

BECAUSE YOUR BUSINESS RUNS THROUGH US

Berk-Tek: THE Choice for Data Center Cabling

Berk-Tek Technology Summit

Lisa Huff, CDCP

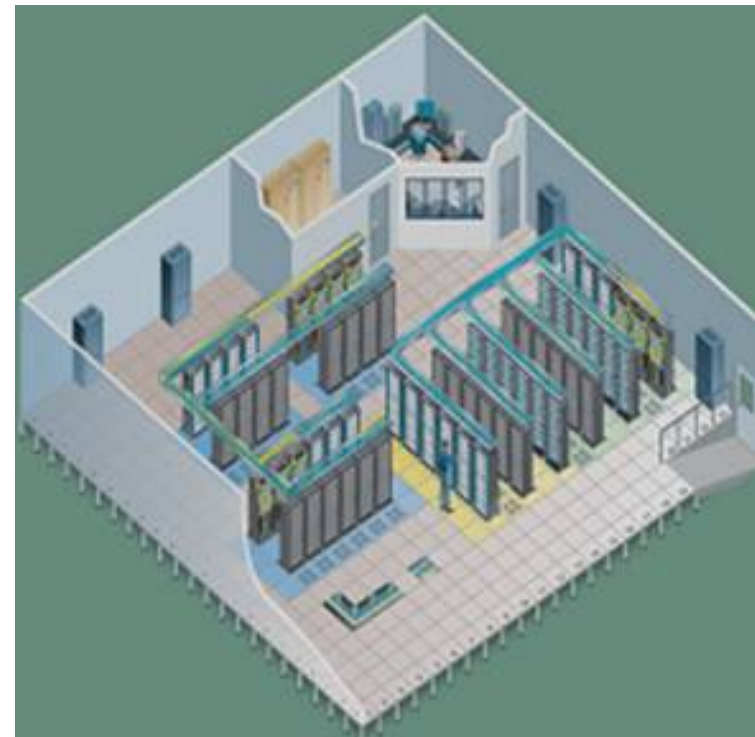
Data Center Applications Engineer

September 2008

BECAUSE YOUR BUSINESS RUNS THROUGH US

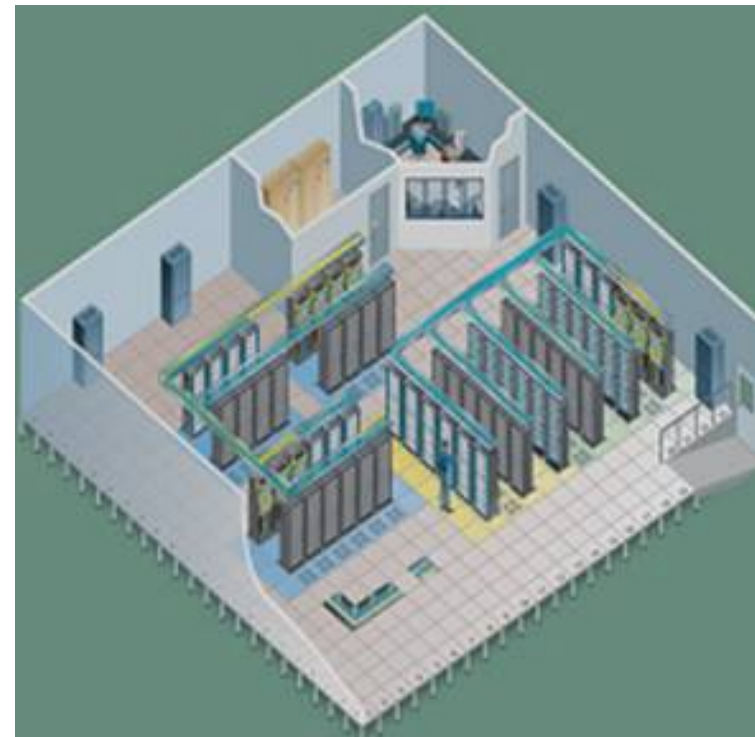
Berk-Tek for All Your Data Center Cable Needs

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



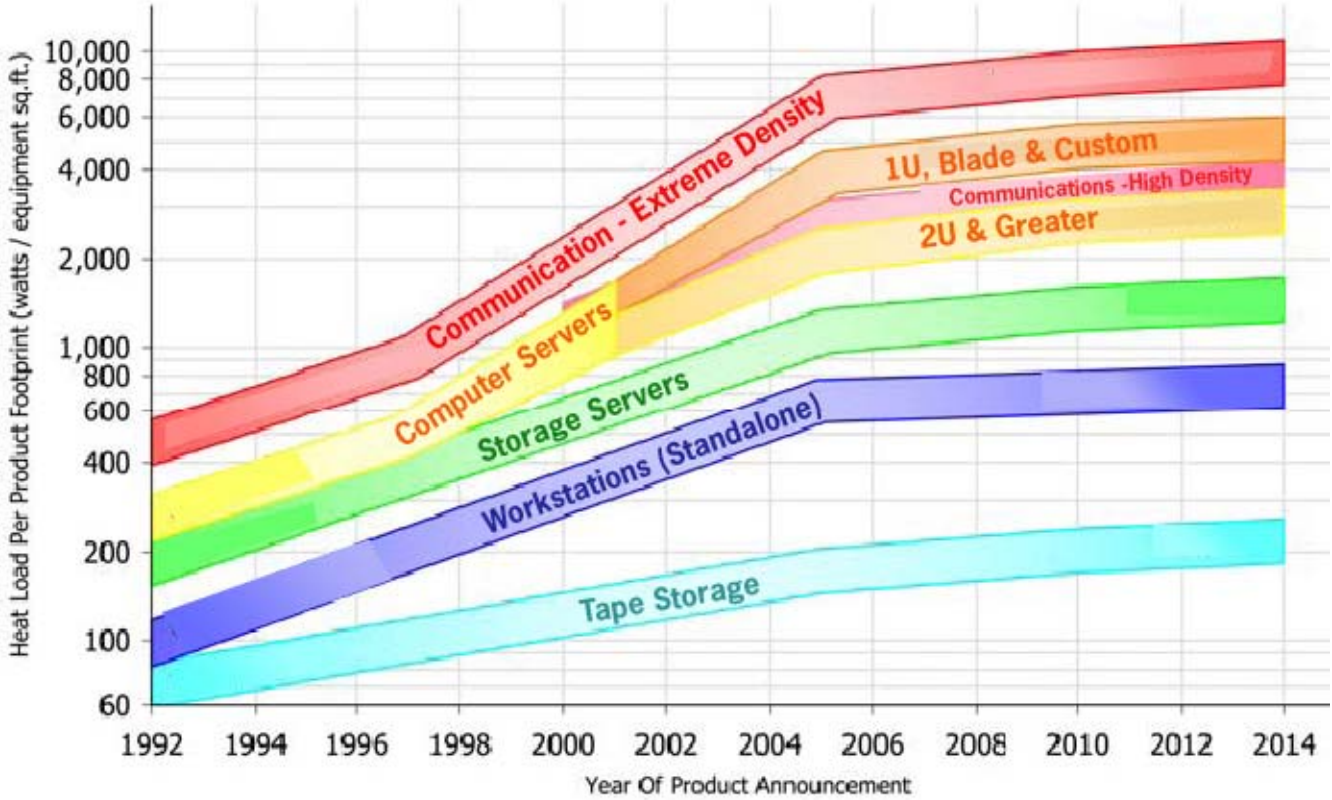
Berk-Tek Cable for All Your Data Center Needs

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



BECAUSE YOUR BUSINESS RUNS THROUGH US

Data Center Heat Load Trends

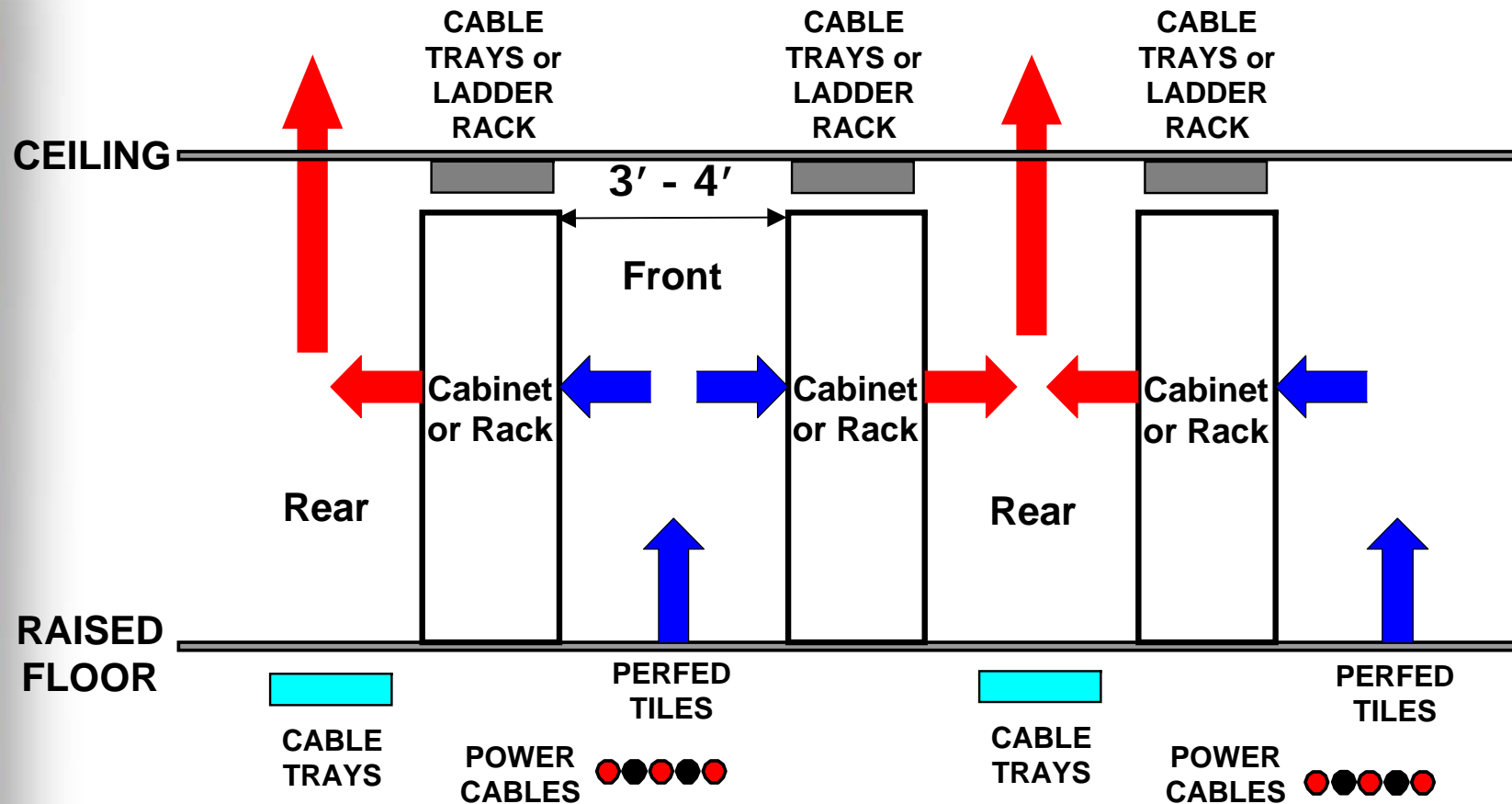


kW/rack

ASHRAE, *Datacom Equipment Power Trends and Cooling Applications*, 2005.
 © American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., www.ashrae.org.

TIA-942 Data Center Airflow

Cooling and Cable Layout Recommendations

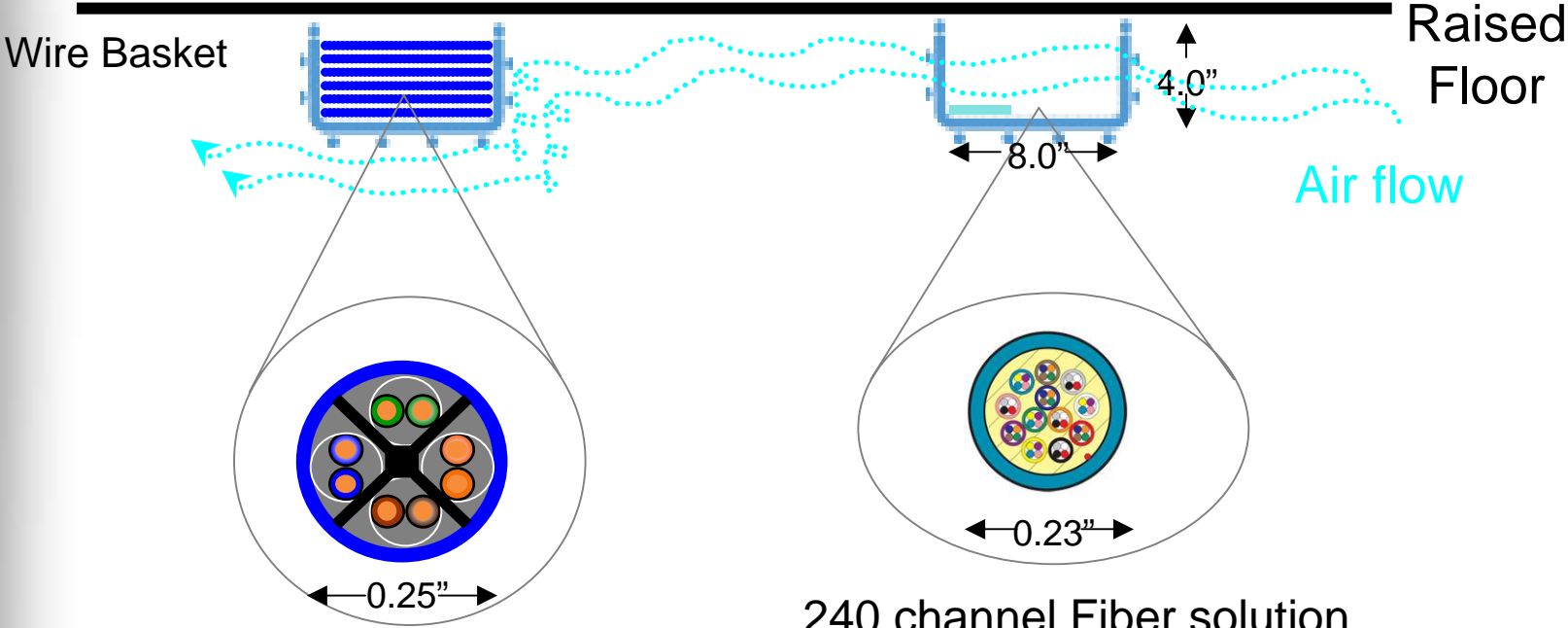


Heat/Density/Cooling Within the rack

- 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
LOMF: Field Terminated	5,500	156.70	34.67	\$5,691.36
LOMF: Pre-Terminated	5,500	217.64	6.25	\$5,723.89
UTP Copper	2,198	184.12	46.75	\$2,428.87
F/UTP Copper	2,198	191.52	52.35	\$2,441.87

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)



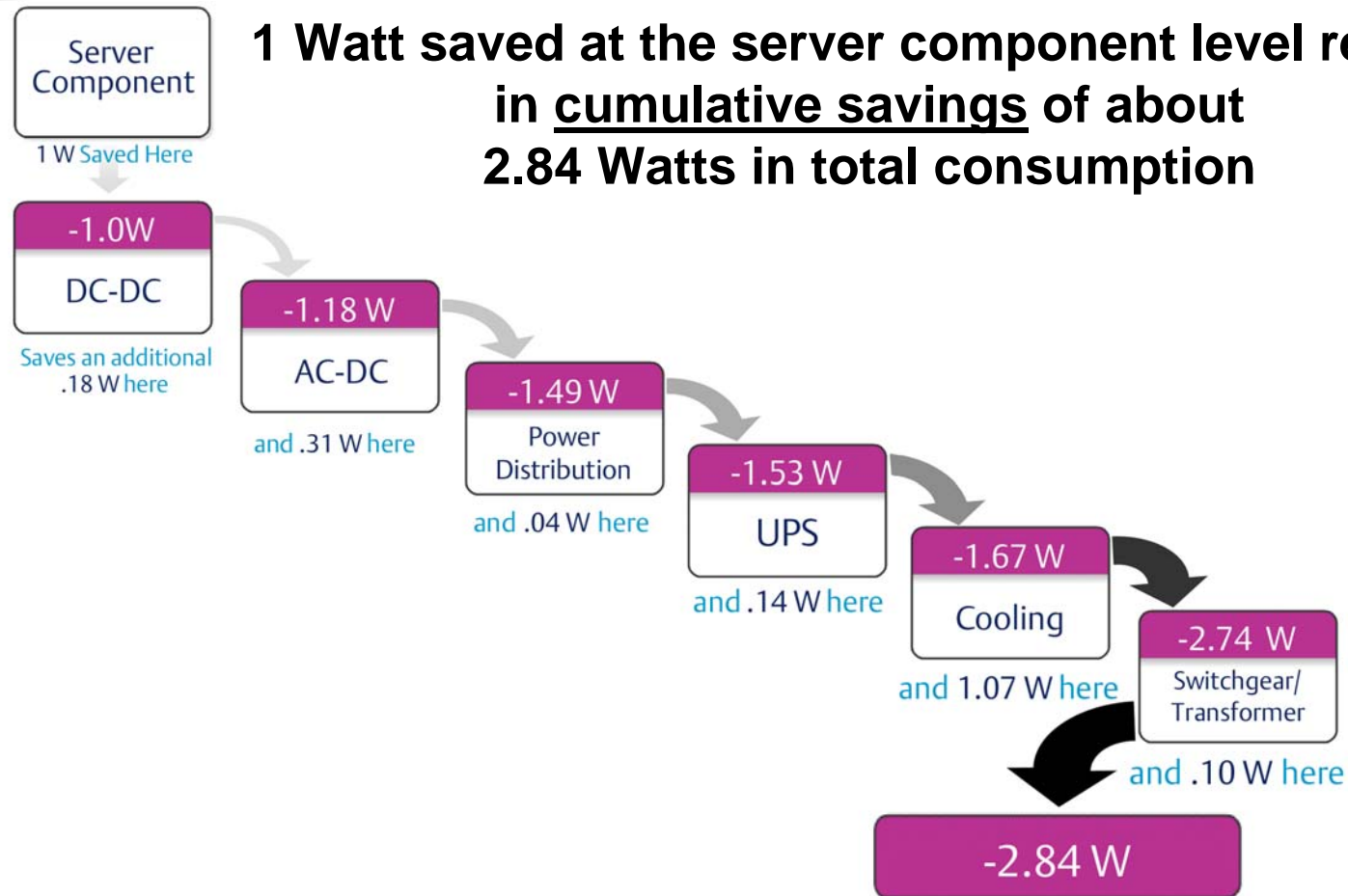
Cost: Heat Load Considerations Copper versus Fiber at 10G

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

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

The 'Cascade' Effect

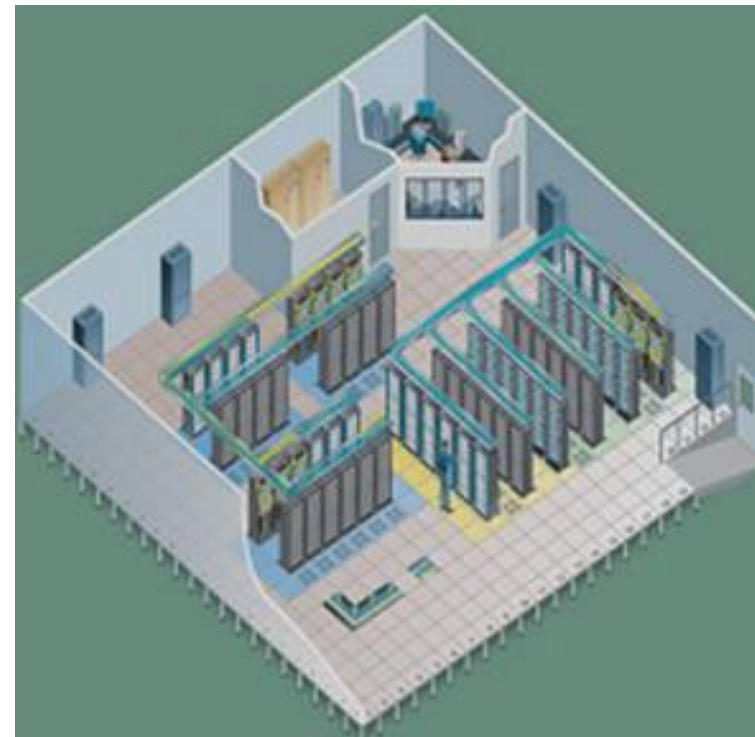
1 Watt saved at the server component level results in cumulative savings of about 2.84 Watts in total consumption



© 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



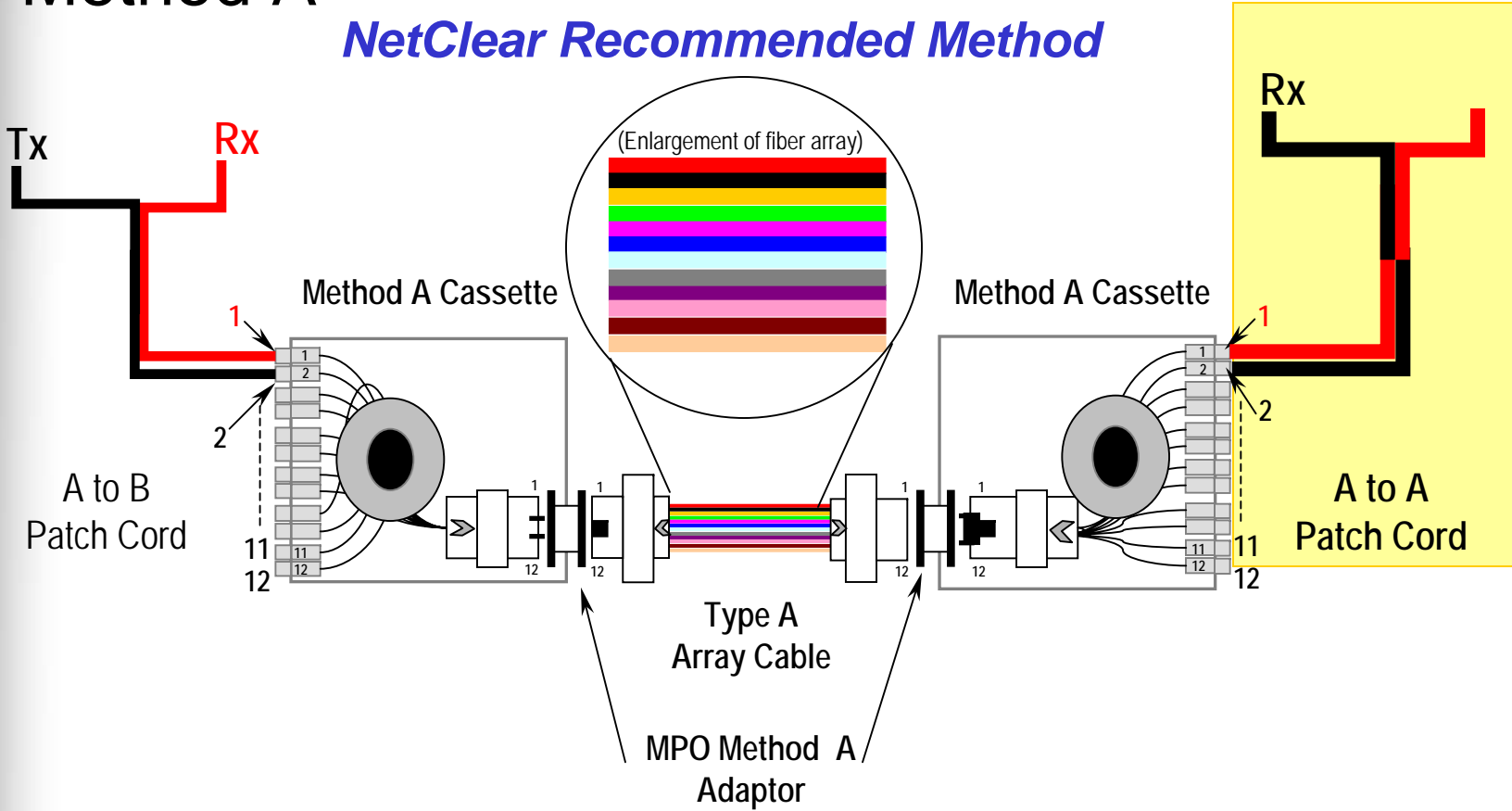
- **Modular pre-terminated cassette-based systems**
- **Simplified and compact data center cabling**
- **MTP™/MPO and LC available**
- **Optimized fiber cable and patch cord management**

Modular Cassette Connectivity

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

Method A

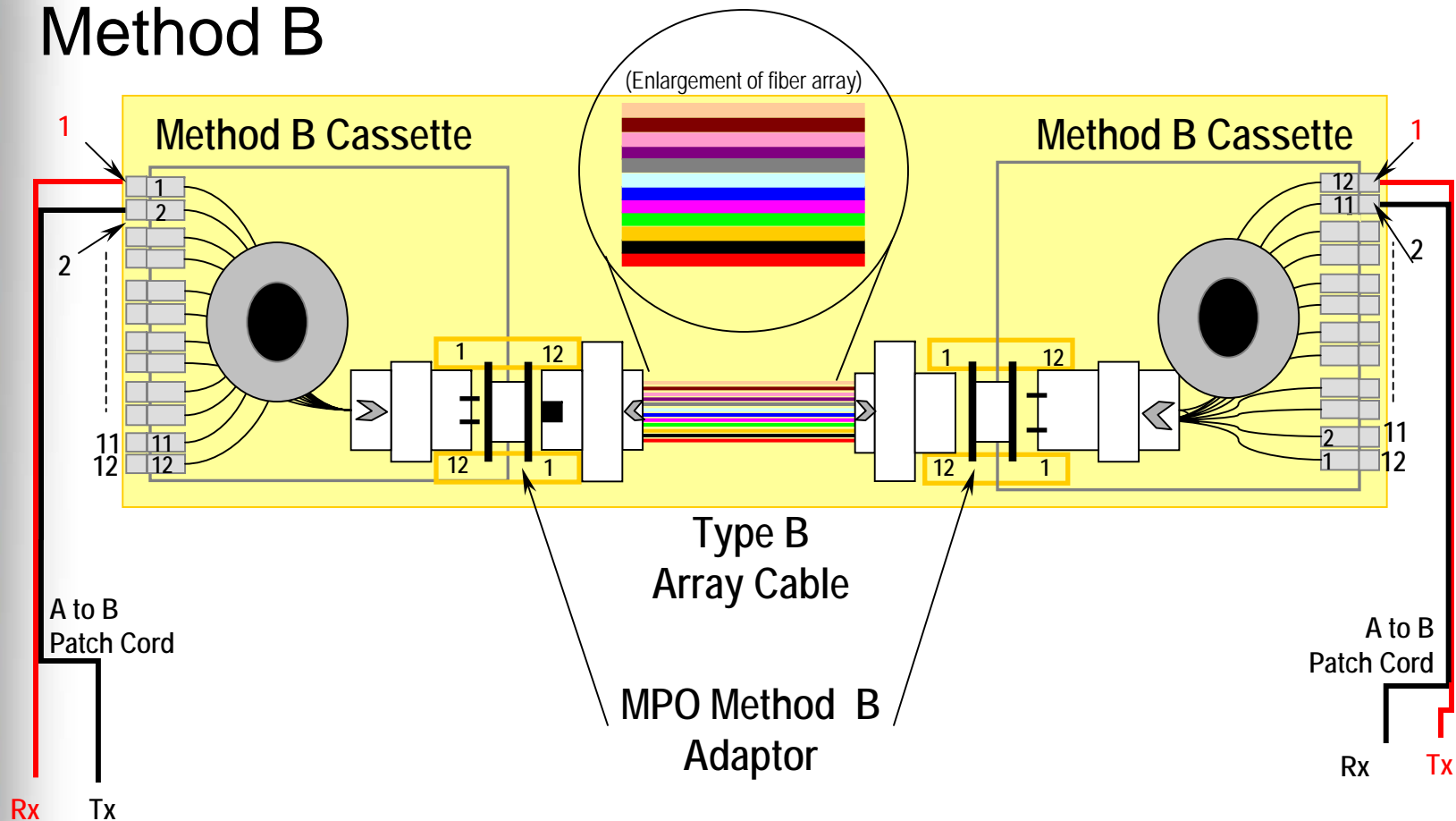
NetClear Recommended Method



Modular Cassette Connectivity

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

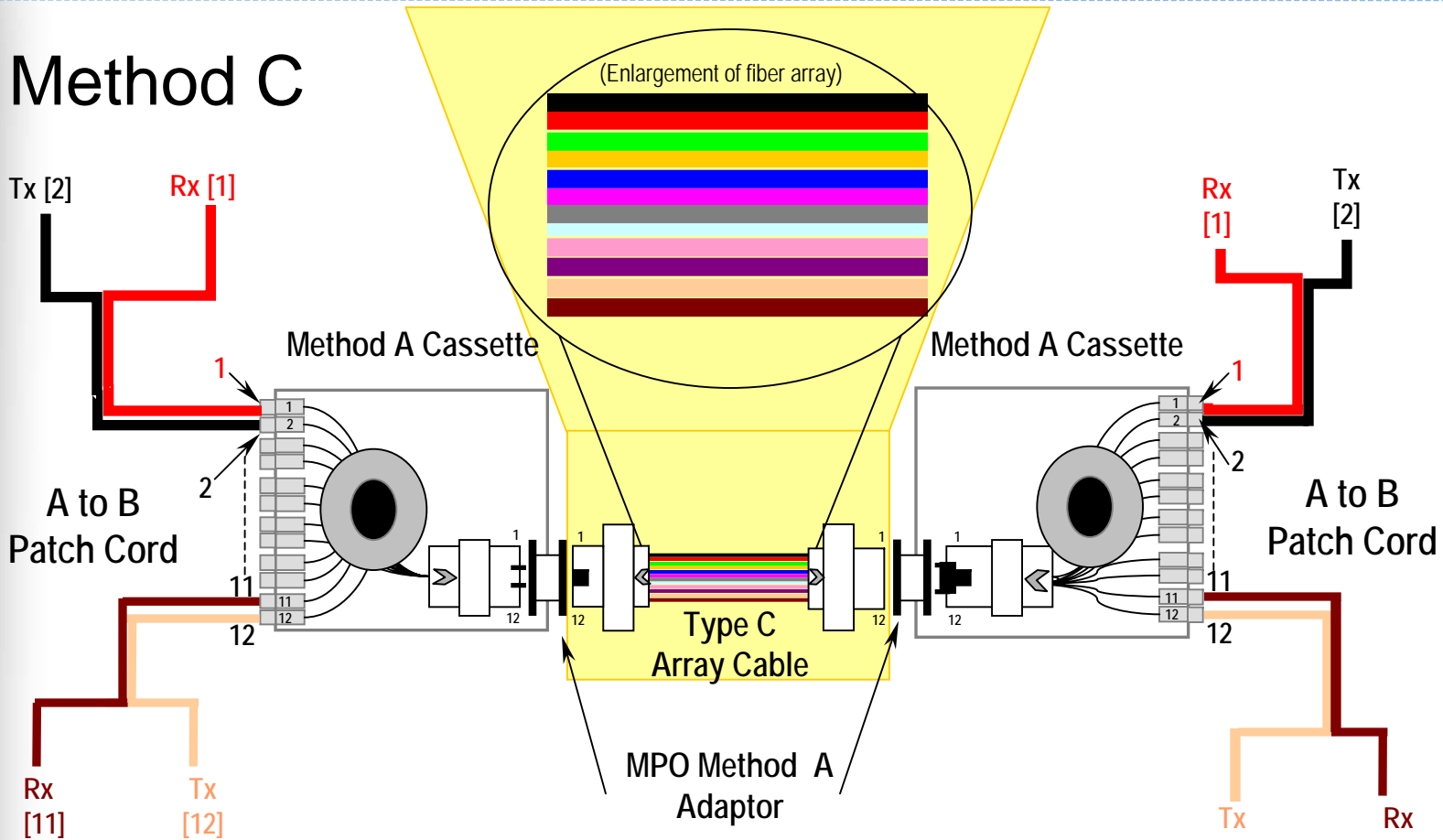
Method B



Modular Cassette Connectivity

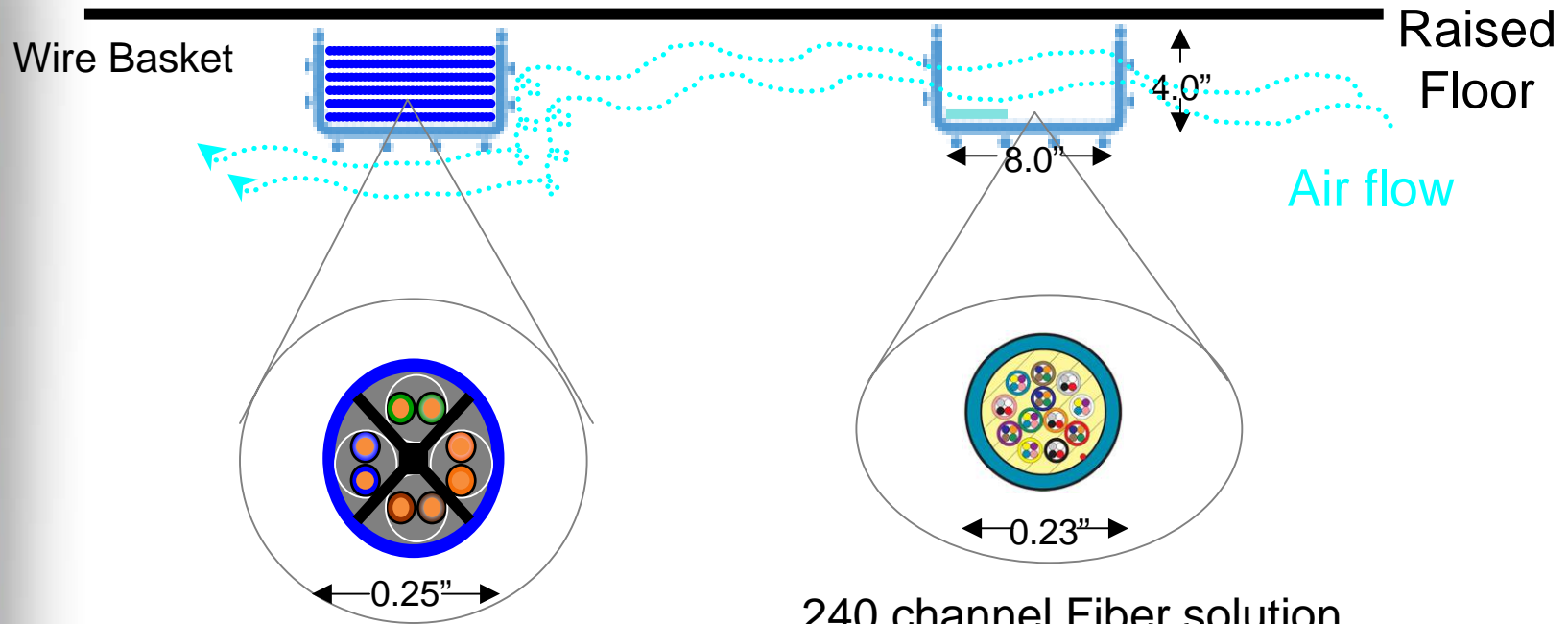
Methods: *Per TIA-568B.1 Addendum 7*

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

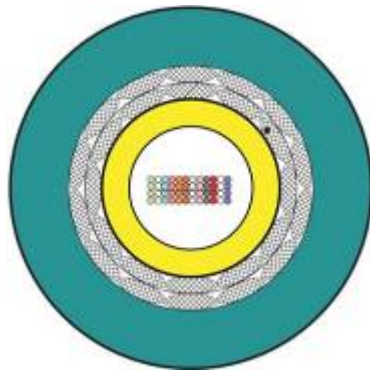
240 channel Fiber solution
50/125 LOMF MDP
10 cables, Fill Ratio < 1 %

*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)

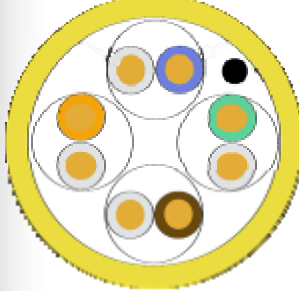


48F MDP Cable
(0.231" OD)

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

1st Generation
Cat 6a
(0.350")



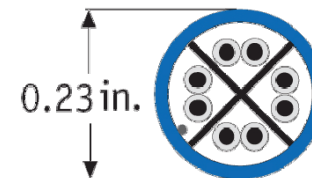
LANmark- 10G2
CMP
(0.300")



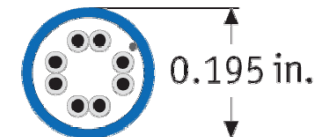
LANmark-6 F/UTP
(0.290")



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



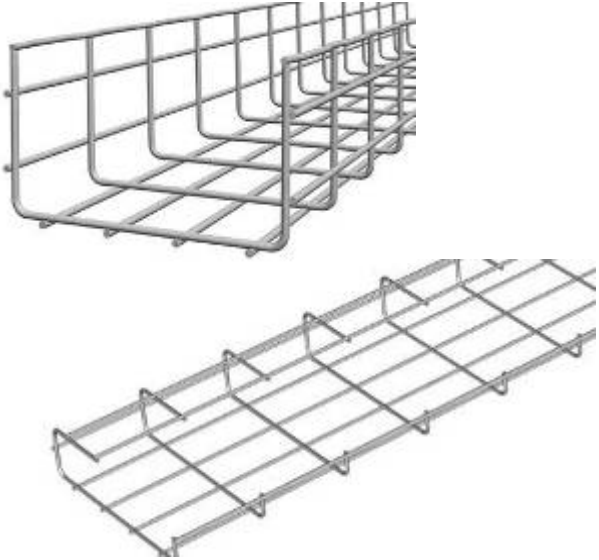
60 cables in an
8"x2" basket tray



Category 6A

BECAUSE YOUR BUSINESS RUNS THROUGH US

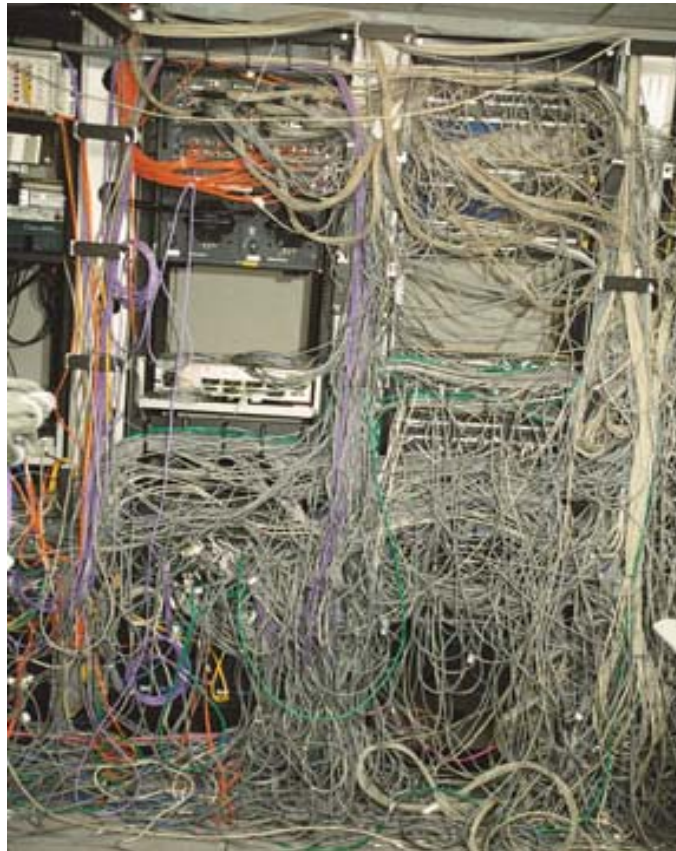
Wire Rack-mounted Patch Panels



BECAUSE YOUR BUSINESS RUNS THROUGH US

One More Important Practice

Cable Management



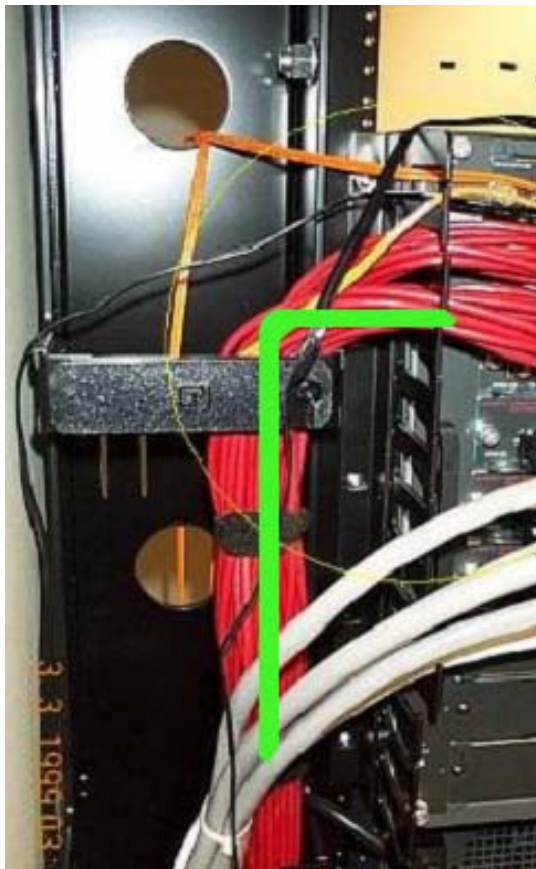
Cable Management

- 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)



BECAUSE YOUR BUSINESS RUNS THROUGH US

Good Cable Management

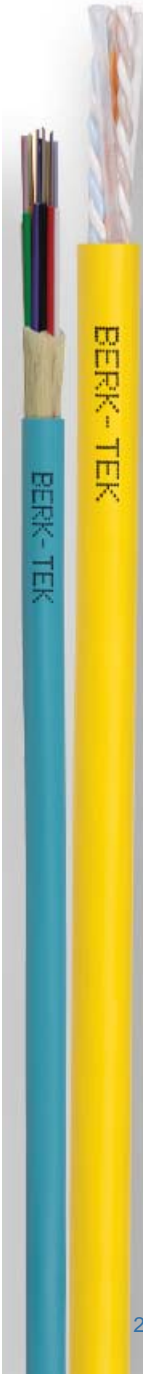


Best
Practice



BECAUSE YOUR BUSINESS RUNS THROUGH US

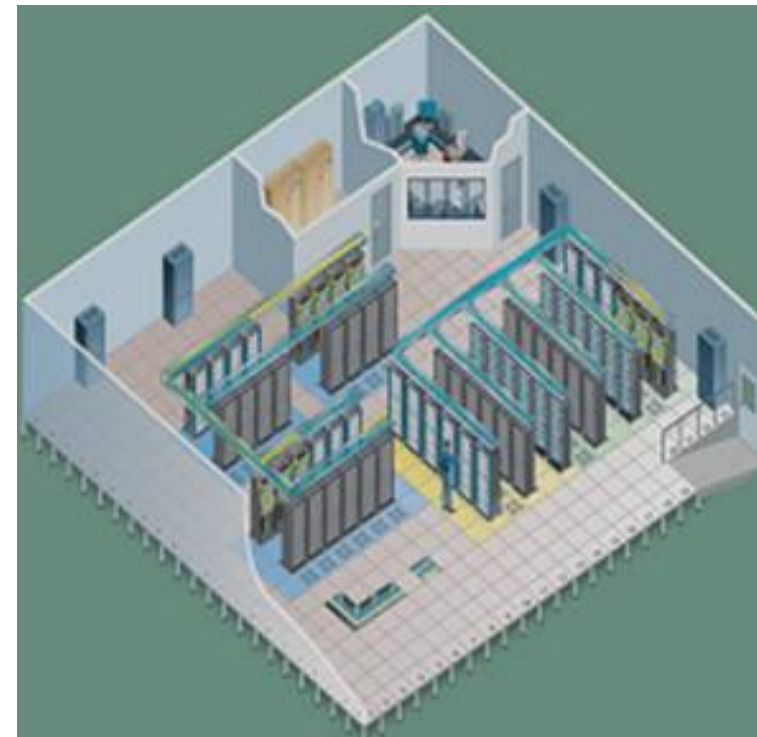
Berk-Tek Competence Center Installation Scenarios



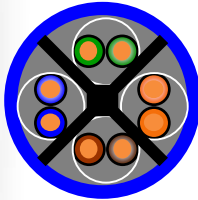
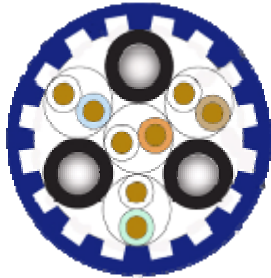

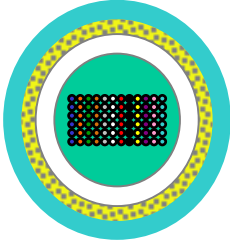

Berk-Tek Cable for All Your Data Center Needs

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

 Flexibility

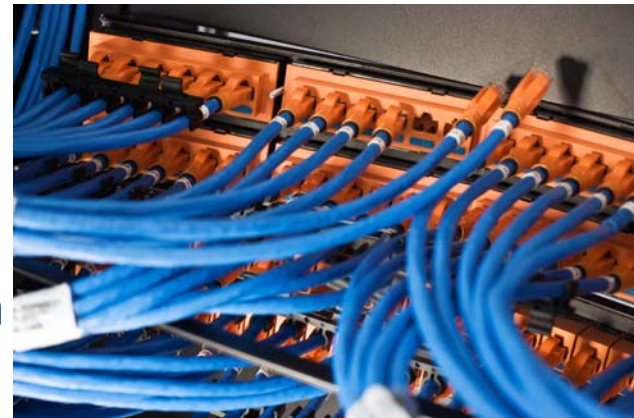
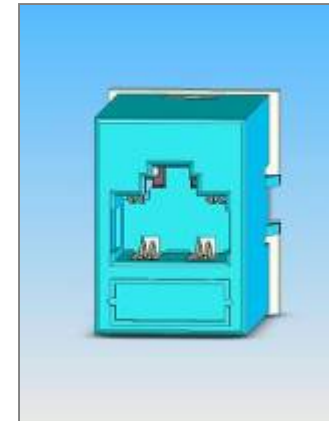


Data Center Cabling Options

				
← 0.25" →	← 0.30" →	← 0.231" →	← 0.32" →	← 0.46" →
UTP	10G UTP	48F MDP	72 F Multi-Ribbon Cable	72 F Loose Tube Cable
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***



	<i>Berk-Tek</i>	<i>Competition</i>
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.)

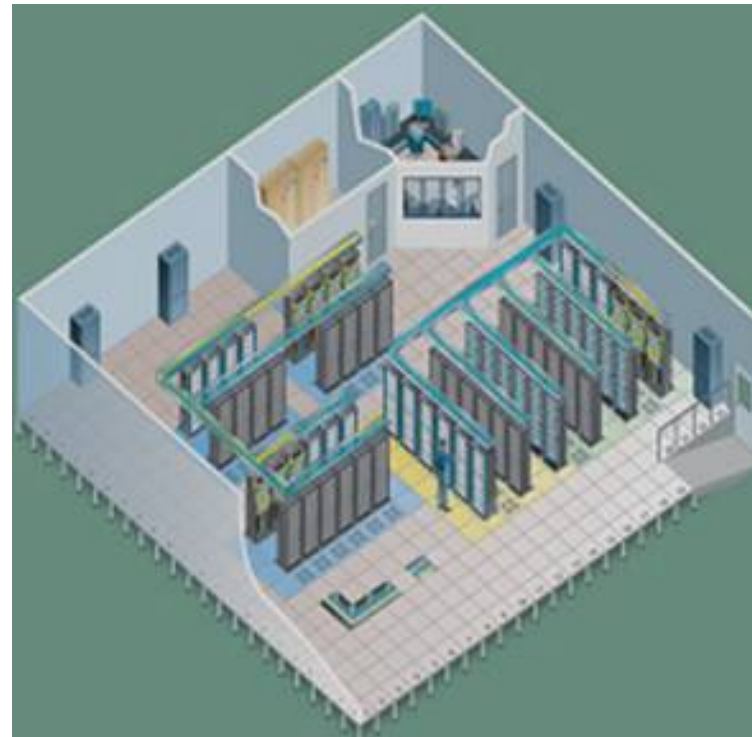
Cabling Best Practices

- 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

- 21st century data center considerations
 - Energy and cooling
 - Space savings and density
 - Flexibility



BECAUSE YOUR BUSINESS RUNS THROUGH US

Questions?