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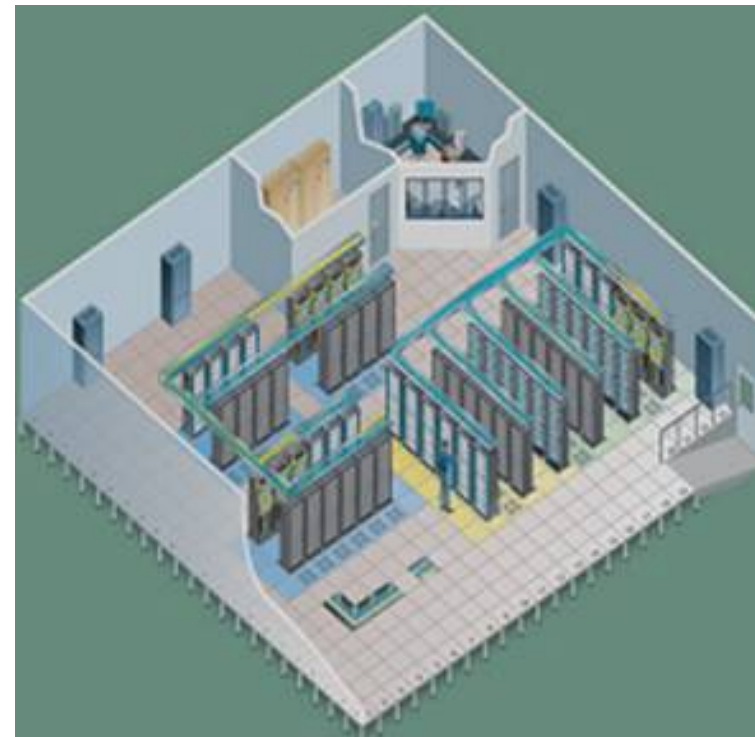
# **Berk-Tek: THE Choice for Data Center Cabling**

Berk-Tek Technology Summit  
Lisa Huff, CDCP  
Data Center Applications Engineer  
September 2008

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# Berk-Tek for All Your Data Center Cable Needs

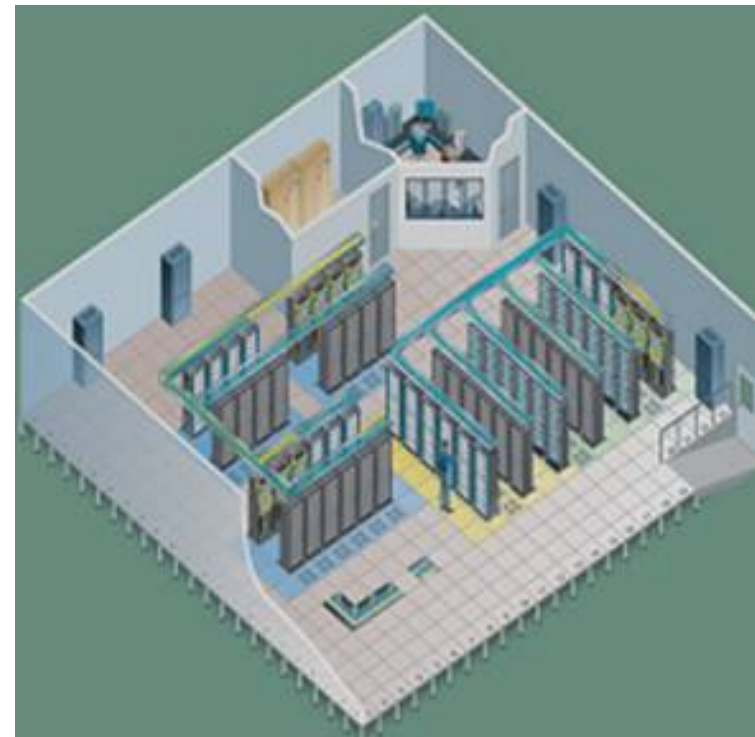
- Data center managers top considerations
  - Energy and cooling
  - Space savings and density
  - Flexibility



# Berk-Tek Cable for All Your Data Center Needs

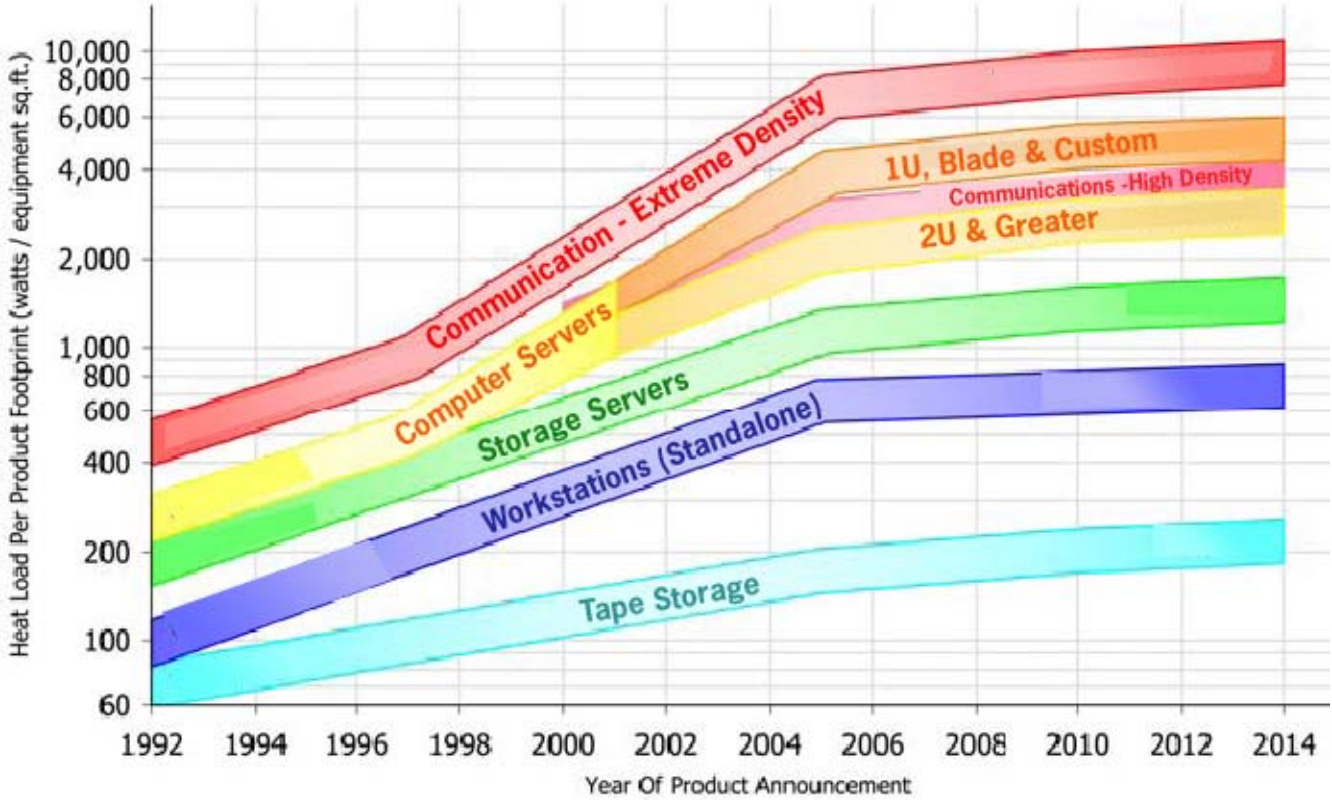
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# Data Center Heat Load Trends

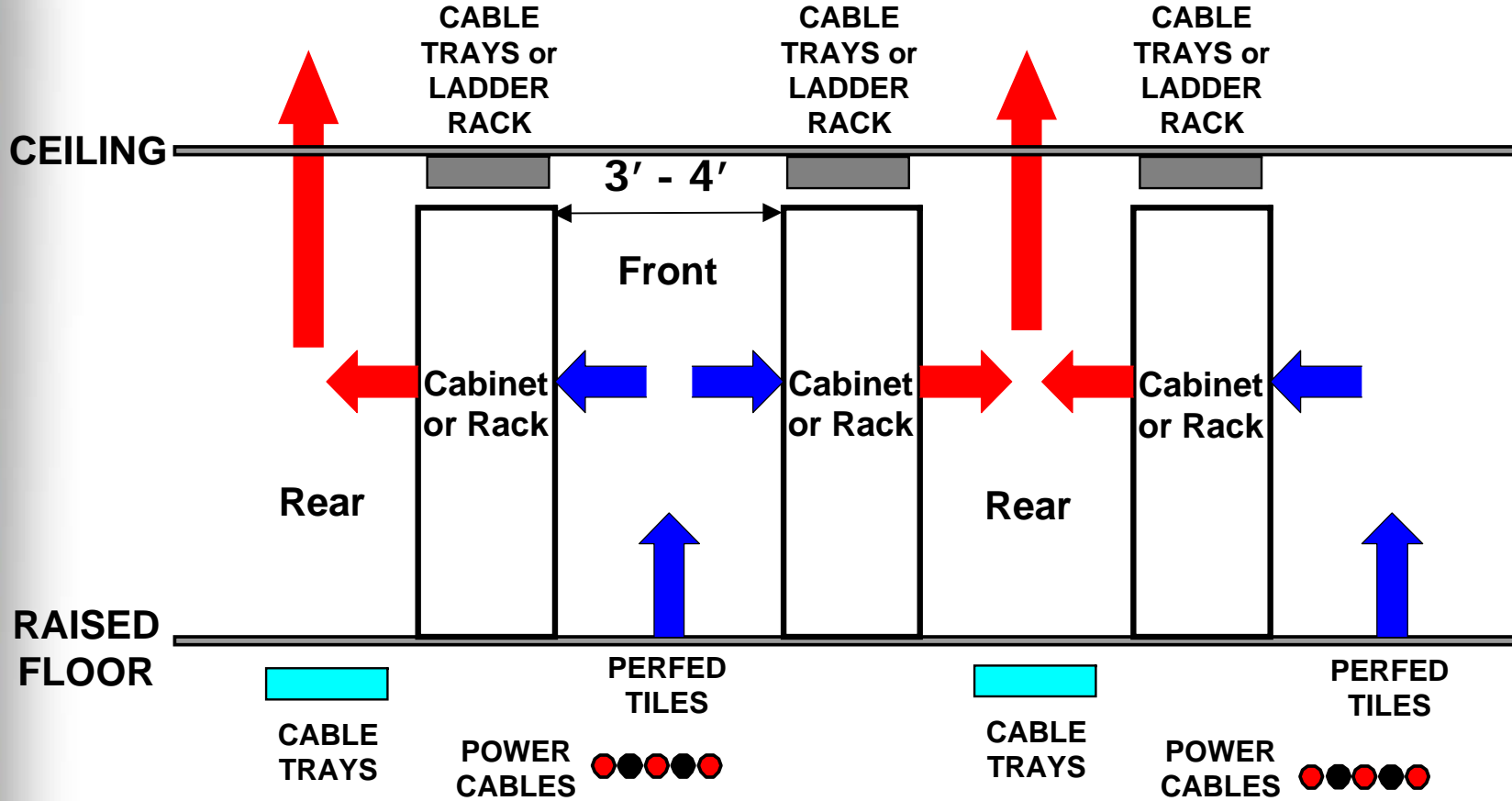


kW/rack

ASHRAE, *Datacom Equipment Power Trends and Cooling Applications*, 2005.  
© American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., [www.ashrae.org](http://www.ashrae.org).

# TIA-942 Data Center Airflow

## Cooling and Cable Layout Recommendations

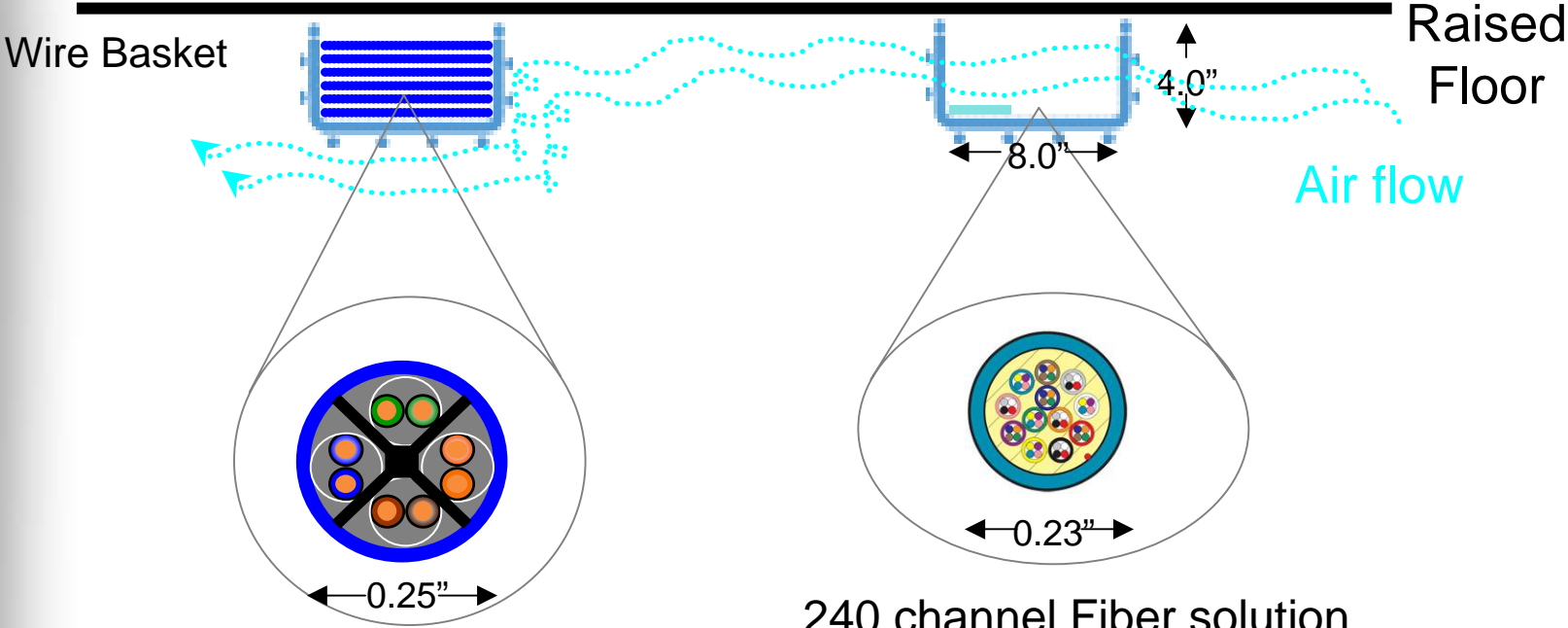
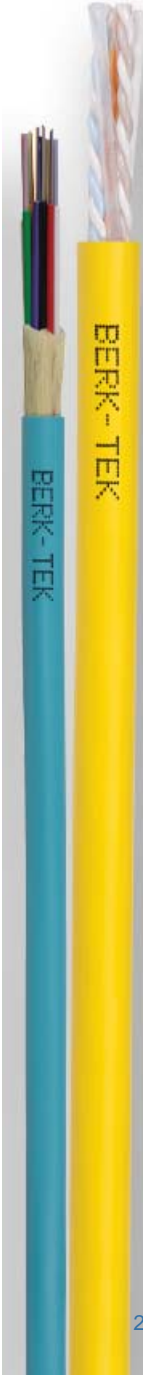


# Heat/Density/Cooling Within the rack

- Airflow improvements
  - Honeycomb uprights
  - Inter-bay baffles
  - Vertical managers allow for more angled panels and switch ports



# CAT 6 versus 48-Fiber MDP Cable



242 channel Cat 6 UTP solution  
242 cables at 50% Fill Ratio

240 channel Fiber solution  
50/125 LOMF MDP  
10 cables, Fill Ratio < 1 %

\*channels include 2 fibers

# There is a Cost Trade-off

- Optical ports currently 60-percent higher installed cost of copper
- Currently studying ROI payback for copper versus fiber
  - Includes total system cost of ownership
    - Power and cooling efficiency calculations
    - Space savings

# Cost Comparison Summary

Connection type	Port cost	Materials: Cable, patch cords, connectivity	Installation labor per channel	Total per channel cost
<b>LOMF: Field Terminated</b>	5,500	156.70	34.67	<b>\$5,691.36</b>
<b>LOMF: Pre-Terminated</b>	5,500	217.64	6.25	<b>\$5,723.89</b>
<b>UTP Copper</b>	2,198	184.12	46.75	<b>\$2,428.87</b>
<b>F/UTP Copper</b>	2,198	191.52	52.35	<b>\$2,441.87</b>

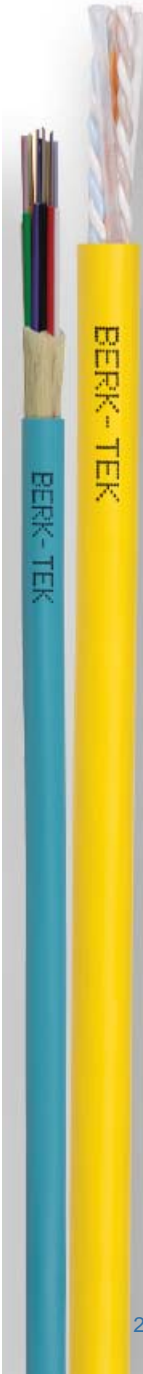
Cost per channel based on: Seven 48-port GigE copper/fiber blade; One 8-port 10-Gig switch blade with X2 modules; distribution pricing; 2 meter patch cords; labor rate of \$60/hour

# Cost: Heat Load Considerations Copper versus Fiber at 10G

Cisco Catalyst 6500 Switch	Watts per Network Port
<i>Copper Solution 1</i>	10.6
<i>Copper Solution 2</i>	6.3
<i>Optical Solution</i>	8.1

Power consumption based on:

- Common Items
  - WS-C6509-E-FAN (chassis & fan tray)
  - WS-X6K-SUP1A-2GE (supervisor engine)
  - WS-X6708-10G-3C (8-port 10G w/modules)
- Copper Blades
  - 1: WS-X6748-GE-TX (48-port 1G copper)
  - 2: WS-X6548-GE-TX (48 port 1G copper)
- Optical Blade
  - WS-X6748-SFP (48-port 1G optical)



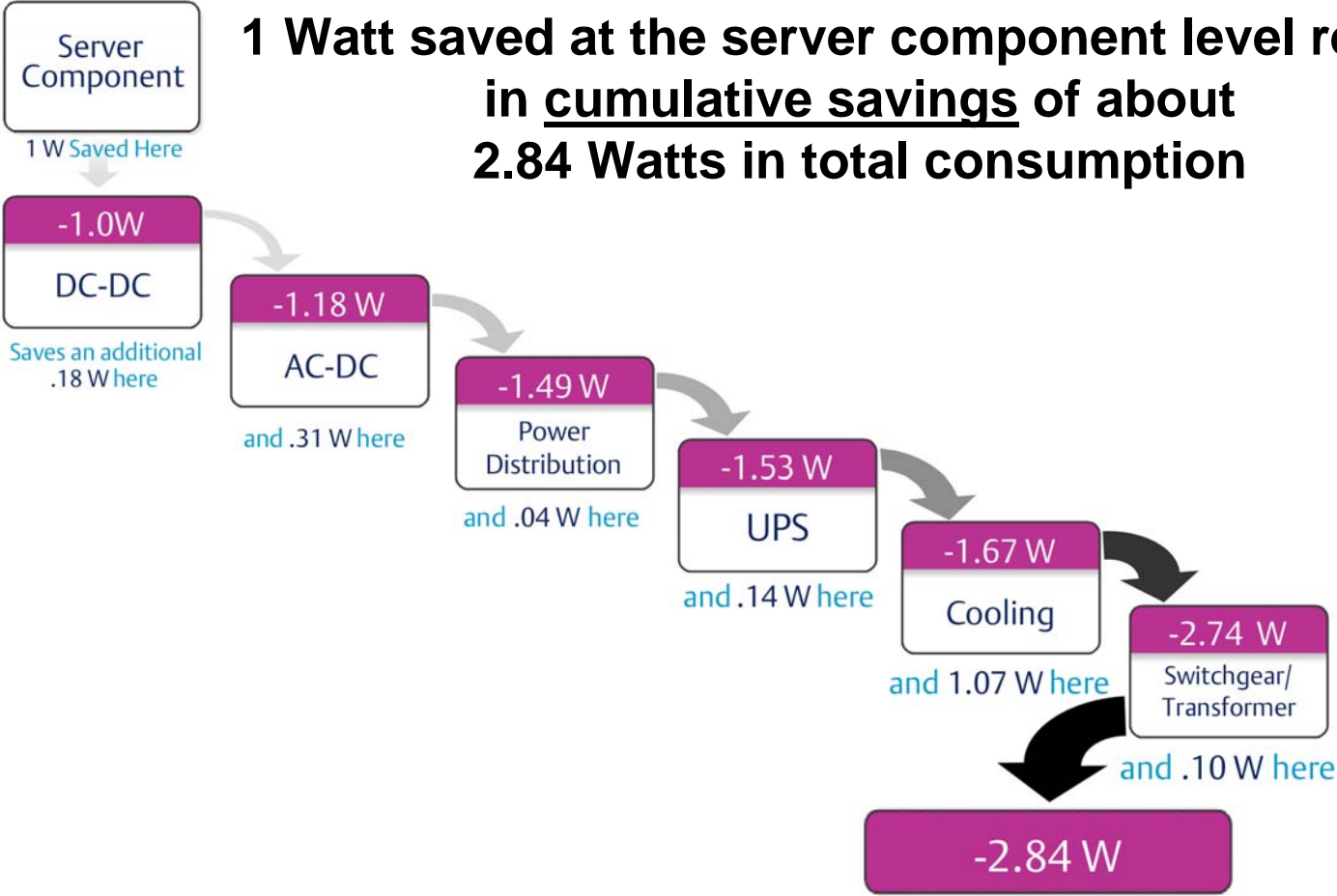
# Cost: Heat Load Considerations Copper versus Fiber at 10G

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***Saving 1W in equipment could  
save up to 2.84W in cooling***

# The 'Cascade' Effect

**1 Watt saved at the server component level results in cumulative savings of about 2.84 Watts in total consumption**

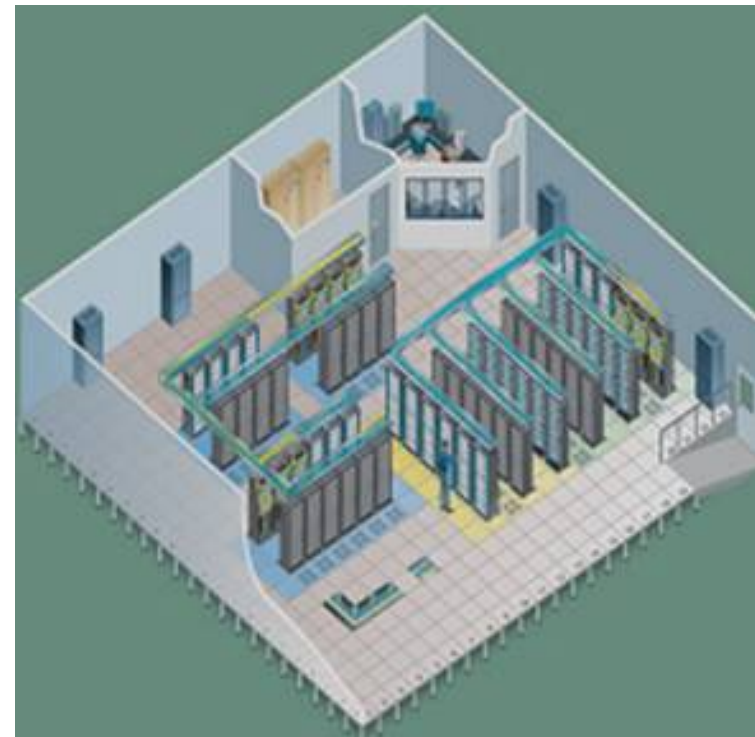


© 2007 Emerson Network Power



# Berk-Tek Cable for All Your Data Center Needs

- Data center managers top considerations
  - Energy and cooling
  - Space savings and density
  - Flexibility



# High Density Fiber Options



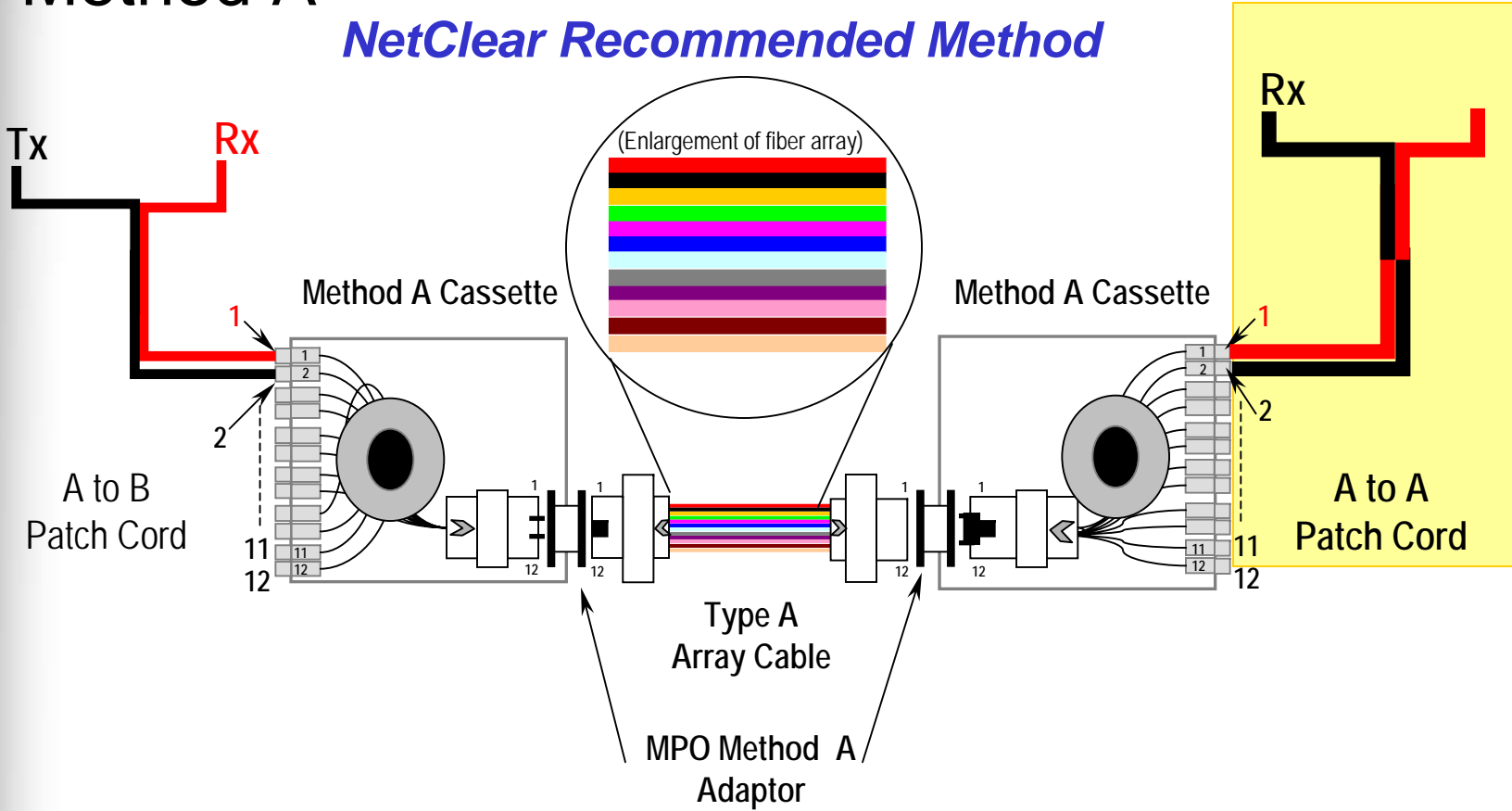
- **Modular pre-terminated cassette-based systems**
- **Simplified and compact data center cabling**
- **MTP™/MPO and LC available**
- **Optimized fiber cable and patch cord management**

# Modular Cassette Connectivity

## Methods: *Per TIA-568B.1 Addendum 7*

### Method A

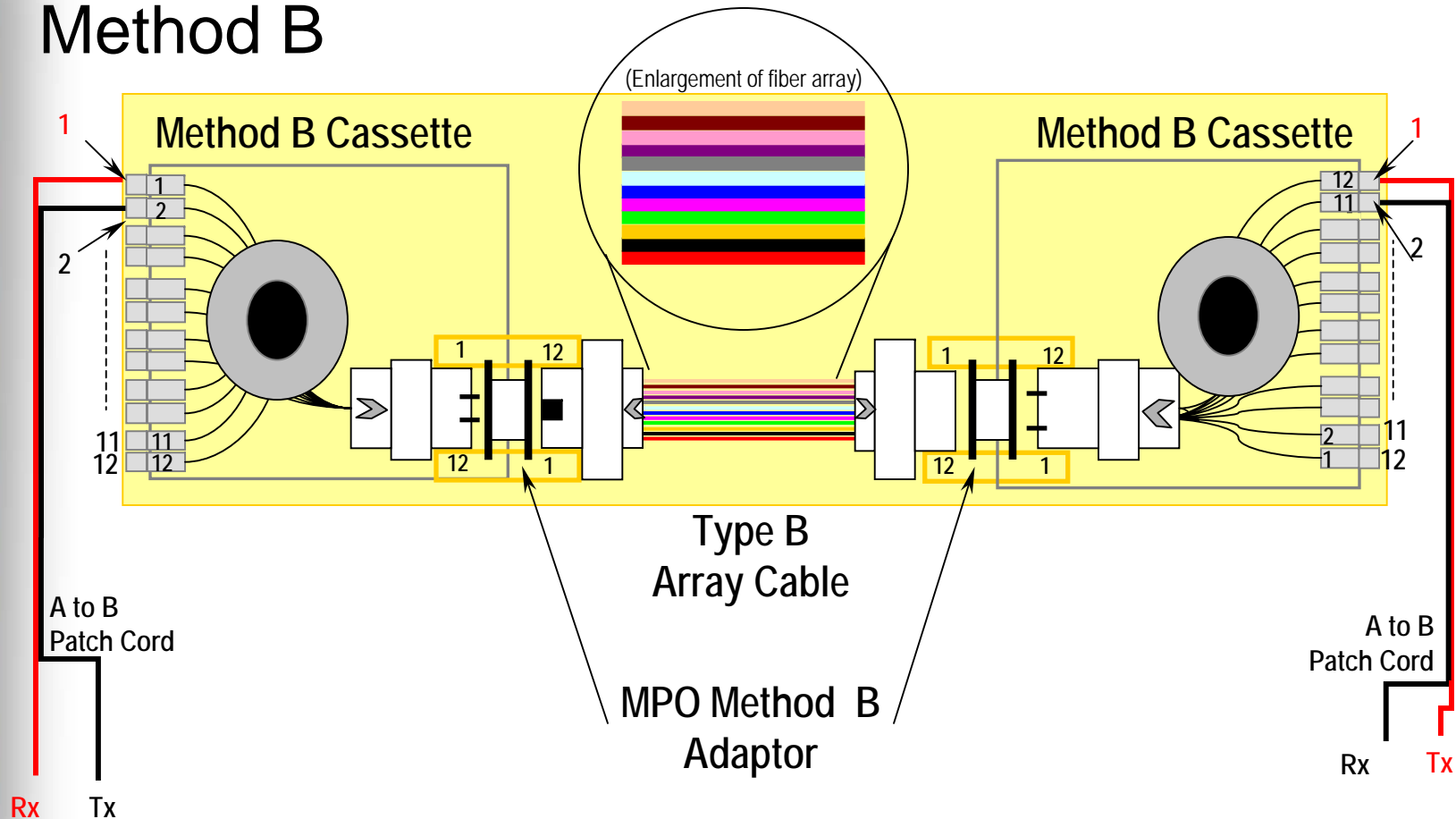
*NetClear Recommended Method*



# Modular Cassette Connectivity

Methods: *Per TIA-568B.1 Addendum 7*

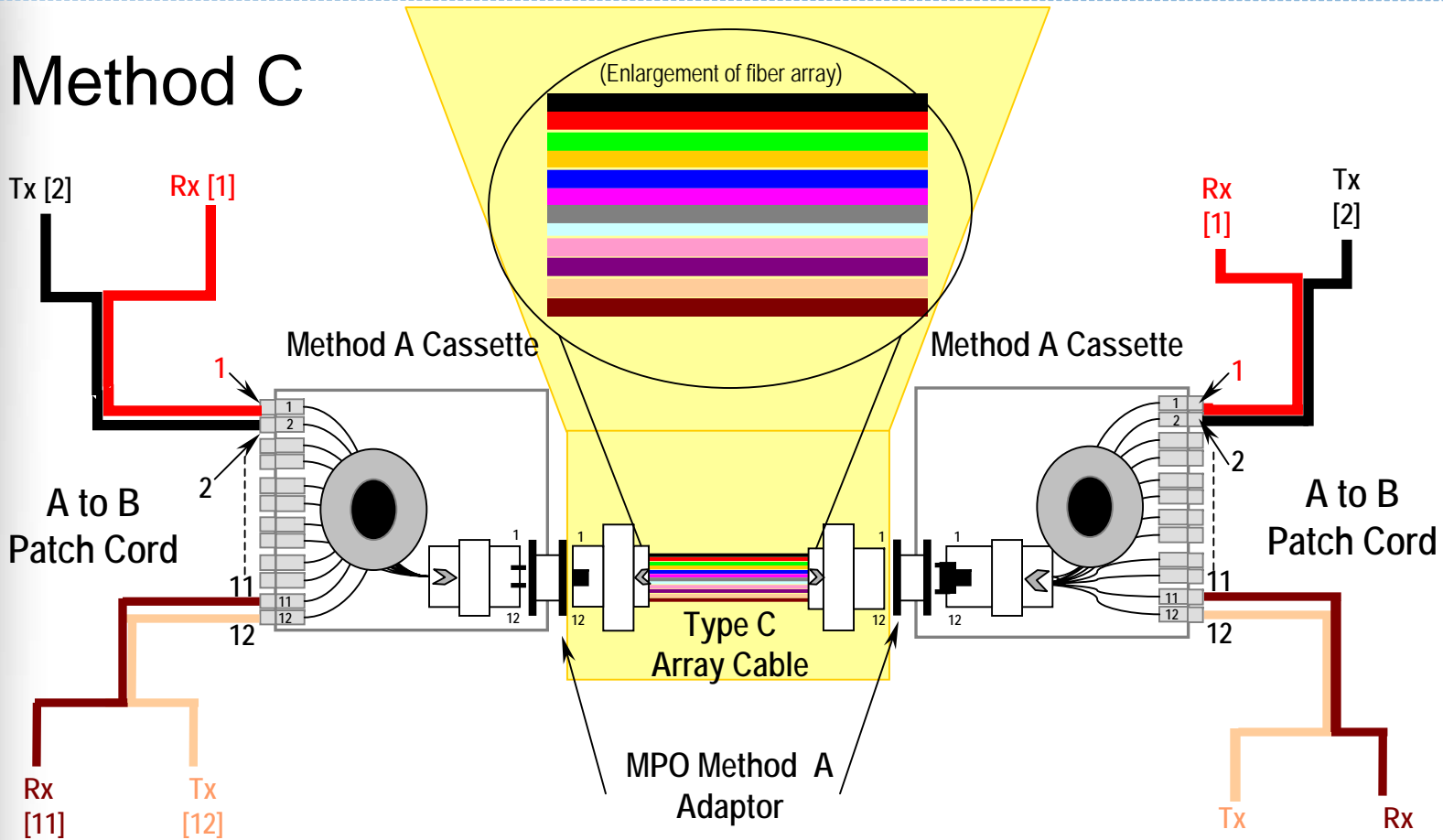
## Method B



# Modular Cassette Connectivity

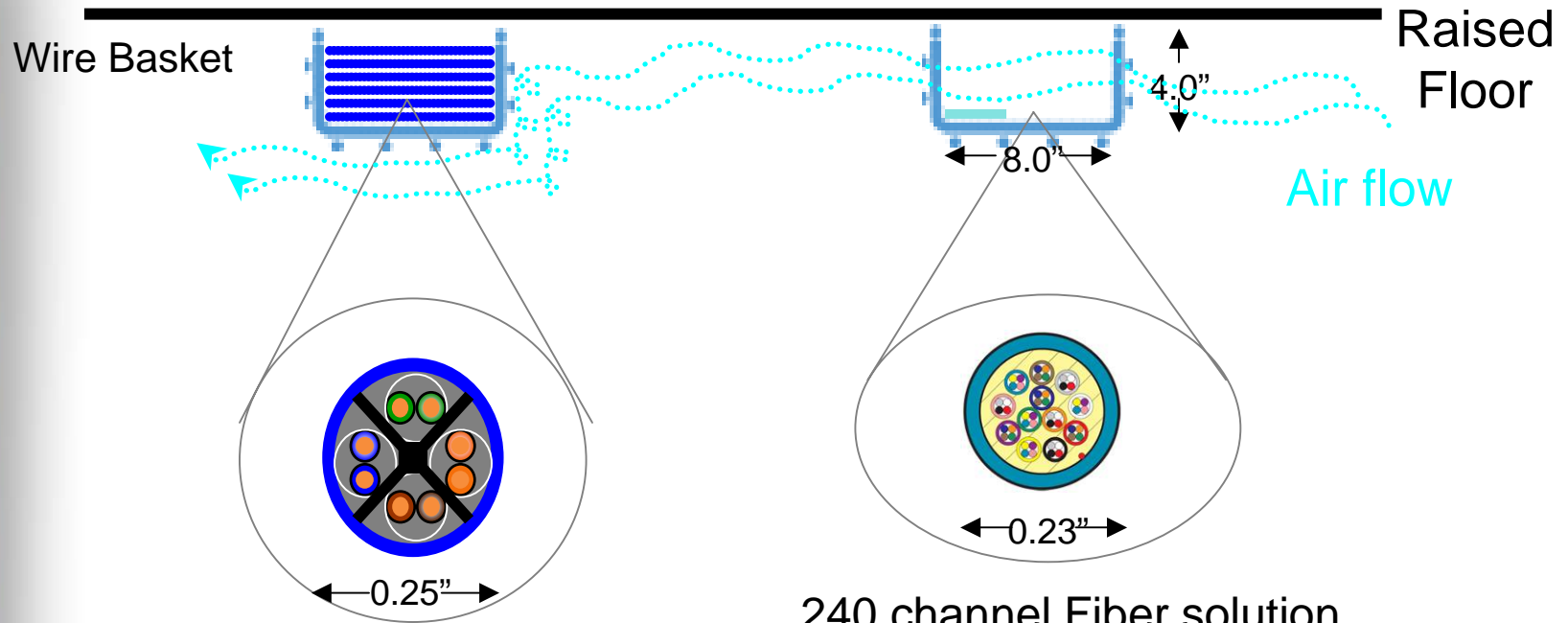
## Methods: *Per TIA-568B.1 Addendum 7*

### Method C



Fibers within the assembly: 1-2, 2-1, 3-4, 4-3, etc.

# CAT 6 versus 48-Fiber MDP Cable



242 channel Cat 6 UTP solution  
242 cables at 50% Fill Ratio

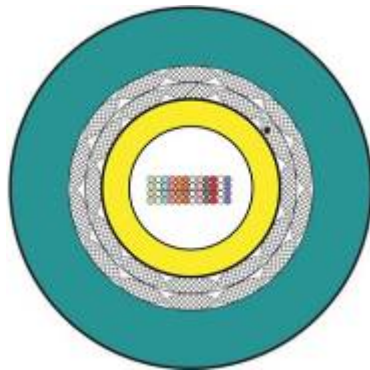
240 channel Fiber solution  
50/125 LOMF MDP  
10 cables, Fill Ratio < 1 %

\*channels include 2 fibers

# Cable Design Considerations

## Optical Fiber Cables

- High-fiber count
- Bend radius
- Reduced diameter options



48F Stacked Ribbon  
Cable (0.520" OD)



48F LTP Cable  
(0.370" OD)

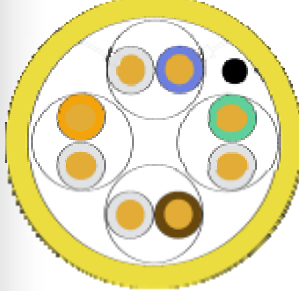


48F MDP Cable  
(0.231" OD)

# Reduced Diameter Copper Cables for the Data Center

- Examples:
  - Berk-Tek LANmark-10G2 CMP = 0.300"
    - Most manufacturer's initial designs = 0.35"
  - Berk-Tek LANmark-6 FTP CMP = .290"
  - Berk-Tek LANmark-6 UTP = .195"
    - No-filler designs reduce overall diameter

1<sup>st</sup> Generation  
Cat 6a  
(0.350")



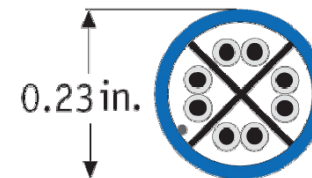
LANmark- 10G2  
CMP  
(0.300")



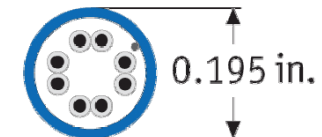
LANmark-6 F/UTP  
(0.290")



Category 6  
with Spline



LANmark 6



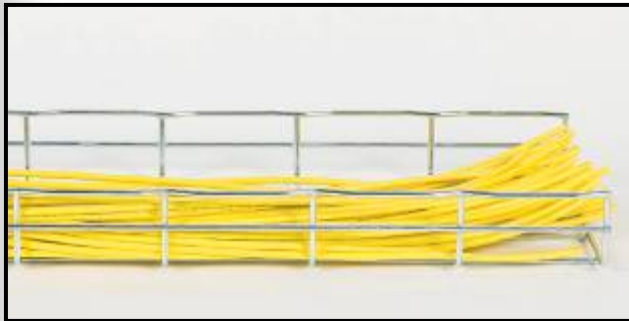
# 10G UTP Pathways and Spaces Design

- Cable size is larger than CAT6
  - Bend radius 4 x OD for UTP
  - 1" minimum for Category 6 cable
  - 1.2" minimum for Category 6A UTP with .30" OD
- Density and fill rates
  - Cabinets
  - Racks
  - Pathways
    - Conduits
    - Raceways
    - Cable trays
  - Work area outlets



# Installation - Cable Tray

## Category 6



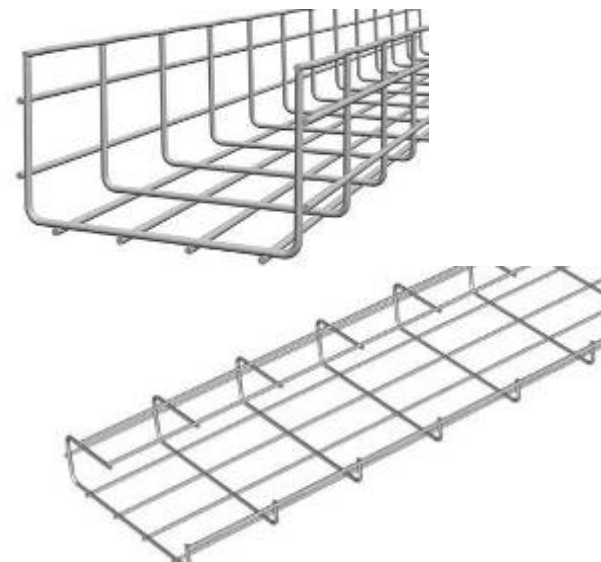
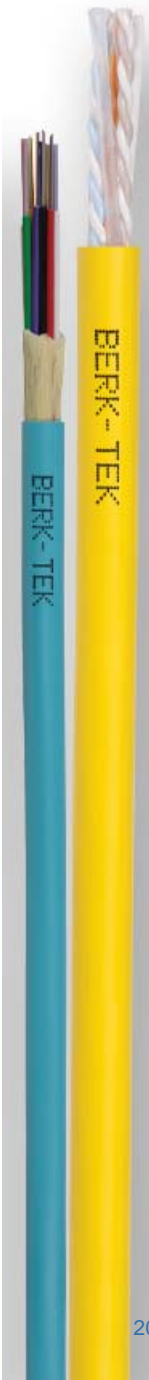
**60 cables in an  
8"x2" basket tray**



## Category 6A

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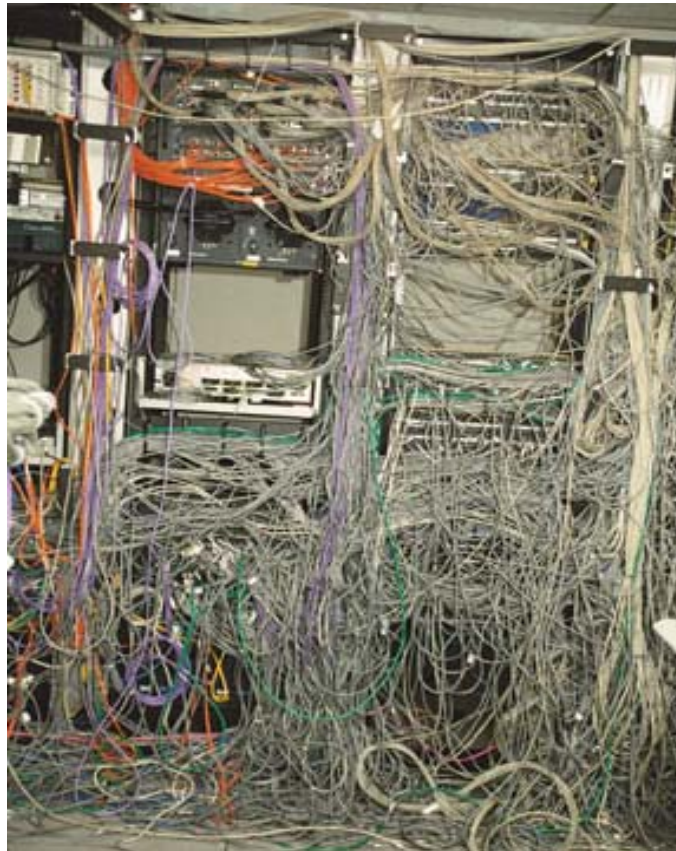
# Wire Rack-mounted Patch Panels



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# One More Important Practice

## Cable Management



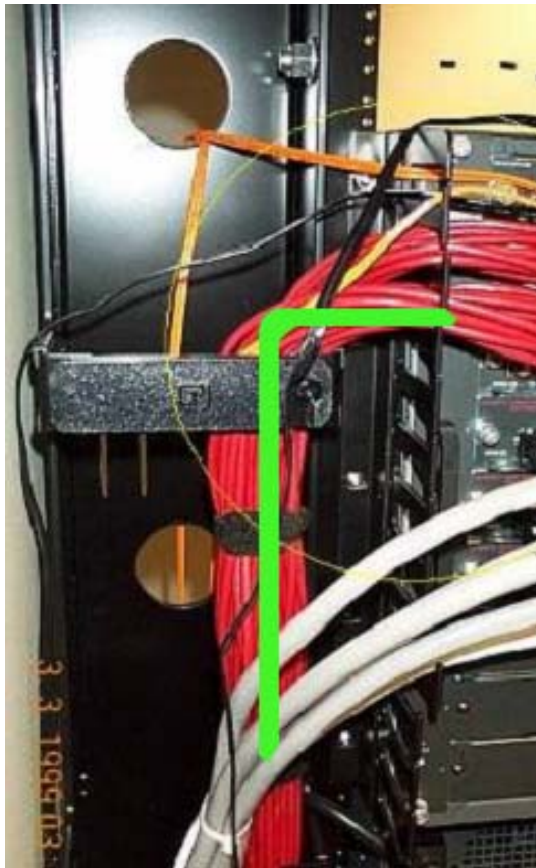
# Cable Management

- Simplifies system maintenance
- Extends useful life of system



# Cable Management

Incorrect



Correct



# Actual Installation Shots

Best Practice



Cat 6  
(KVM, out of band mgmt)

Cat 6A  
(data)

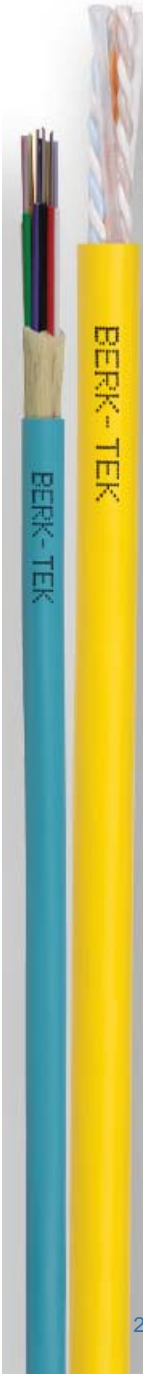


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# Good Cable Management



Best  
Practice



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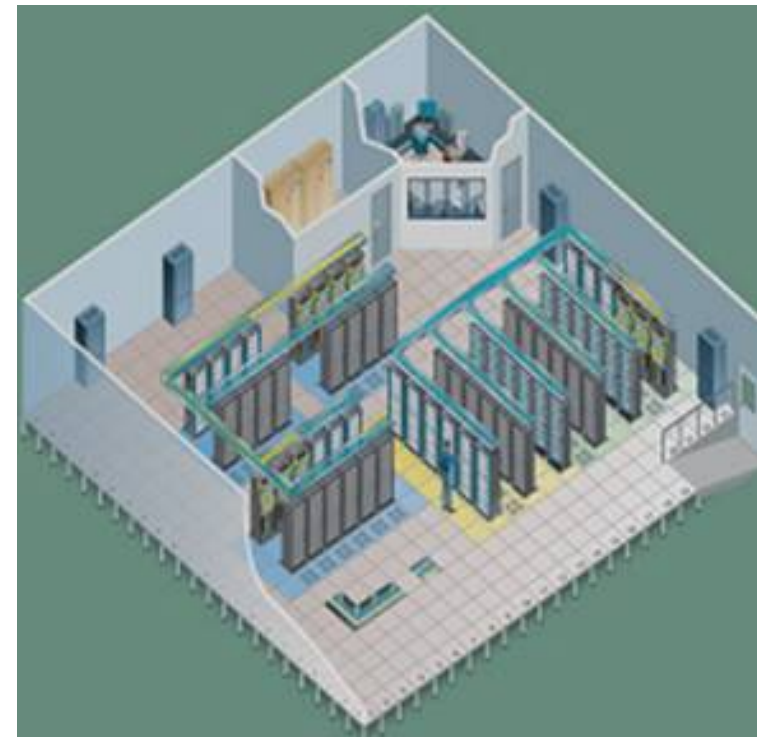
# Berk-Tek Competence Center Installation Scenarios



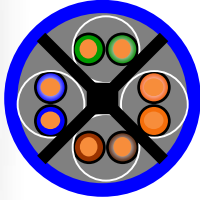
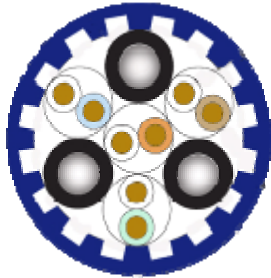

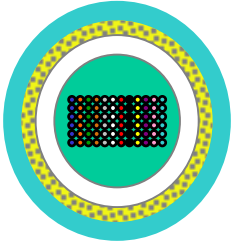

# Berk-Tek Cable for All Your Data Center Needs

- Data center managers top considerations
  - Energy and cooling
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 Flexibility

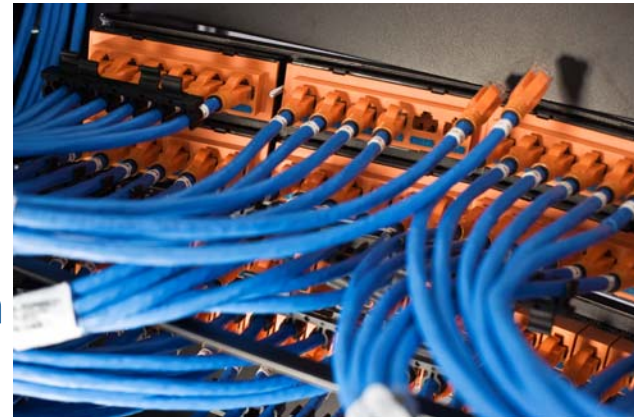
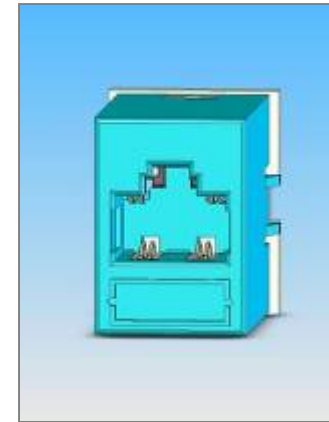


# Data Center Cabling Options

				
← 0.25" →	← 0.30" →	← 0.231" →	← 0.32" →	← 0.46" →
<b>UTP</b>	<b>10G UTP</b>	<b>48F MDP</b>	<b>72 F Multi-Ribbon Cable</b>	<b>72 F Loose Tube Cable</b>
Cat 6	Cat 6A	50/125 LOMF	50/125 LOMF	50/125 LOMF
1 channel	1 channel	24 channels	36 channels	36 channels
40 lbs/kft	47 lbs/kft	20 lbs/kft	28 lbs/kft	68 lbs/kft
Max 10G length: <55m	Max 10G length: 100m	Max 10G length: 600m	Max 10G length: 600m	Max 10G length: 600m
Install load: 25 lb	Install load: 25 lb	Install load: 200 lb	Install load: 200 lb	Install load: 600 lb

# Pre-Terminated Copper Cabling

- Ortronics Clarity SNAP™
  - Made with Berk-Tek cable
  - Small (new high speed) connectors
    - Reliable performance up to 10G
    - Easy to pull or lay in cable assemblies
    - Less disruption to termination
  - Offered in single or multi/bundled cable drops
  - Expands the ability to trade out cables or end terminations
  - Support Ortronics core connection types
  - Supports Clarity 10G, 6 and 5E



# Armored Fiber Cable

- Cost savings as compared to conduit or plenum inner-duct
- Enhanced security and reliability with robust impact, crush, rodent, steam, and cut-through resistance
- Available Options
  - Tight buffer (144 fibers)
  - Loose tube (432 fibers)
  - Riser or plenum
  - Aluminum or steel (432 fibers)
- LSZH Optional
- Not all armor is created equally



# Armored Cable Reliability

***Tested Extensively to Failure  
Loading versus competitor product***



	<b><i>Berk-Tek</i></b>	<b><i>Competition</i></b>
Compressive Strength	950 N/cm	500 N/cm
Cyclic Flex	550 Cycles	8 Cycles
Tensile Strength	378.5 lbs	251.9 lbs
Bend Radius	28mm (1.1 in.)	44 mm (1.7 in.)

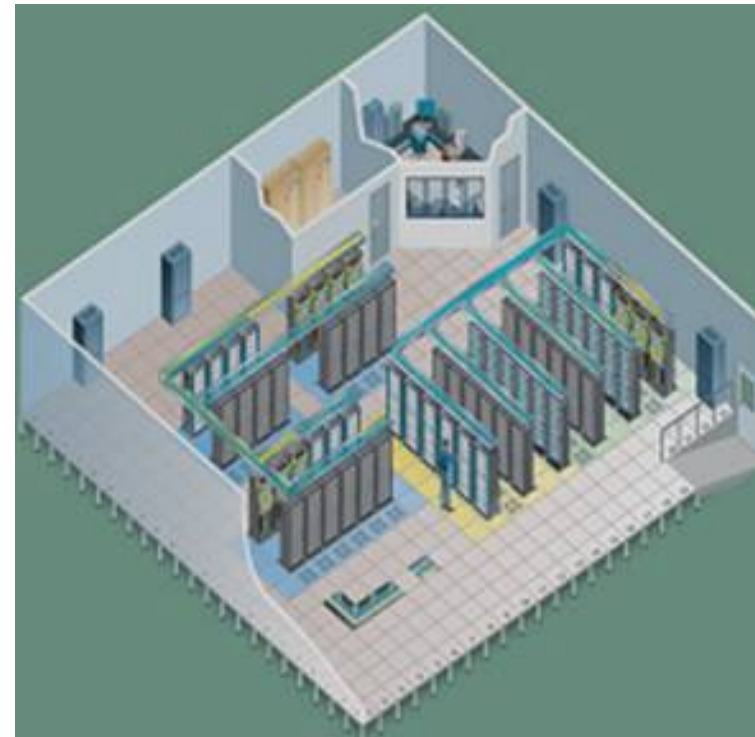
# Cabling Best Practices

- Hot aisle/cold aisle arrangement
- Reduce cable congestion from under the raised floor to improve cold air movement
- Improve airflow with innovative rack designs
- Use thinner cables to reduce congestion
- Use blanking panels for open rack spaces
- Make sure raised floor static pressure is adequate – plug all openings with appropriate materials
- Hot-air return to CRAC unit
- Use thermal management modeling to determine hot spots before adding another CRAC unit



# Berk-Tek Cable for All Your Data Center Needs

- 21<sup>st</sup> century data center considerations
  - Energy and cooling
  - Space savings and density
  - Flexibility



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**Questions?**