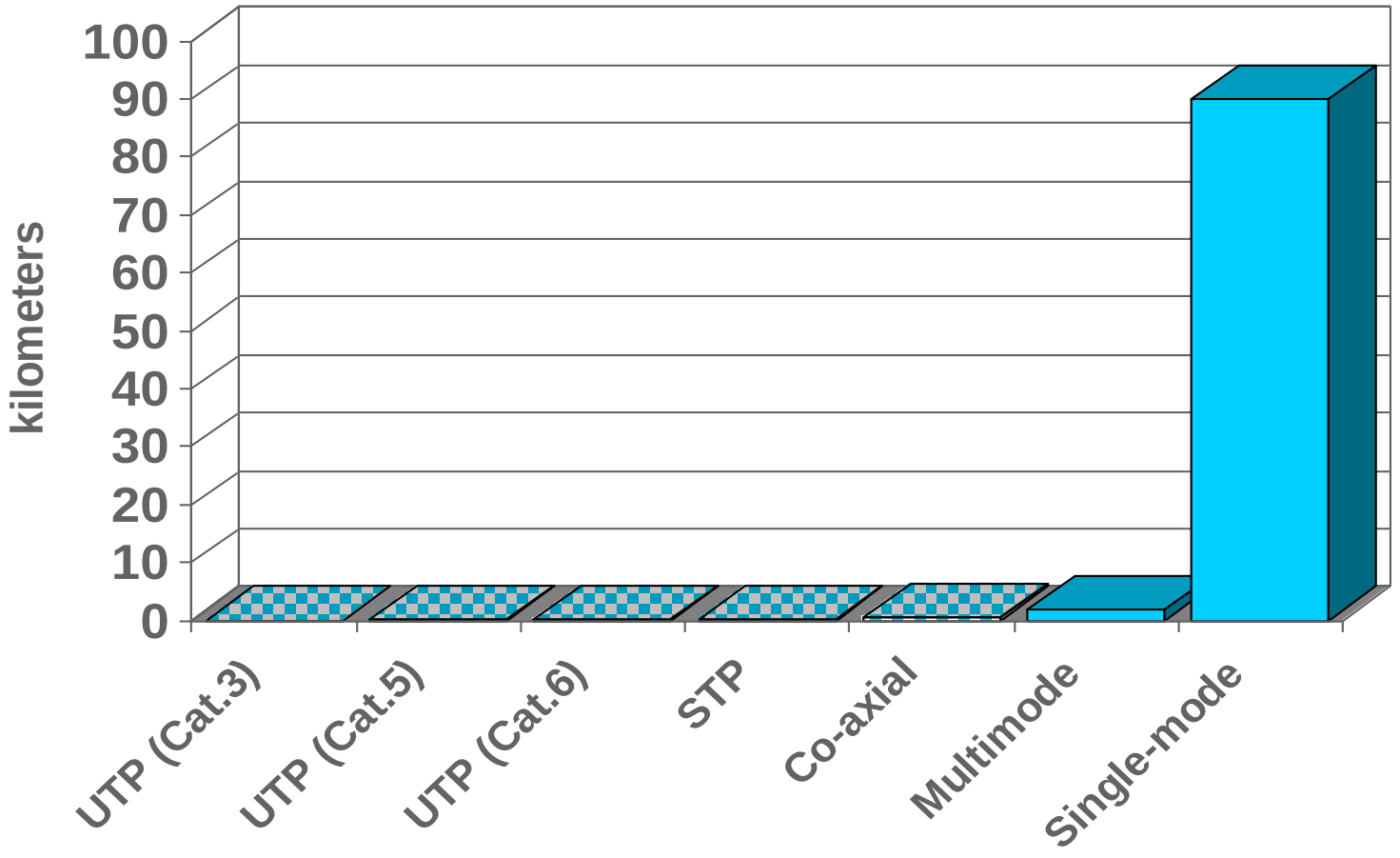
Single-mode

- Applications:
  - Backbones, longhaul, FTTx
- Advantages:
  - Longer lengths
  - Higher data rate systems
    - Video, gaming
  - Lower attenuation
  - Lower dispersion
- Disadvantages:
  - More expensive sources
  - More difficult to align cores

Multimode

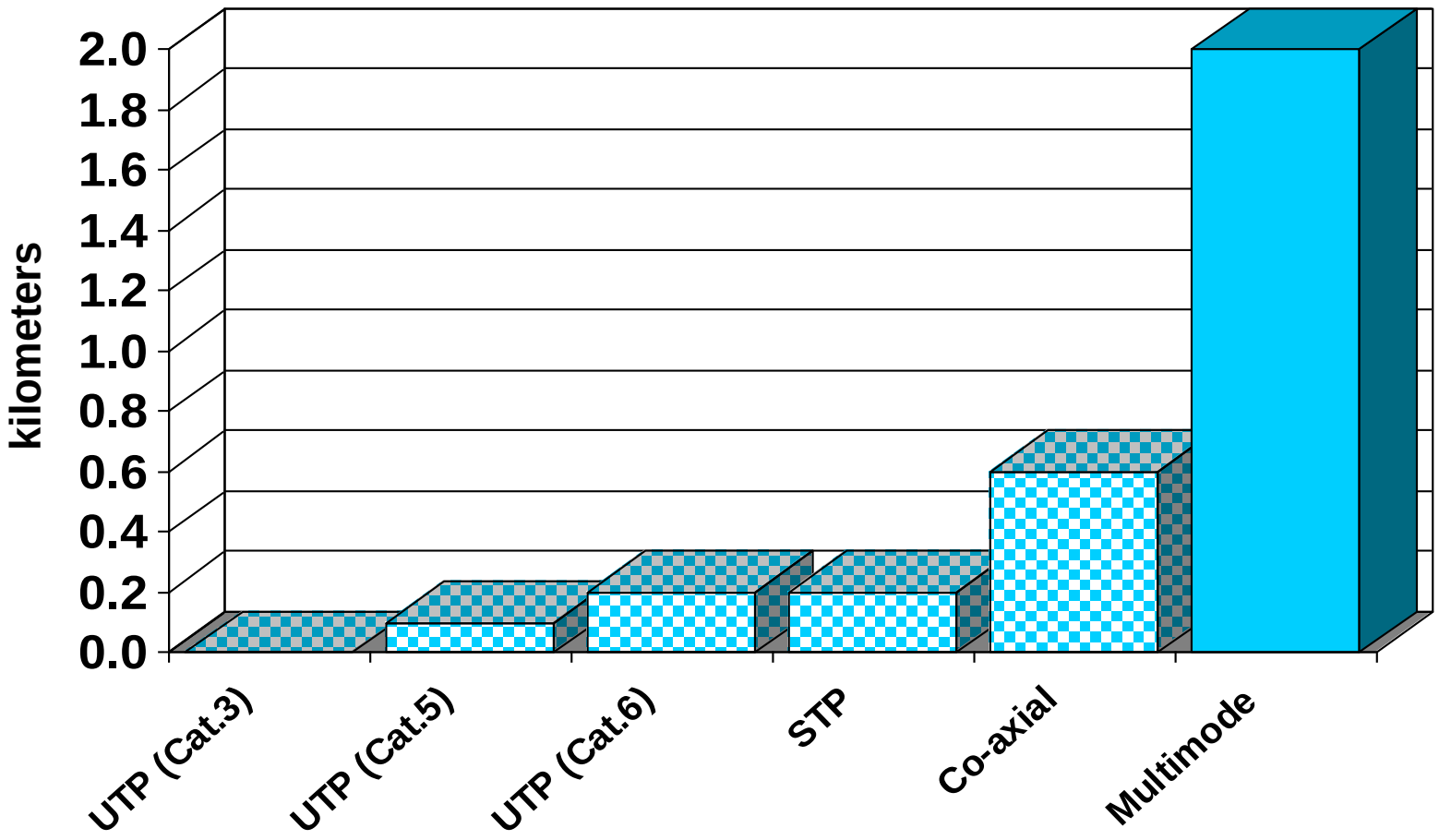
- Applications:
  - DataCenters, LAN
- Advantages:
  - Easier core alignment
  - Less expensive sources
  - Less expensive connectors / adapters
- Disadvantages
  - Shorter lengths
  - Lower data rate systems
  - Modal Dispersion
  - Higher attenuation

Why Fiber? - Longer Distances *



* Typical distance for 1 Gbps system capability

Distances * (without single-mode)



* Typical distance for 1 Gbps system capability

SM and MM Fiber Distance Capabilities

TRANSMISSION PERFORMANCE

	OM1	OM3	OM4	OS2
Optical Fiber Type	62.5 µm Multimode	50 µm Multimode	50 µm Multimode	Single-Mode
Wavelength	850 nm/1300 nm	850 nm/1300 nm	850 nm/1300 nm	1310 nm/1550 nm
Maximum Loose Tube Attenuation	3.4/1.0 dB/km	3.0/1.0 dB/km	3.0/1.0 dB/km	0.4/0.3 dB/km
Maximum Tight-Buffered Cabled Attenuation	2.8/1.0 dB/km	2.8/1.0 dB/km*	2.8/1.0 dB/km*	0.65/0.5 km
Minimum Over Filled Launch (OFL) Bandwidth	200/500 MHz•km	1500/500 MHz•km	3500/500 MHz•km	– / –
Minimum Effective Modal Bandwidth (EMB)	2200/-MHz•km	2000/- MHz•km	4700/- MHz•km	– / –
Serial 1 Gigabit Ethernet Distance	300 m/550 m	1000 m/600 m	1000 m/600 m	5000 m/ –
Serial 10 Gigabit Ethernet Distance	33 m/ -	300 m/-	550 m/-**	10000 m/40000 m

*FREEDM® LST™ cable attenuation is 3.0/1.0.
**IEEE 802.3 specifies a maximum distance of 400 meters for 10GBASE-SR transmission. 550 meters is considered an acceptable engineered-length distance utilizing a complete Corning solution.
Contact Corning Customer Care at 800-743-2675 for information.

Enterprise Networks Core Products | 6

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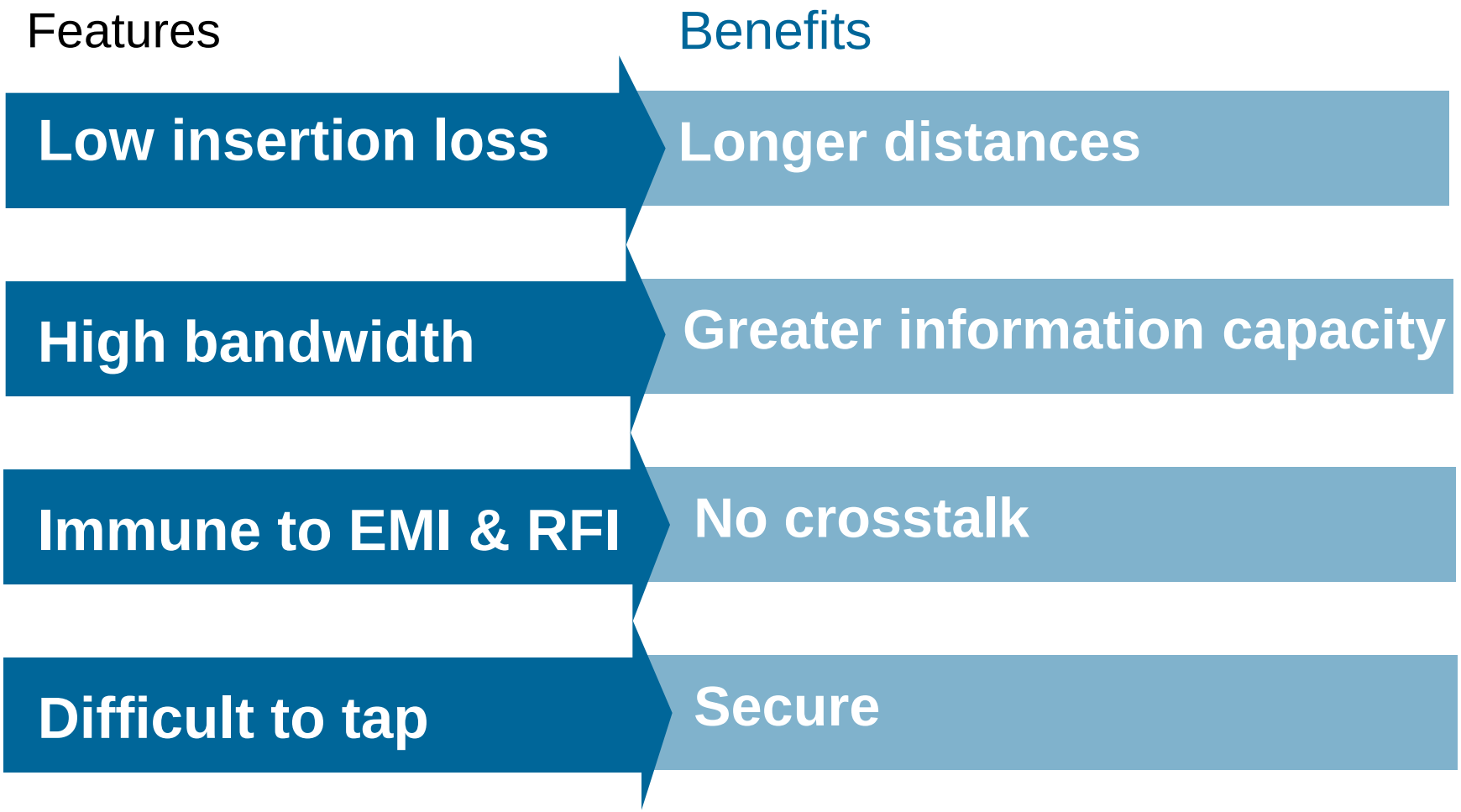
Benefits of Optical Fiber



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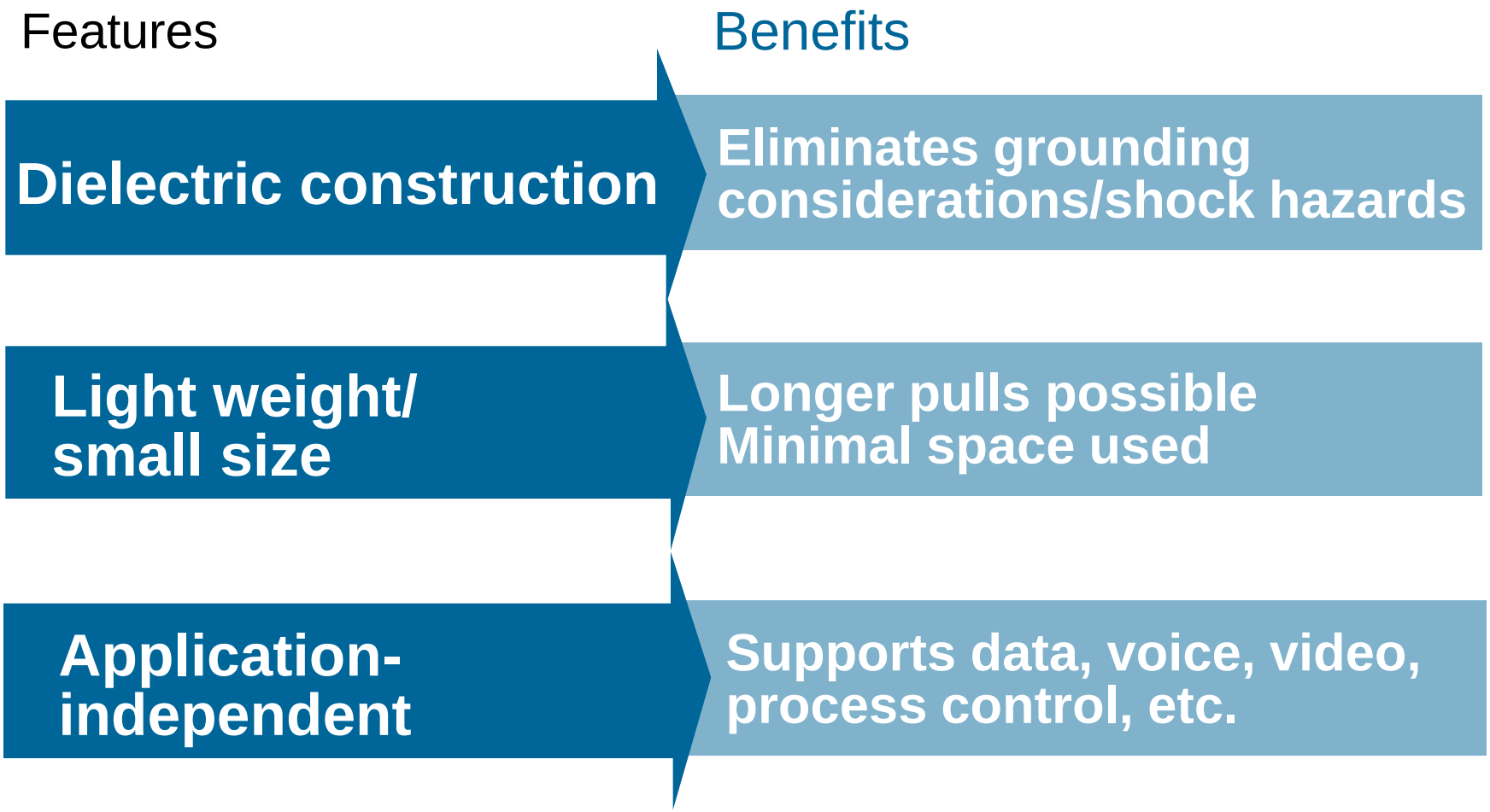
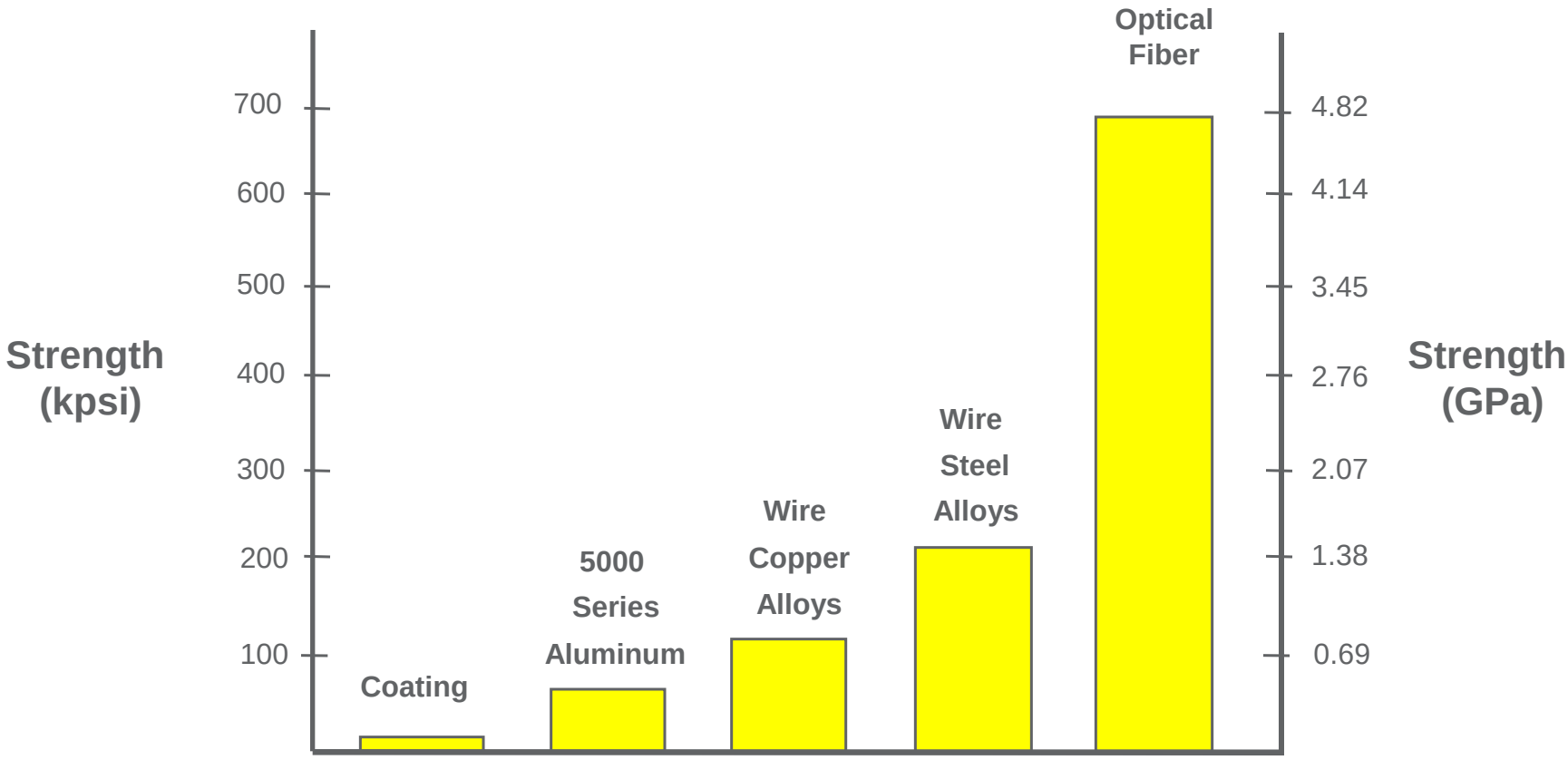


Intrinsic Strength…the Facts!

- Measured fiber intrinsic strength compared to other materials

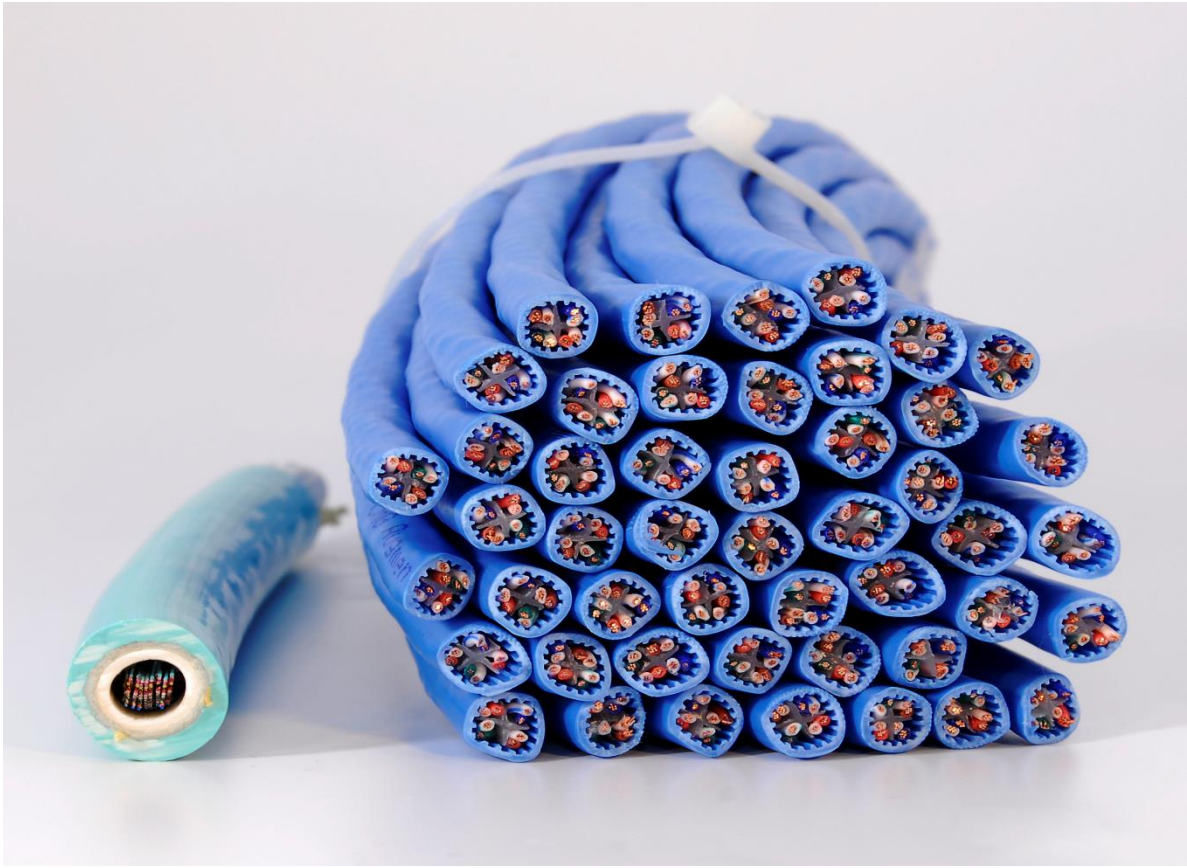


Fiber Optics 101

Fiber versus Copper

- A fiber optic cable with the **same bandwidth capacity** as a comparable copper cable is less than **1% of both the size and weight**

Fiber optic cable vs CAT6 copper cable



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What *is* Fiber Optic Cable?

General Definition:

Fibers packaged and bundled together for maximum mechanical and physical protection.

Standard Types:

- Indoor Tight Buffered Cables
- Outdoor Cables
- Indoor/Outdoor Cables
  - Tight Buffered
  - Loose Tube

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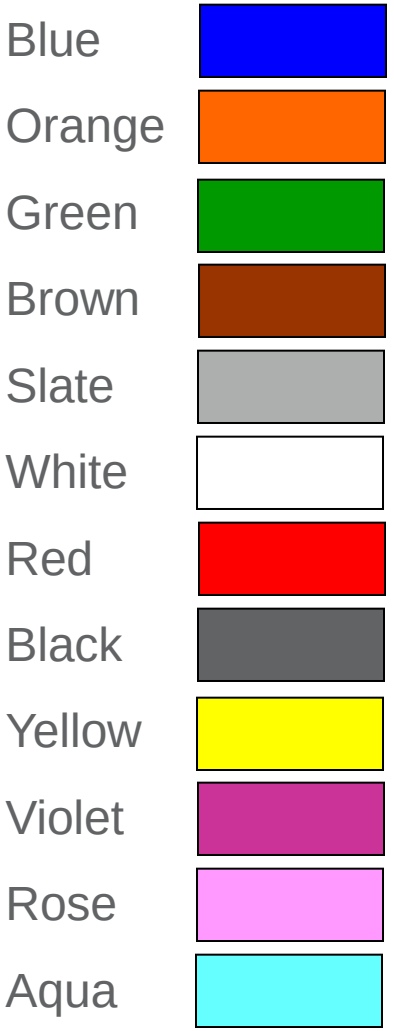
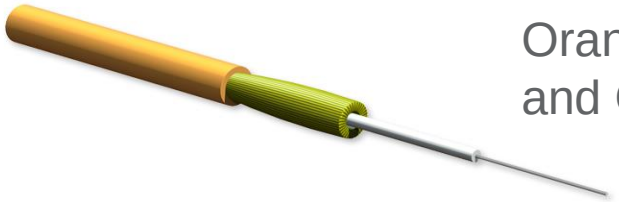
Fiber Coloring

- Purpose
  - Provides fiber identification
- Coloring ink applied directly on the coated fiber.
- Standard US Color Code
  - Blue, orange, green, brown, slate, white, red, black, yellow, violet, rose, aqua



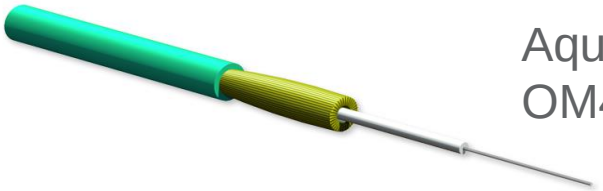
Cable Jacket Identification

- Purpose
  - Provides fiber type identification (Indoor Cables)
  - Provides UV protection (Outdoor Cables)

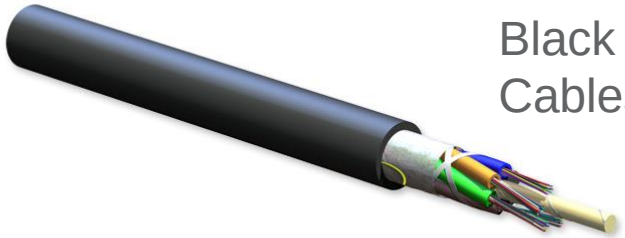


Orange = OM1 and OM2

Yellow = OS2 (SM)



Aqua = OM3 and OM4



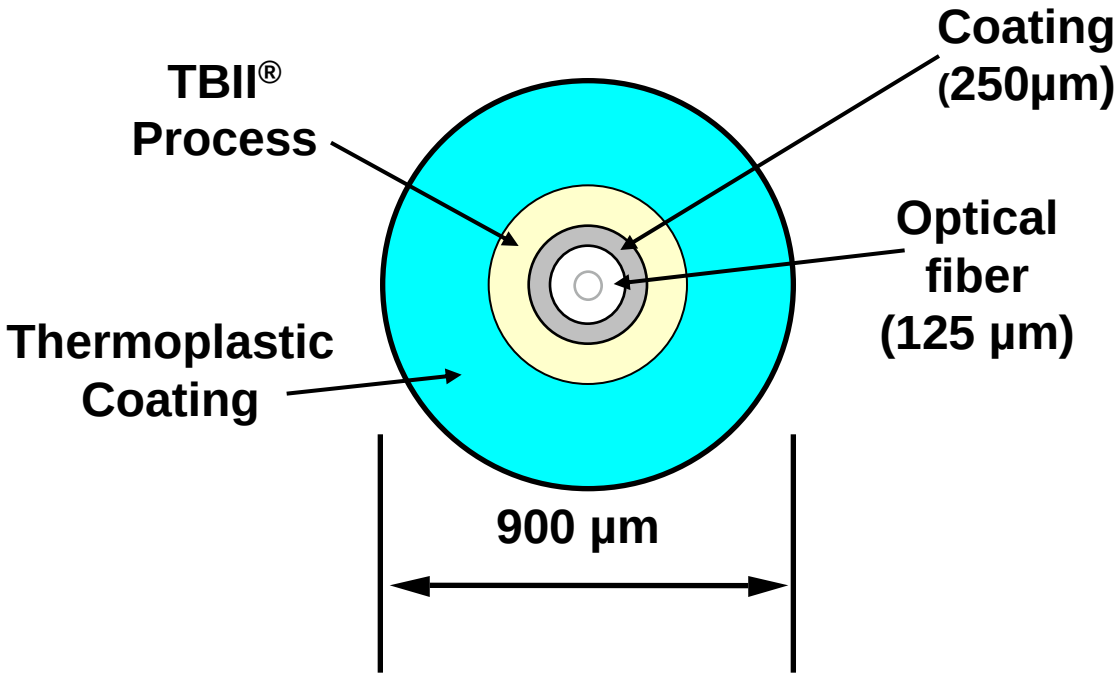
Black = Outdoor Cables

Indoor Tight Buffered Cable

- Primarily used indoors (exception: FREEDM® One)
  - Building and data center backbones
  - Horizontal applications
  - Patch cords and equipment cables
- Meet applicable flame listing requirements
- Increased flexibility
- Easy to field-terminate
- Variety of fiber counts and cable designs

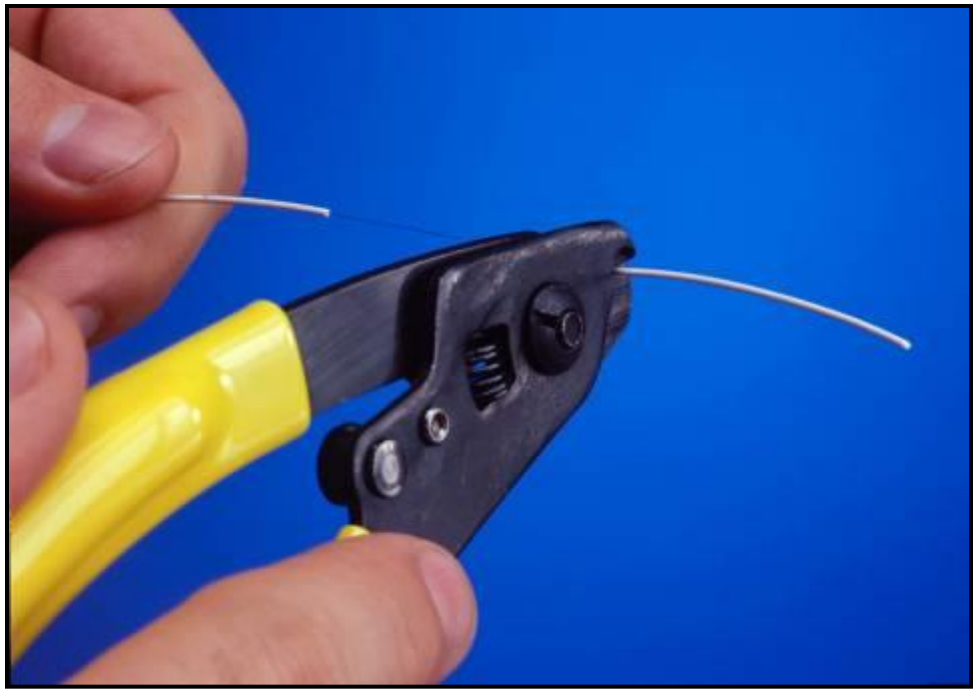
Tight-Buffered Fiber Construction

- Buffer material applied directly to the 250 µm fiber to obtain a 900 µm outer diameter
- To construct cable, 900 µm may be
  - Stranded or unitized
- Lacks environmental and mechanical robustness of Loose Tube cable

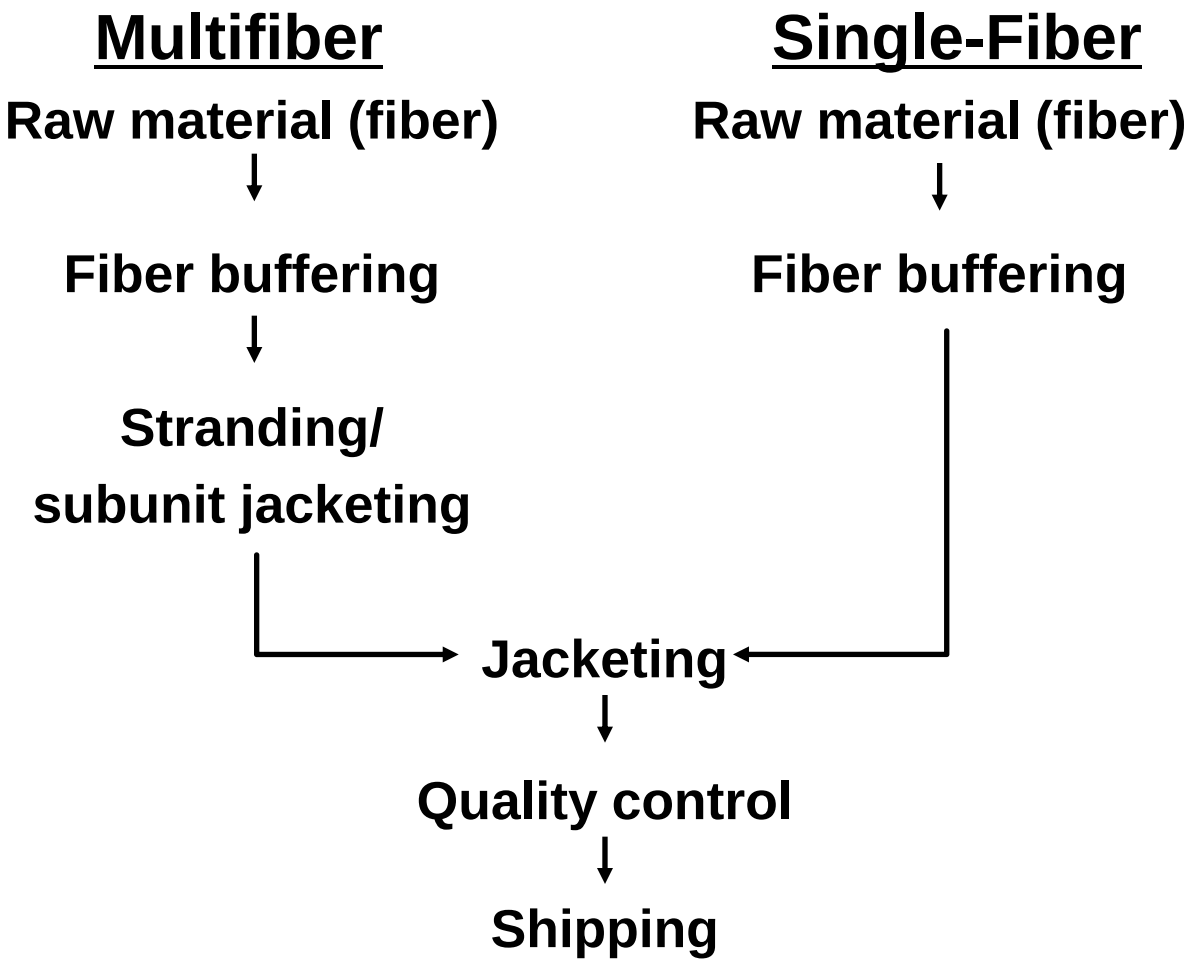


Tight-Buffered Fiber Construction

- TBII® Buffered Fiber uses a patented process that allows for easy removal of the buffering material for splicing or connectorization.

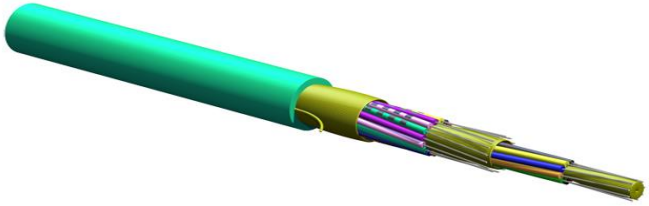


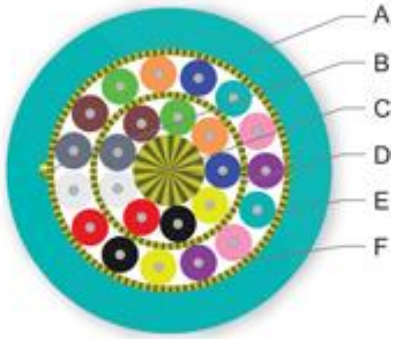
Indoor Tight-Buffered Cable Manufacturing



Common Indoor Tight Buffered Cables

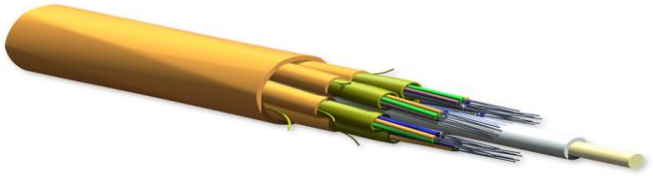
MIC® Cable

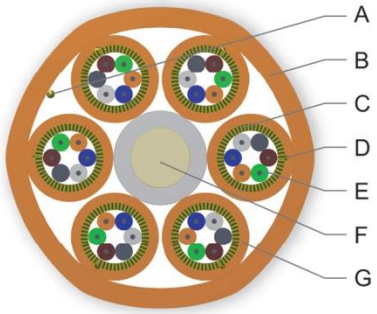




Legend
A - Flame-Retardant Outer Jacket
B - Ripcord
C - Dielectric Strength Members
D - Dielectric Strength Members
E - Tight-Buffered Fiber
F - Dielectric Strength Members

Unitized MIC® Cable

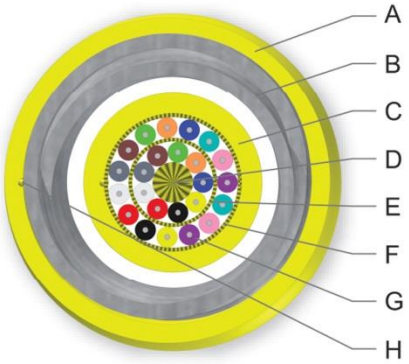




Legend
A - Ripcord
B - Flame-Retardant Outer Jacket
C - Dielectric Strength Members
D - Ripcord
E - Tight-Buffered Fiber
F - Dielectric Central Element
G - Flame-Retardant Subunit Jacket

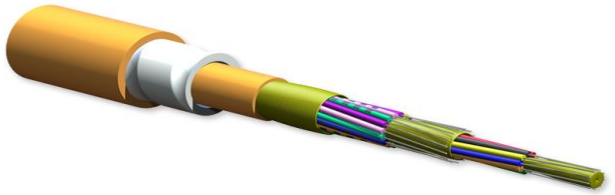
Common Indoor Tight Buffered Cables

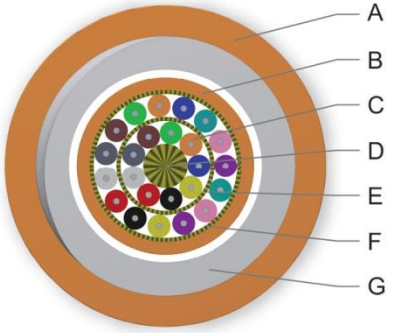
MIC® Interlocking Cable



Legend
A - Flame-Retardant Outer Jacket
B - Interlocking Armor
C - Flame-Retardant Inner Jacket
D, E, & F - Dielectric Strength Members
G - Tight-Buffered Fiber
H - Ripcord

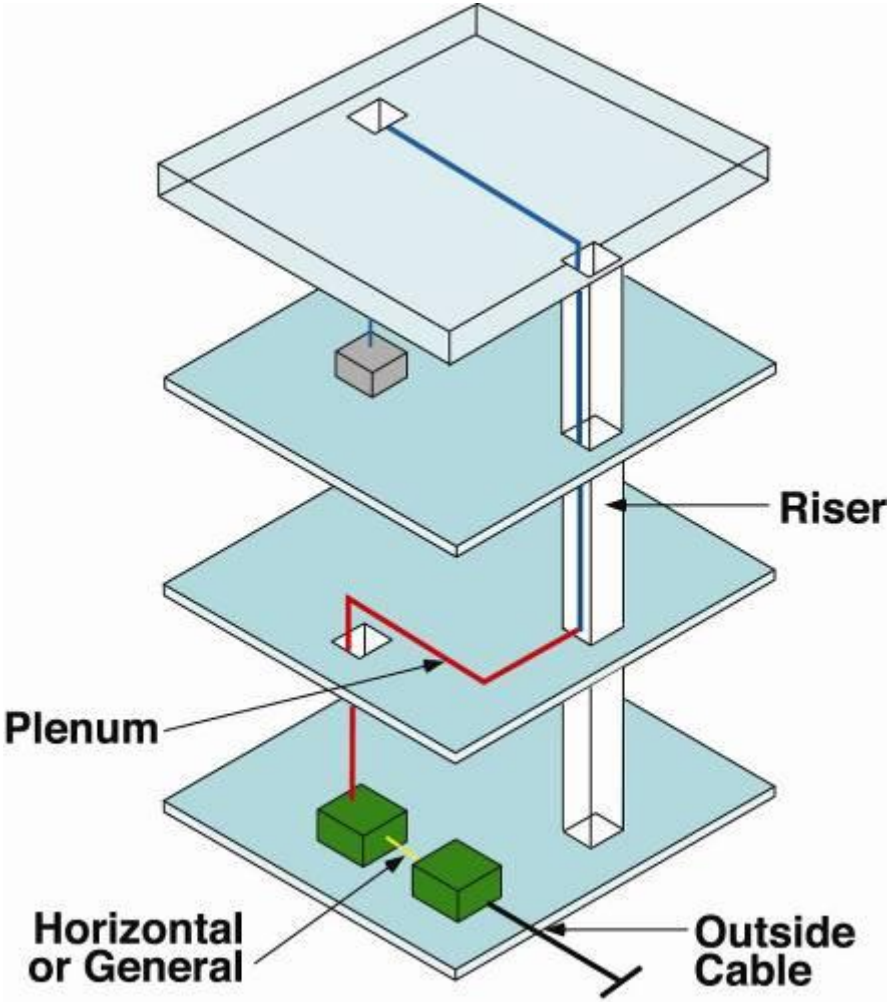
MIC® DX Armored Cable





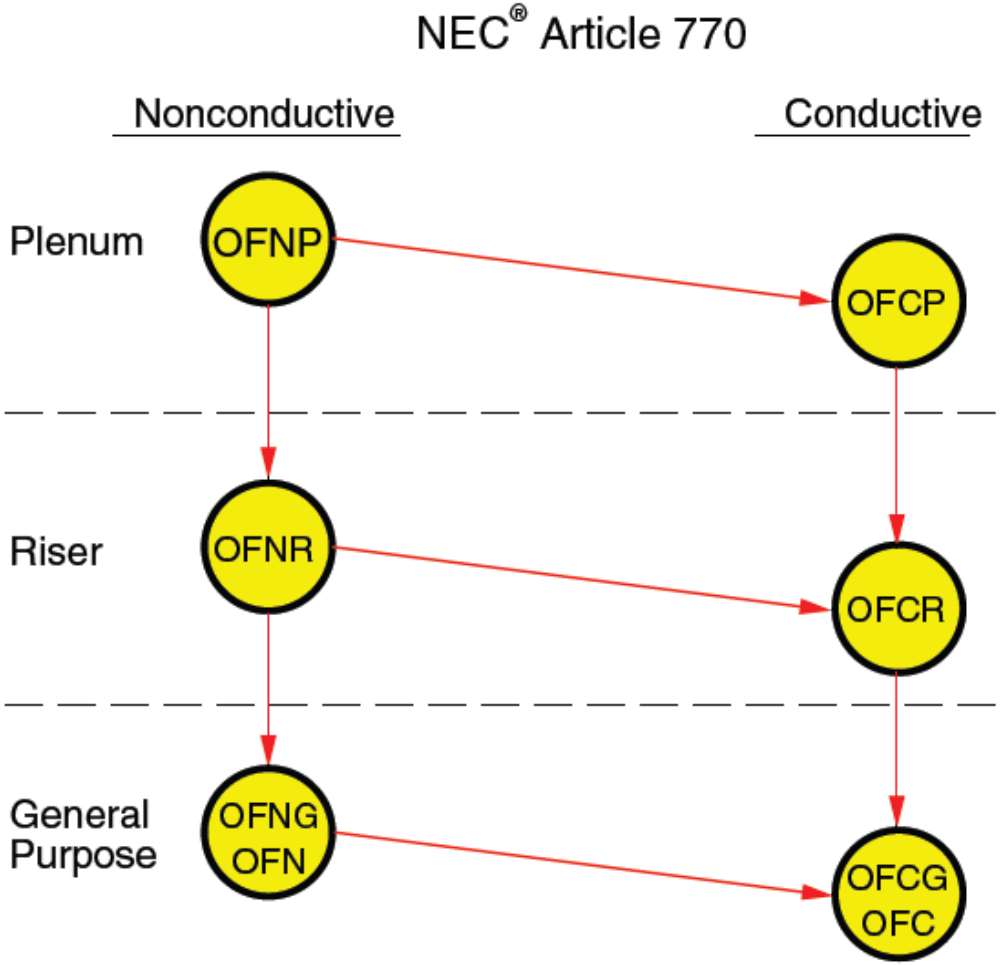
Legend
A - Flame-Retardant Outer Jacket
B - Flame-Retardant Inner Jacket
C - Tight-Buffered Fiber
D, E, & F - Dielectric Strength Members
G - Dielectric Armor

Tight Buffered Considerations – Flame Ratings



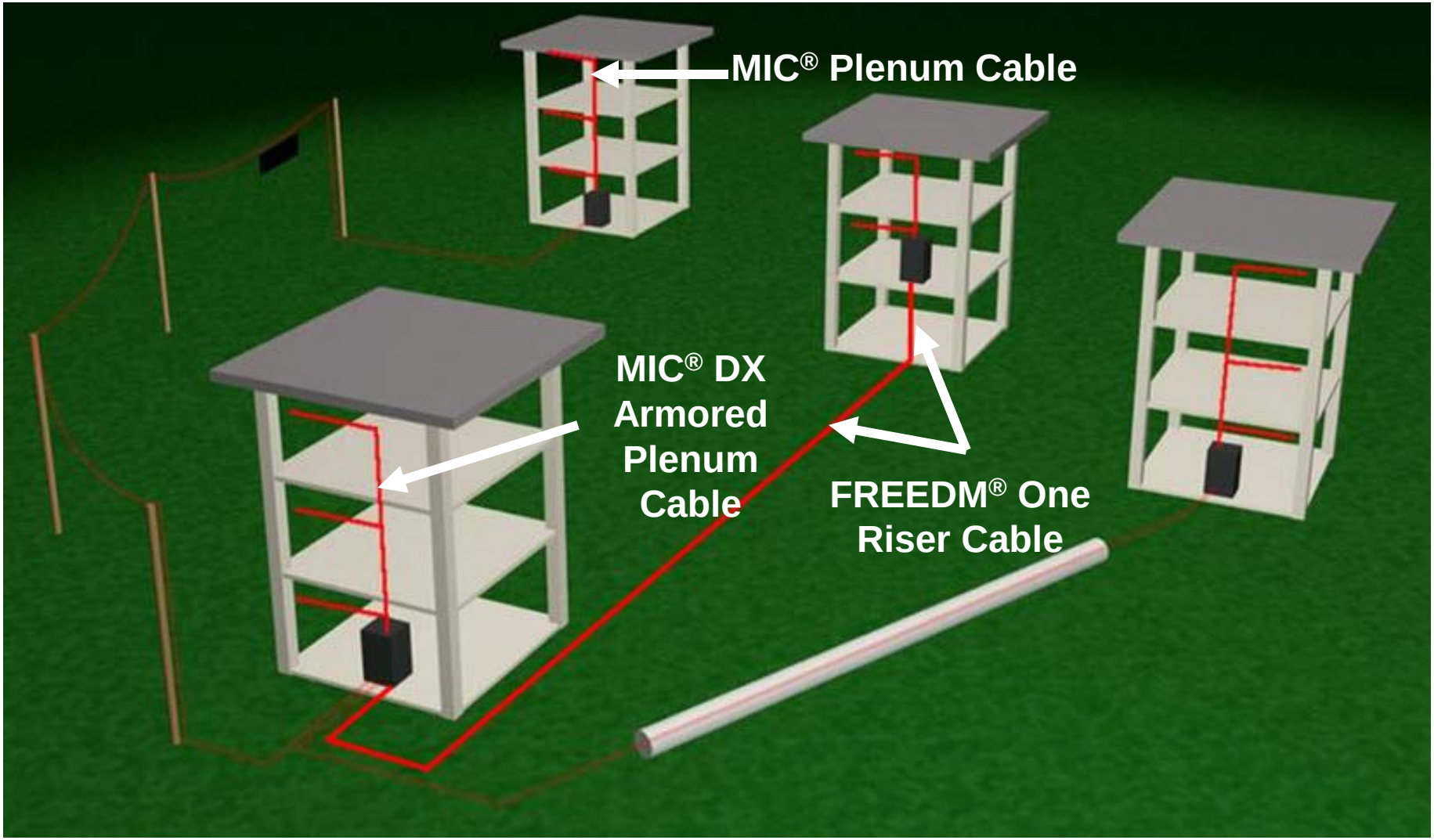
- National Electric Code (NEC)
- OFNP = Plenum
  - Highest rating – plenum air handling spaces
- OFNR = Riser
  - Middle rating – vertical cable runs
- OFN = General
  - Lowest rating – horizontal cable runs (non-plenum or riser)
- Outside Plant Cable is not flame rated and up to 50 feet can be inside a building

Tight Buffered Considerations – Flame Ratings



Fiber Optic Cable 101

Tight Buffered Cable Applications

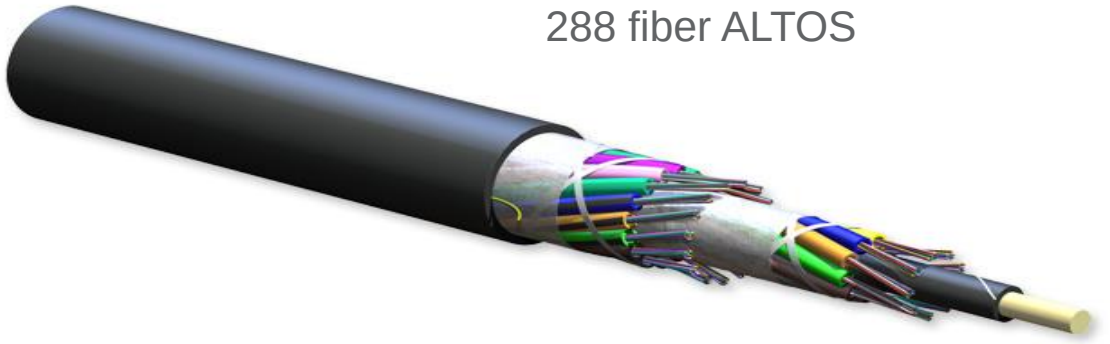


Fiber Optic Cable 101

Outdoor Loose Tube Cables

- Designed for harsh outdoor installations
- Tensile Strength Elements
  - Central member
    - Dielectric or Steel
    - Maintains bend radius
  - Aramid yarns provide tensile strength
- Cable Waterblocking Material
- Ripcord for accessing core
- Jacket
  - Polyethylene
  - Protection of cable core
  - Chemical resistance
  - UV and abrasion resistance

72 fiber ALTOS



288 fiber ALTOS

Outdoor Loose Tube Cable Manufacturing

Stranded Loose Tube

Raw material (fiber)

↓

Fiber coloring

↓

Fiber buffering

↓

Stranding

↓

Jacketing

↓

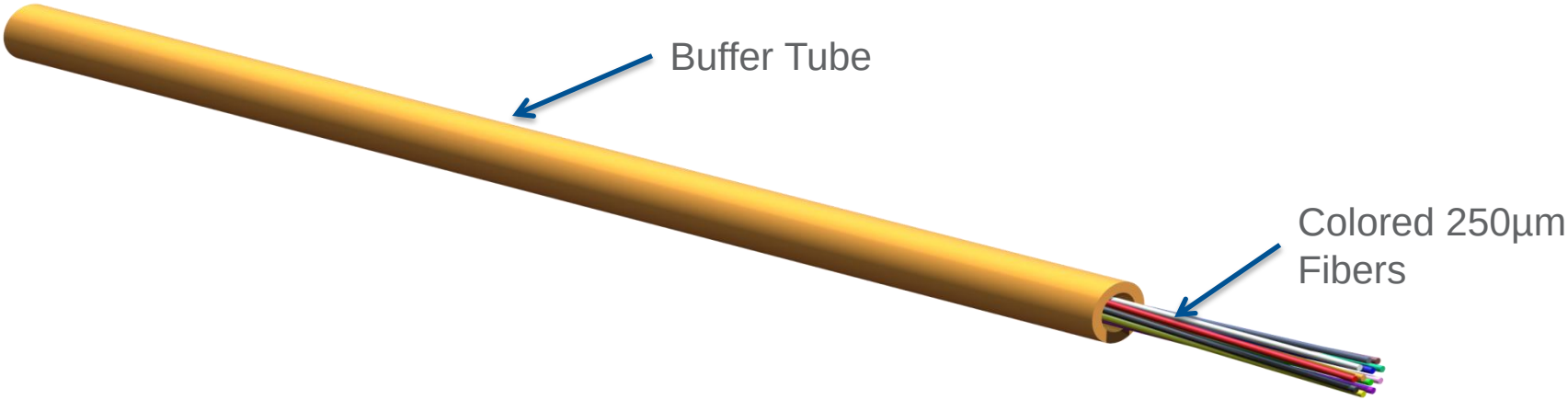
Quality control

↓

Shipping

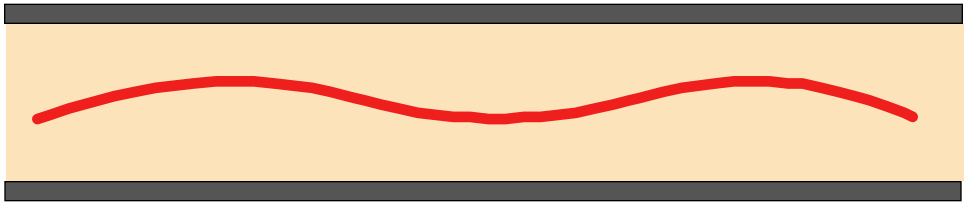
Outdoor Loose Tube Cable Construction

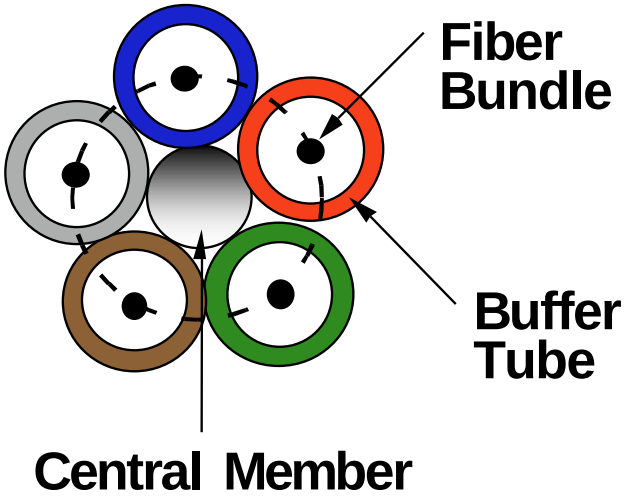
- Buffer Tube
  - 250 µm fibers placed in buffer tube
- Gel-free design is fully waterblocked using craft-friendly water-swellable materials
  - Makes cable access simple and requiring no clean up



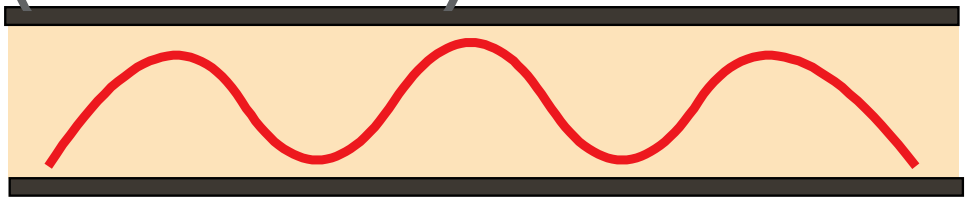
Loose Tube Cable Fiber Buffering

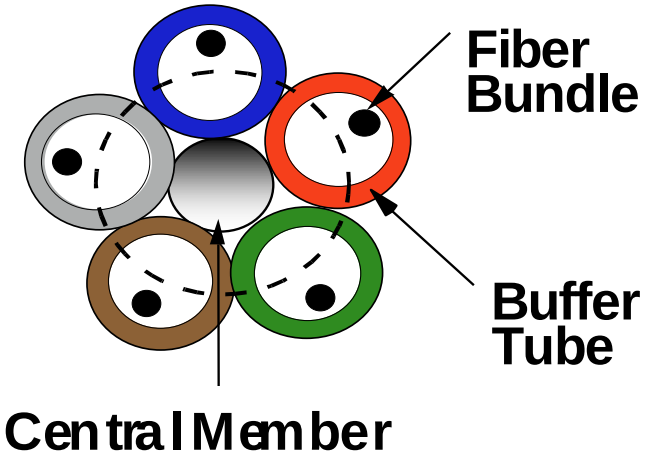
Neutral State





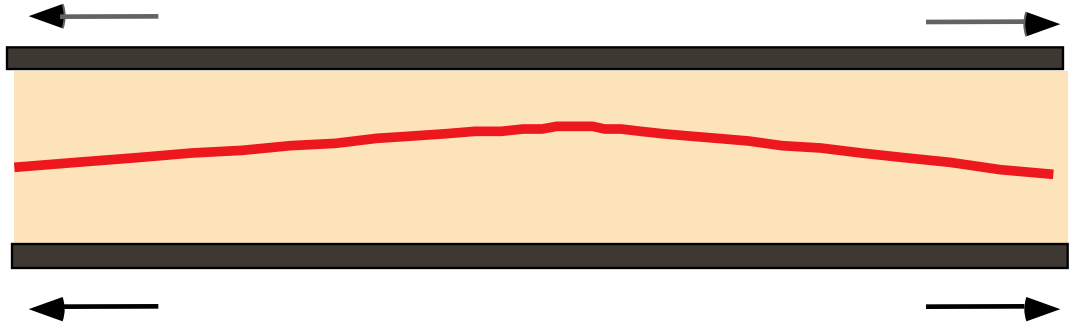
Buffer Tube Contraction (Cold Weather)

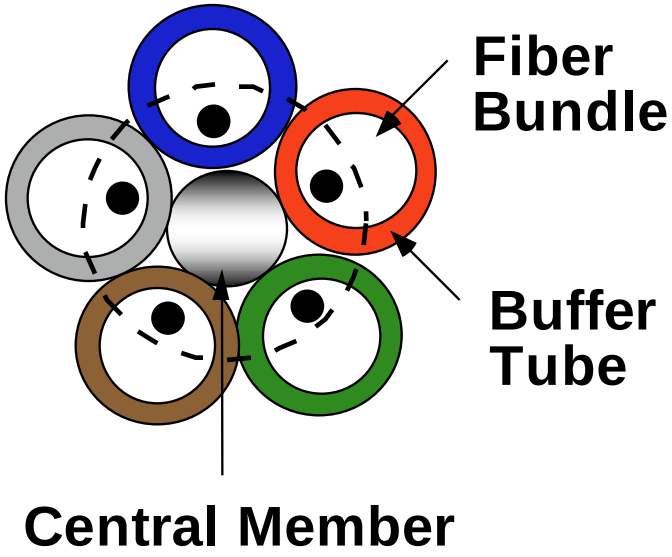




Loose Tube Cable Fiber Buffering

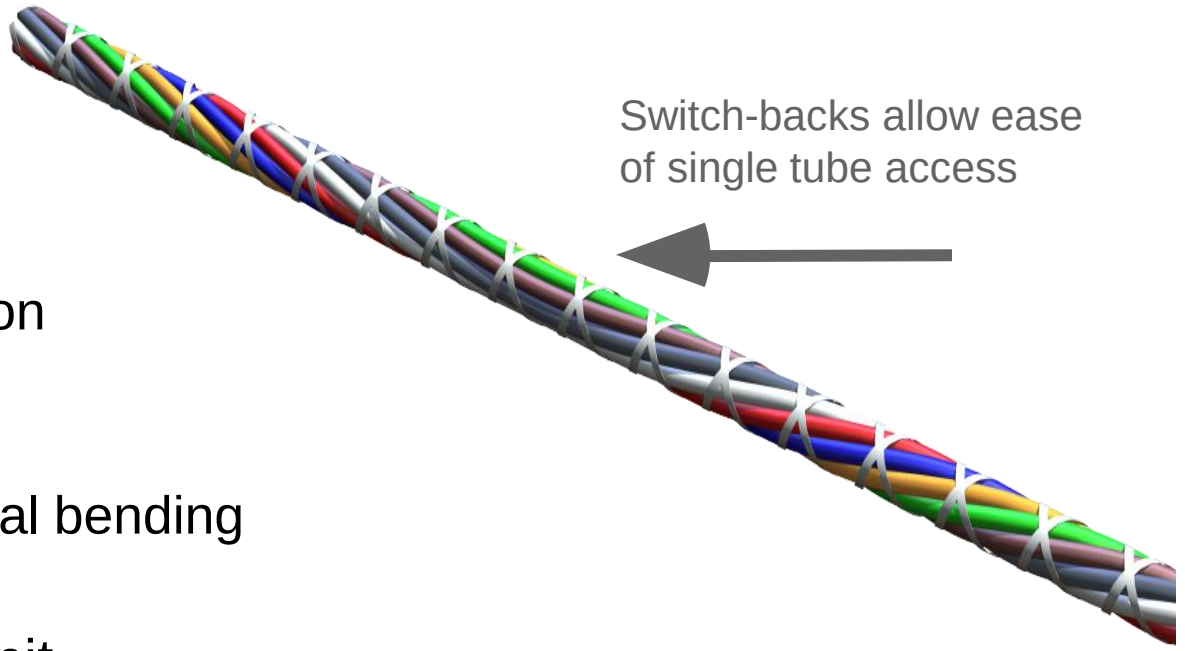
Buffer Tube Expansion





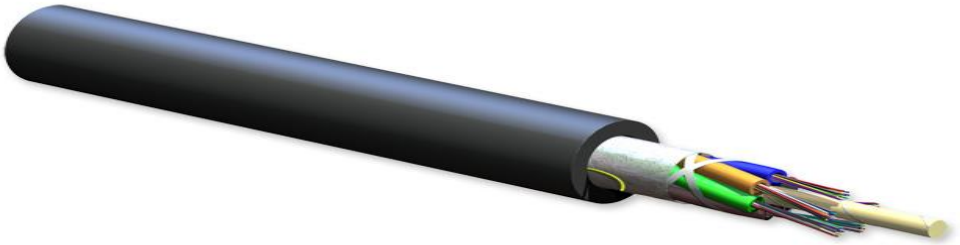
Outdoor Loose Tube Cable Stranding

- **Central member**
  - Tensile strength
  - Anti-buckling
  - Steel or dielectric
- **SZ stranding**
  - Tensile force reduction
  - Ease of tube access
    - Midspan access
  - Eliminates preferential bending
- Completed stranded unit sometimes called “**cable core**”

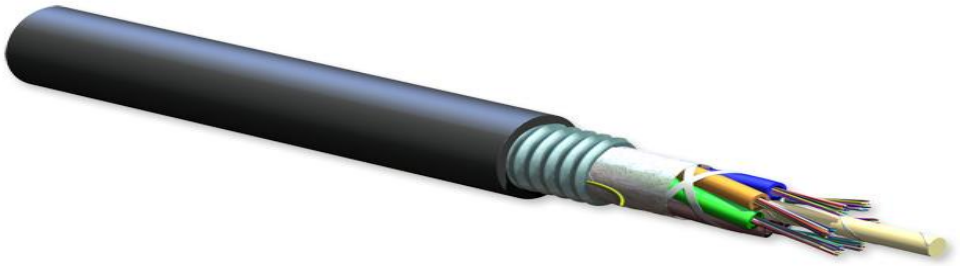


Outdoor Loose Tube Cable Jacketing

- **Jacket**
  - Polyethylene
  - Protection of cable core
  - Chemical resistance
  - UV and abrasion resistance

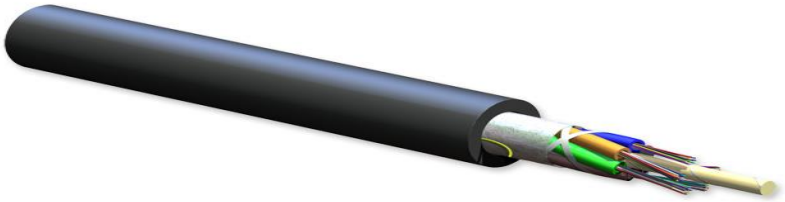


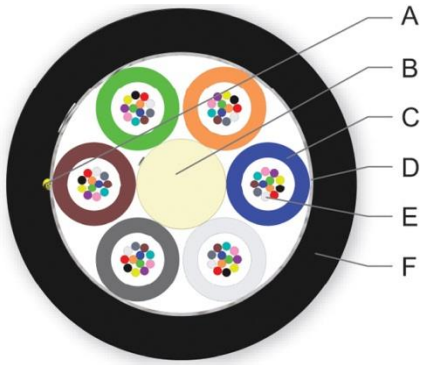
- **Jacket over armor**
  - Same outer jacket protection
  - Armor
    - Corrugated steel tape
    - Provides rodent resistance
    - Provides mechanical protection
    - Used for toning cable



Common Outdoor Loose Tube Cables

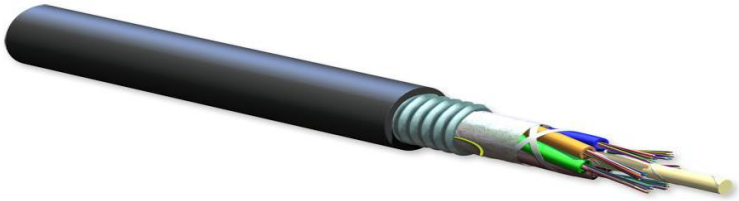
ALTOS® Dielectric Cable

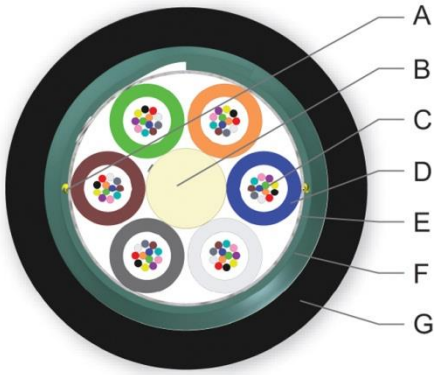




Legend
A - Ripcord
B - Dielectric Central Member
C - Buffer Tube
D - Dielectric Strength Members
E - Fiber
F - Polyethylene (PE) Outer Jacket

ALTOS® Armored Cable





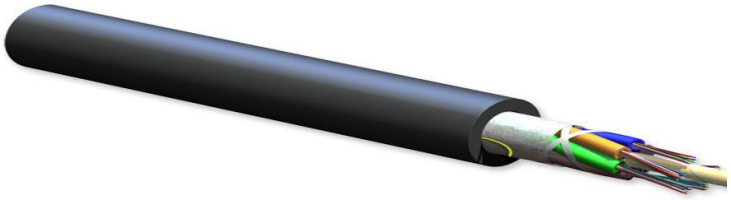
Legend
A - Ripcord
B - Dielectric Central Element
C - Fiber
D - Buffer Tube
E - Water-Swellable Tape
F - Corrugated Steel Armor
G - Polyethylene (PE) Outer Jacket

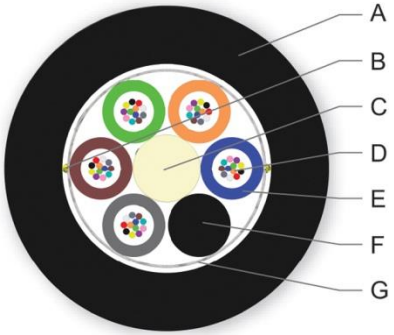
Indoor/Outdoor Cables (Loose Tube & Tight Buffered)

- FREEDM® Cables
  - Plenum or Riser rated options
  - All dielectric or armored
  - Eliminates need for transition splice
  - Aerial, conduit, & direct buried if armored
- UV-resistant outer jacket
- Water-blocked cable and buffer tubes
- High tensile strength to protect fibers during installation
- Extreme temperature tolerance

Common Indoor/Outdoor Loose Tube Cables

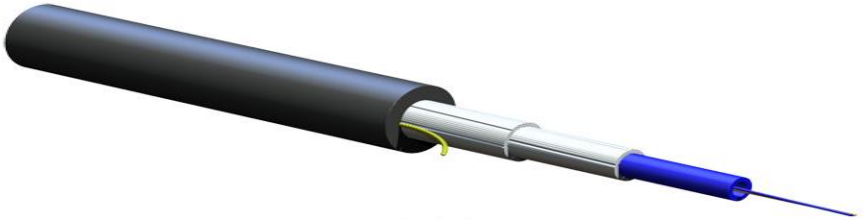
FREEDM® Loose Tube

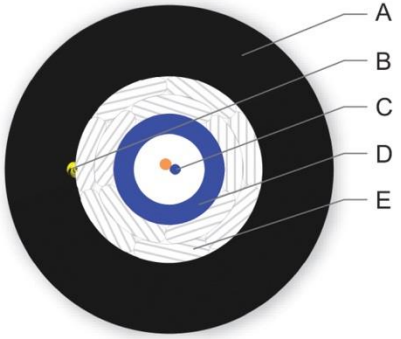




Legend
A - FR / UV-Resistant Outer Jacket
B - Ripcord
C - Dielectric Central Element
D - Fiber
E - Buffer Tube
F - Filling Element
G - Water-Swellable Tape

FREEDM® LST

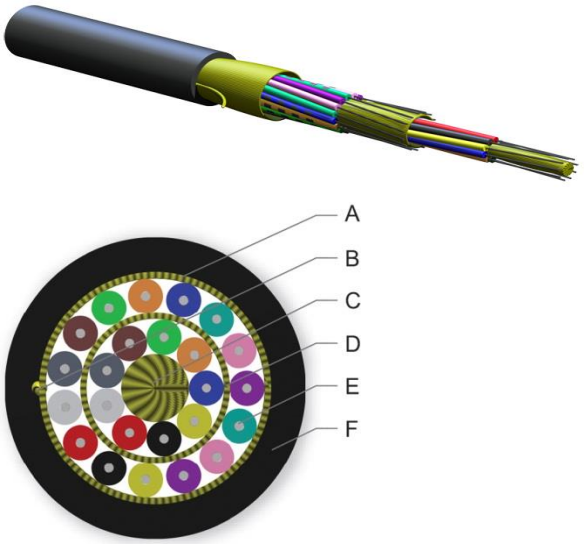




Legend
A - FR / UV-Resistant Outer Jacket
B - Ripcord
C - Fiber
D - Buffer Tube
E - Dielectric Strength Members

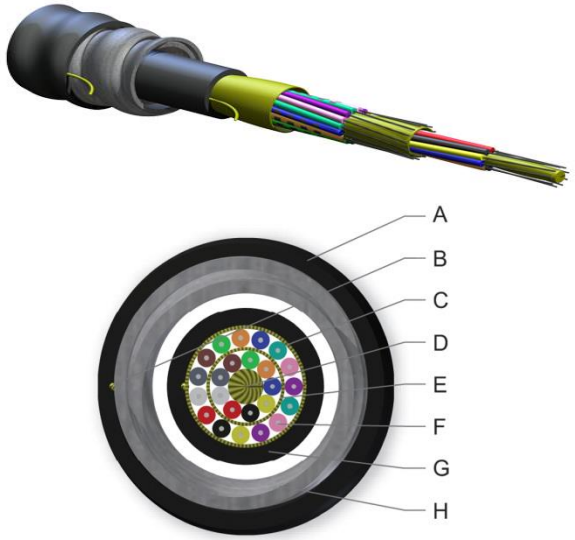
Common Indoor/Outdoor Tight Buffered Cables

FREEDM® One Cable



Legend
A - Dielectric Strength Yarns
B - Ripcord
C - Dielectric Strength Yarns
D - Dielectric Strength Yarns
E - Tight-Buffered Fiber
F - FR / UV-Resistant Outer Jacket

FREEDM® One Interlocking Armor Cable



Legend
A - FR / UV-Resistant Outer Jacket
B - Ripcord
C - Dielectric Strength Yarns
D - Dielectric Strength Yarns
E - Dielectric Strength Yarns
F - Tight-Buffered Fiber
G - FR / UV-Resistant Inner Jacket
H - Interlocking Armor

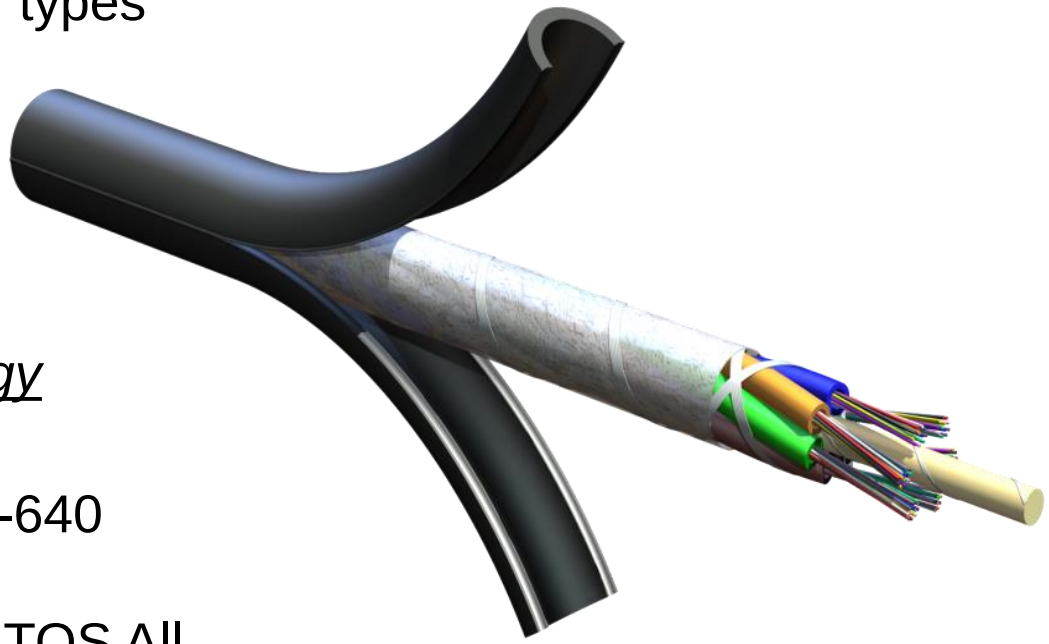
Fiber Optic Cable 101

Indoor/Outdoor Colored Jackets

- **Which Indoor/Outdoor cables?**
  Industrial LSZH™, ALTOS LSZH, FREEDM® One, FREEDM LST™ and FREEDM Loose Tube (</= 72f) Cables.
- **What color options are available?**
  Any of the 12 standard colors defined by TIA/EIA-598, “Optical Fiber Cable Color Coding” are available: Blue, Orange, Green, Brown, Slate, White, Red, Black, Yellow, Violet, Rose, Aqua.

ALTOS® Cable with FastAccess™ Technology

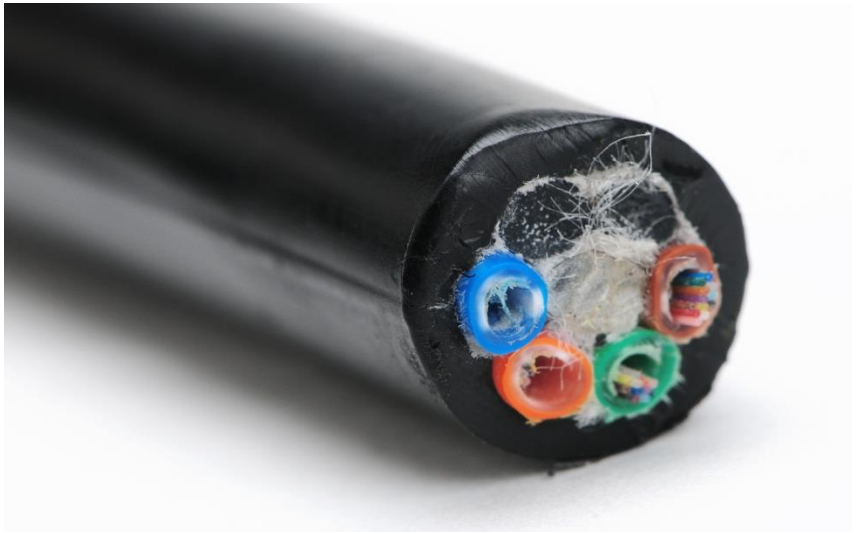
- Co-extruded jacket feature allows easy jacket removal
- Gel-Free All Dielectric only
- Available with all standard fiber types
- **Ripcord will be removed**
- No stripes
- Special print statement
  - *ALTOS® Cable with FastAccess(TM) Technology*
- Meets OSP cable standards
  - Telcordia GR-20 and ICEA-640
  - Same specs, weights, and dimensions as standard ALTOS All-Dielectric Gel-Free cable



Fiber Optic Cable 101

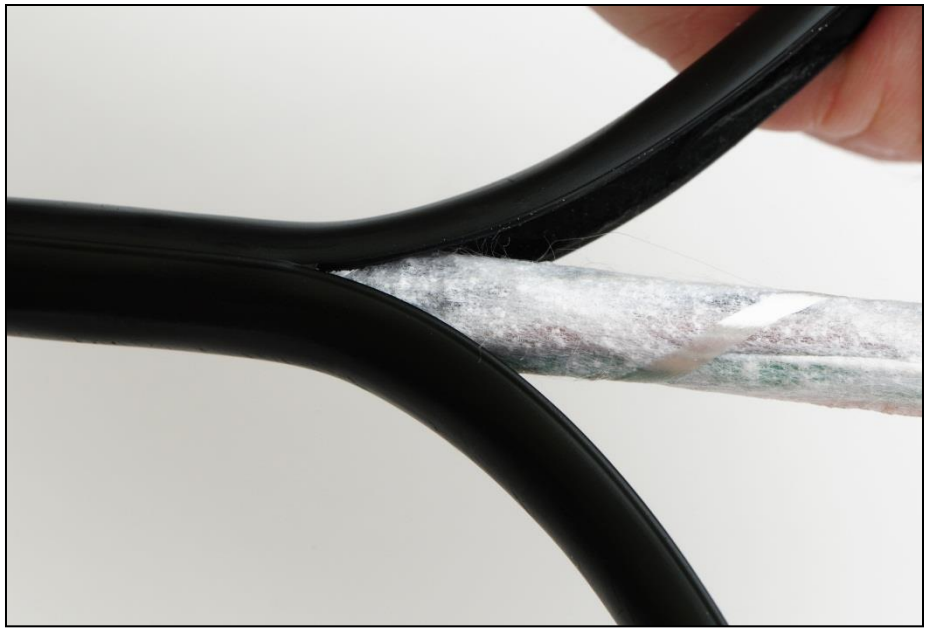
ALTOS® Cable with FastAccess™ Technology

- Enterprise Networks will take to market at Fall BICSI
  - Week of Sept. 16, 2012
- Value Prop
  - Simple/quick cable access
  - Limits mistakes for inexperienced craft
  - **No price increase**
  - Differentiated cable product when combined with gel-free technology
  - Provides an advantage for 65% of:
    - Enterprise Market
    - Outside Plant Market
    - Loose Tube Market



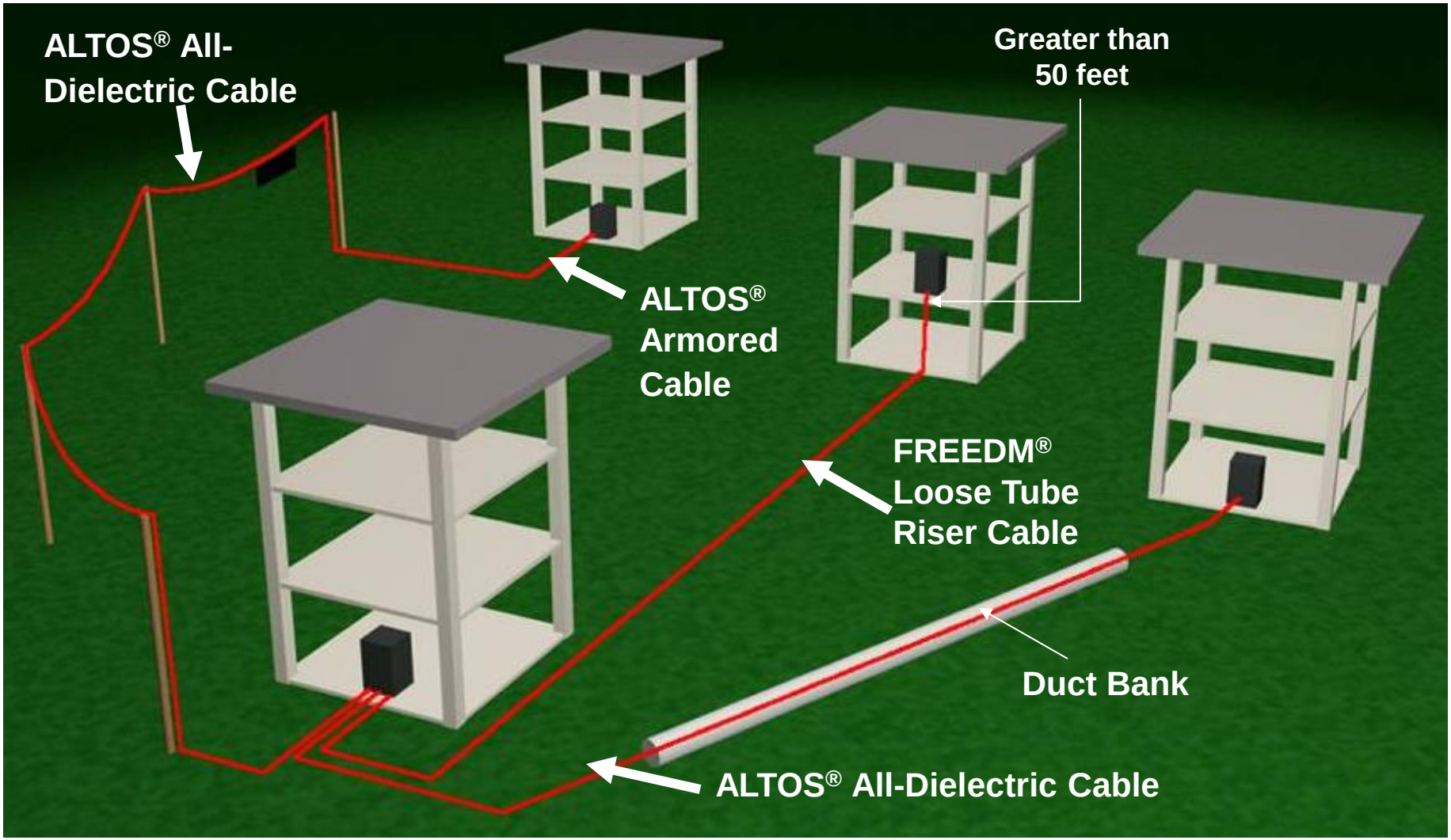
Fiber Optic Cable 101

ALTOS® Cable with FastAccess™ Technology



Fiber Optic Cable 101

Loose Tube Cable Applications



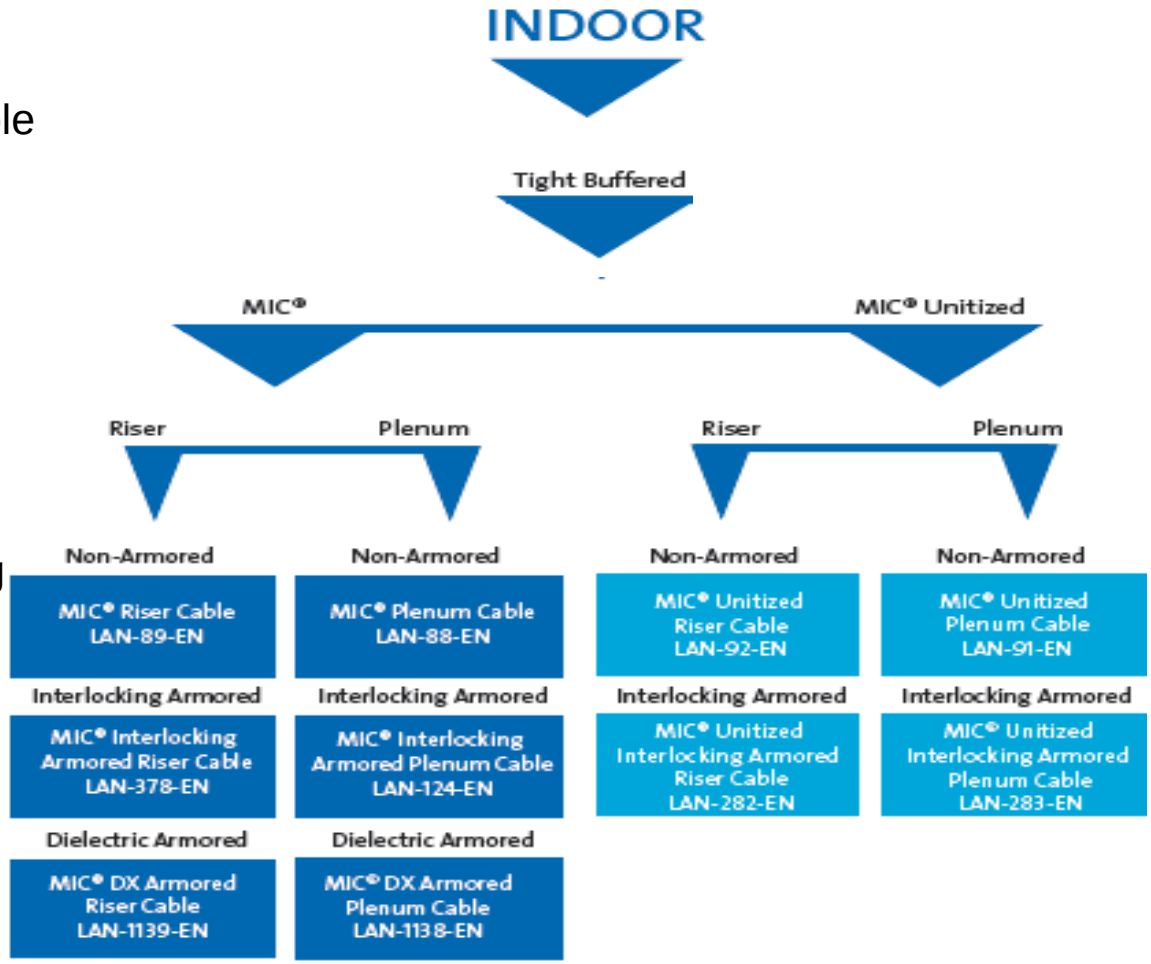
Agenda

What Are We Going To Learn Today?

- Overview of Corning Cable Systems
- Fiber Optics 101
  - What is it?
  - How does it work?
  - Fiber Types
  - Fiber Performance
  - Benefits over Copper
- Fiber Optic Cable 101
  - What is it?
  - Cable Construction
  - **How to Pick a Fiber Optic Cable**
  - Pulling Best Practices
- Fiber Optic Termination Methods
- Installing a Fiber Optic System
  - Components of an installation
- Review of Corning Cable Systems Offerings

How to Pick a Fiber Optic Cable

- If Indoor….
  - Fiber Count
    - ≤ 24 Fibers = MIC® Cable
    - > 24 Fibers = MIC® Unitized Cable
  - Flame Rating
    - Riser or Plenum
  - Installation
  - Need for extra protection
    - Dielectric or Interlocking Armor

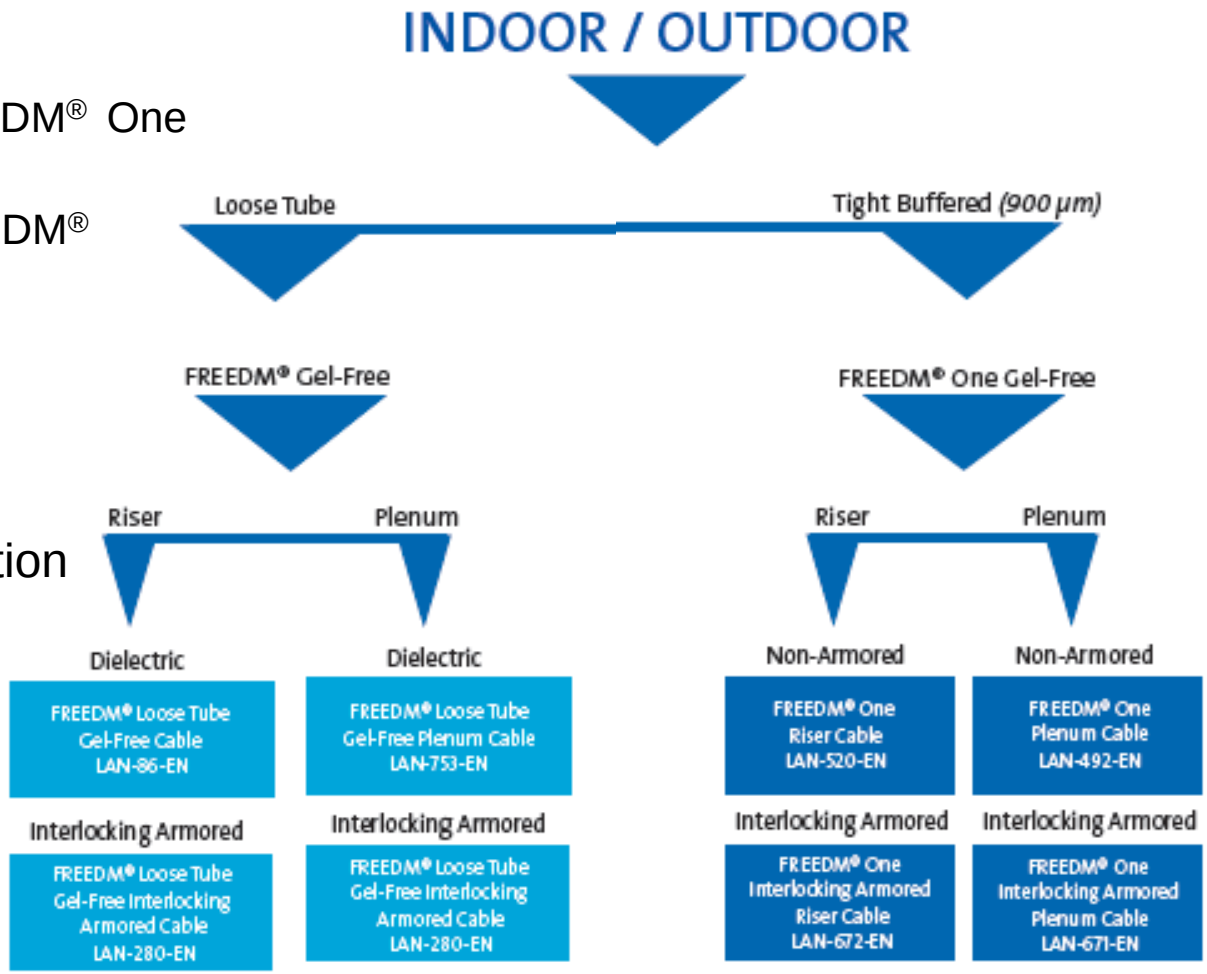


How to Pick a Fiber Optic Cable

- Where and how will the cable be installed?
  - Outdoor, Indoor, or Both?
- If Outdoor…
  - Environment
  - Installation Technique
    - Direct Buried
    - Aerial
    - Duct
  - If armor is needed

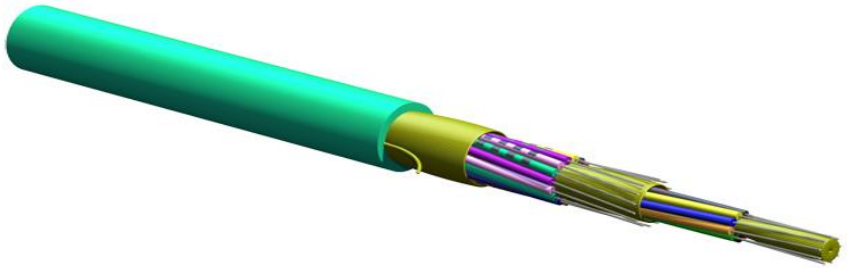
How to Pick a Fiber Optic Cable

- If Indoor/Outdoor….
  - Fiber Count
    - ≤ 24 Fibers = FREEDM® One Cable
    - > 24 Fibers = FREEDM® Loose Tube Cable
  - Flame Rating
    - Riser or Plenum
  - Installation
  - Need for extra protection
    - Interlocking Armor
  - Termination Method
    - Direct or Fan-Out

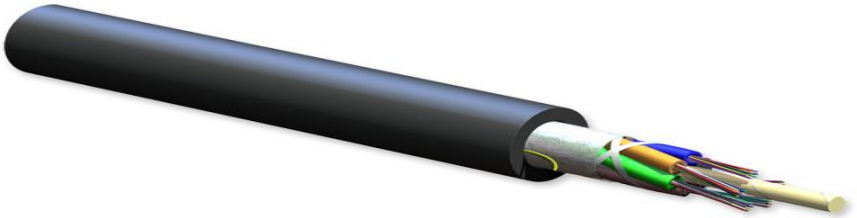


Summary

- **Tight Buffered Cables**
  - Mainly used indoors
  - 900 um coated fiber
  - Meet applicable flame listing requ
  - Common CCS brands are MIC® a FREEDM® One



- **Loose Tube Cables**
  - Mainly used outdoors
  - 250 um coated fiber
  - Operate in large temperature win
  - Common CCS brands are Altos® FREEDM® Loose Tube



- **Indoor/Outdoor Cables** such as FREEDM ® Plenum can go any where

Agenda

What Are We Going To Learn Today?

- Overview of Corning Cable Systems
- Fiber Optics 101
  - What is it?
  - How does it work?
  - Fiber Types
  - Fiber Performance
  - Benefits over Copper
- Fiber Optic Cable 101
  - What is it?
  - Cable Construction
  - How to Pick a Fiber Optic Cable
  - **Pulling Best Practices**
- Fiber Optic Termination Methods
- Installing a Fiber Optic System
  - Components of an installation
- Review of Corning Cable Systems Offerings

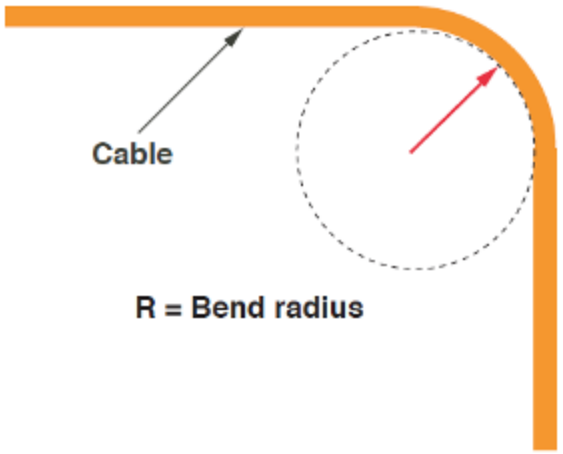
Cable Placement Safety Information

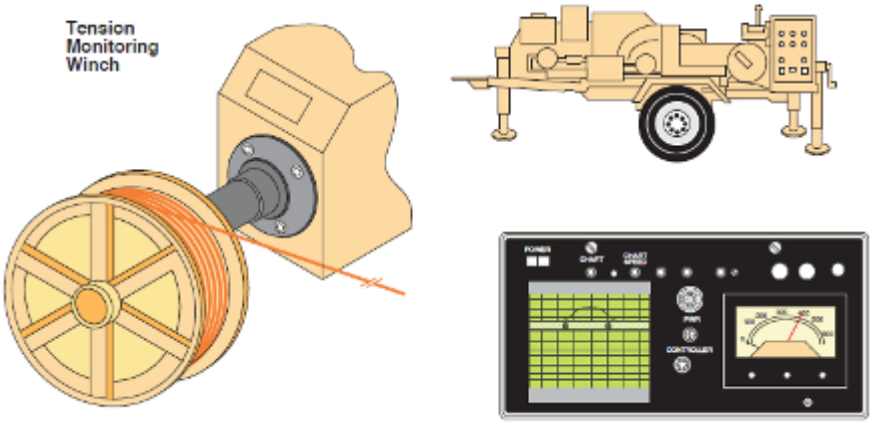
Numerous cable installation techniques exist and each can present a unique set of safety hazards. Take the utmost care to make sure you are aware of all hazards that may be encountered with any work activity. For specific safety requirements and practices, consult, at a minimum, your Company's policies and procedures, federal, state, and local requirements/standards, and manufacturer* recommendations.

* "manufacturer" in this case, suggests manufacturers of installation equipment.

Cable Placement Considerations

- Ensure sufficient slack
- Monitor tension
- Maintain minimum bend radius
- Protect exposed cable





OSP Cable Pulling Best Practices

- Choose a Reputable Supplier
  - Conducts rigorous testing
  - Provides installation guidelines
- Inspect Your Reel
  - Conduct On-reel-testing to verify cable was correctly shipped
  - Check cable for signs of excessive weathering
- Choose Proper Installation Hardware
  - Choose fiber cable with proper tension and bend limits
  - Use the right tools for the task

- Control Cable Installation to Avoid Common Mistakes

  1: Paying off the cable

  2: Entering and exiting ducts

  3: Handling the cable at midspan points

  4: Jetting Cable Direct Burial

  - Additional Information

    “Avoiding a Costly Crush”

Cable Stripping Hands-on

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Termination Methods

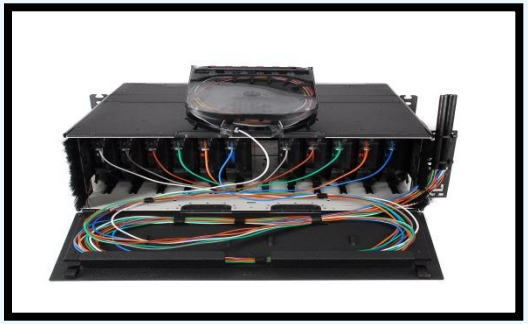
Epoxy and Polish

Anaerobic Connector Tool Kit

No Epoxy and No Polish

UniCam® High Performance Tool Kit

Fusion Splicing



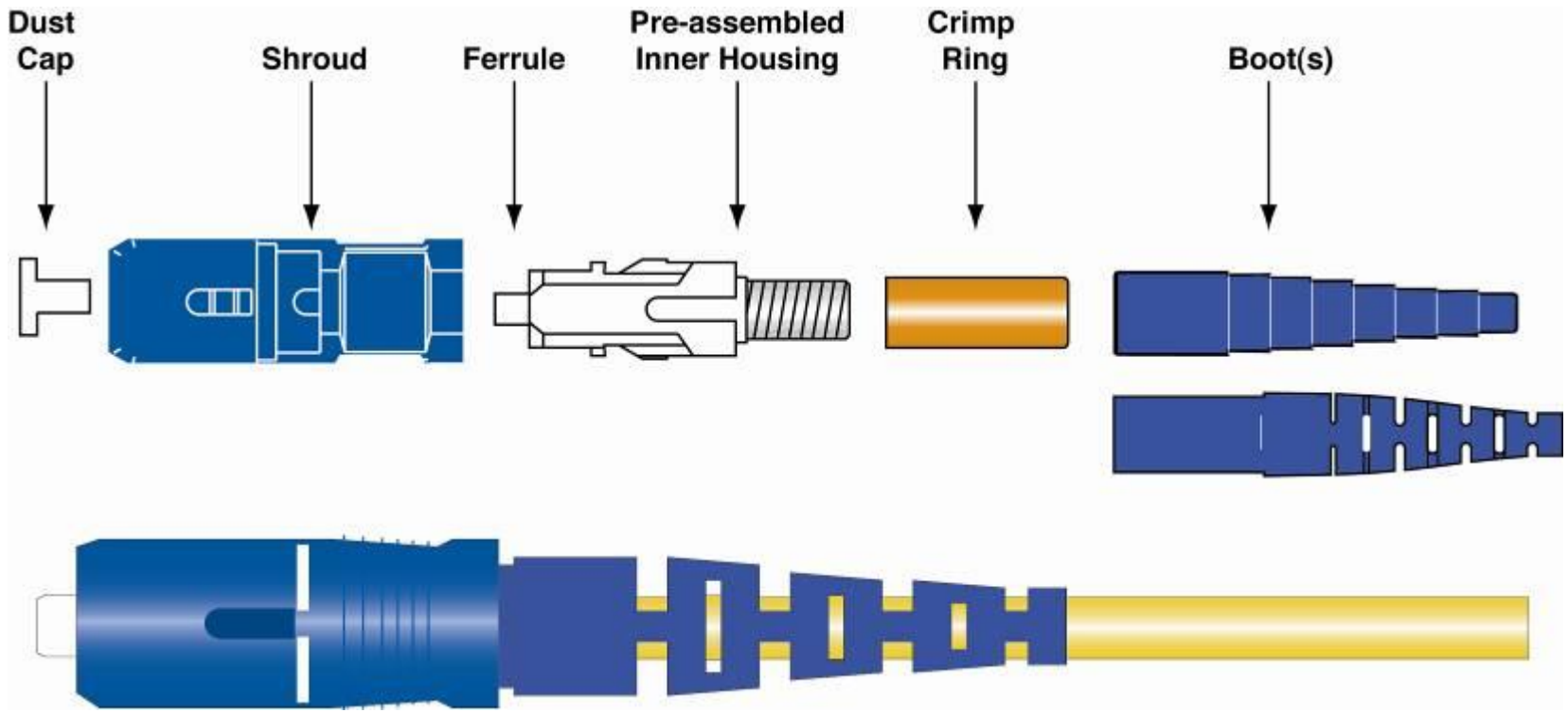
Pigtail Splicing

Preterminated Cable

Plug & Play™ Solutions

Fiber Termination

Anatomy of a Fiber Optic Connector



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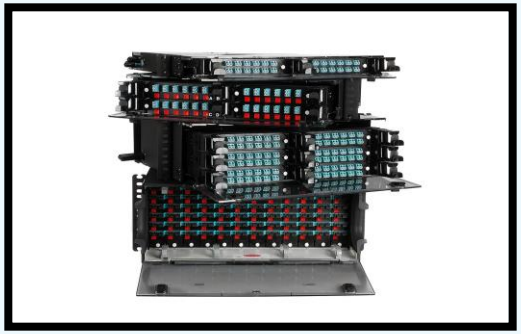
Components of an Installation

- **Cable**
  - Fiber Type (MM = OM1, OM2, OM3, or SM = OS2)
  - Indoor, Outdoor, or Indoor/Outdoor Cable
- **Connectors**
  - Termination Method
    - Anearobic, Unicam, fusion splicing, or preterm
  - Connector Type
    - Fiber and Connector Compatibility
- **Hardware**
  - Wall Mount or Rack Mount
  - Connector and Fiber Type
  - Indoor or Outdoor Application

Installing a Fiber Optic System
Hardware Options

Rack Mount

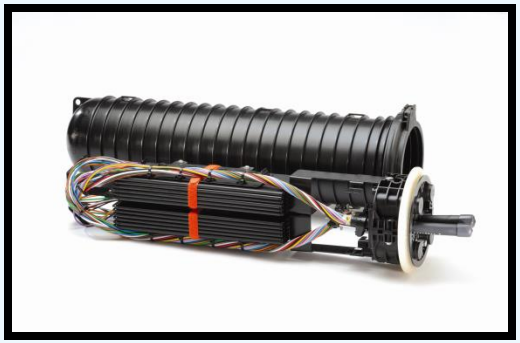


CCH

Wall Mount

WCH

Outside Plant

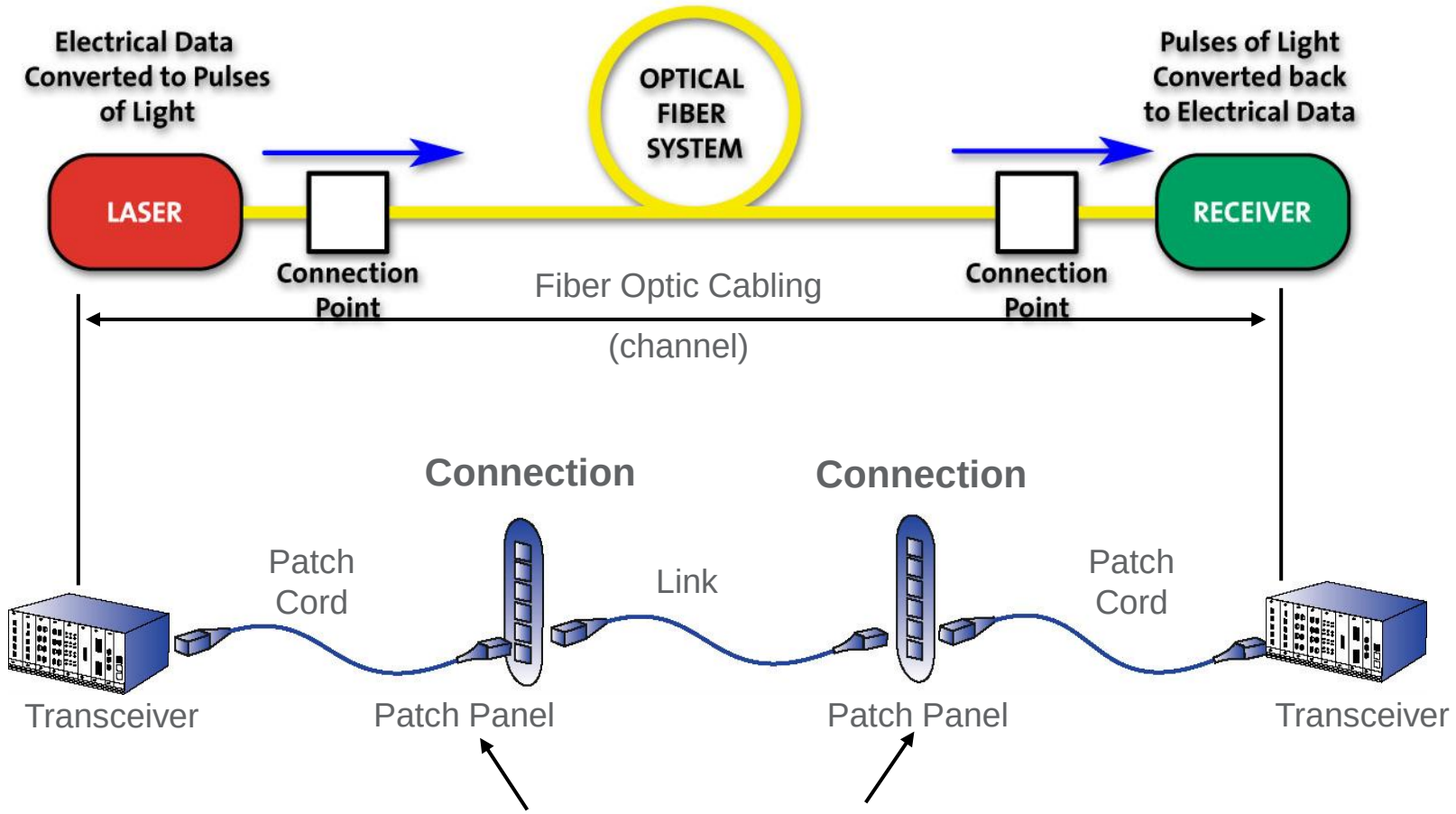


SCF Closures

Pre-terminated

Preterm EDGE

Example of a Fiber Optic System



CORNING