Intelligent Cable Management Systems

Bringing Practical Application

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Why Cable Management Matters

- Performance
- Cooling and air-handling
- Maintenance
ANSI/TIA 569*

- Telecommunication Spaces
  - Entrance Facilities (EF)
  - Equipment Rooms (ER)
  - Telecommunications Rooms (TR)
  - Telecommunication Enclosures (TE)
- Telecommunications Pathways
  - Ceiling spaces
  - Under Floor
  - Furniture pathways
Pathways and Cable Supports

- Attached to support weight and pulling
- Installed with clear vertical space above the ceiling tiles and t-bars.
- Should not rest on panels, wires, power or light fixtures
- Use properly sizes for cable
- Design in room for growth
J Hook Cable Support

• Spacing Intervals for effective support and distribution.
• Cable Sag between 4 and 12 in.
• Use independent support rods or wire to mount
• For large bundles – split the bundle or use a cable tray.
Cable Trays and Ladder Racks

- Design for 25% fill ratio
- Maximum of 50% fill and up to 6 in inside depth.
- Utilize Retaining post to contain cables
- Protect the cable from tneed rod supports
Conduit Guidelines

• Do Not exceed 100ft between pull points
• Flexible Metal Conduit is not recommended
• Maximum Fill Ratio:

<table>
<thead>
<tr>
<th>Number of Cables</th>
<th>Maximum Fill (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53%</td>
</tr>
<tr>
<td>2</td>
<td>31%</td>
</tr>
<tr>
<td>3*</td>
<td>40%</td>
</tr>
</tbody>
</table>
Optical Fiber Raceway

- Use innerduct or raceway to ensure protection
- Must be free of sharp bends and turns
- The Raceway must have the proper fire rating
Fire Stopping

• Two Categories
  – Mechanical
  – Non-Mechanical
    ▪ Putties
    ▪ Caulks
    ▪ Pre-Manufactured Pillow
Cable Handling

- Physical damage to the cable will cause degradation in performance
- Condition the cable to prevent cracking
- No kink, twist, snag or not while pulling.
Cable Pulling

- Watch edges of conduit, tray and sleeves
- Steady as it goes – don’t be a jerk

- Maximum Pulling Tension:

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Maximum Pull Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Pair 100Ω U/UTP</td>
<td>25 lbf (111 N)</td>
</tr>
<tr>
<td>Multipair 100Ω U/UTP</td>
<td>*</td>
</tr>
<tr>
<td>4 Pair 100Ω shielded</td>
<td>*</td>
</tr>
<tr>
<td>Premise Distribution Fiber</td>
<td>50 lbf (222 N)</td>
</tr>
<tr>
<td>OSP Optical Fiber</td>
<td>600 lbf (2.65 kN)*</td>
</tr>
</tbody>
</table>

* Check manufacturer’s specifications for maximum pulling tension
Cable Runs

In plenum and floor spaces, run cables at a constant “altitude” to reduce bends and turns.

Avoid “draping” cables over obstacles such as ducts and fixtures.
## Bend Radius

- Allowable varies with cable type and OD

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Bend Radius</th>
<th>No-Load</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Pair 100Ω U/UTP</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Multipair 100Ω U/UTP</td>
<td>10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4 Pair 100Ω shielded</td>
<td>8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Premise Distribution Fiber (1-4 strands)</td>
<td>-</td>
<td>1&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>Premise Distribution Fiber (5+ strands)</td>
<td>-</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>OSP Optical Fiber</td>
<td>-</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>

Note: In all cases follow manufactures recommended instructions.

![Diagram of bend radius](Image)
Micro- and Macro-Bending

- Violating the bend radius causes Macro-
- Excessive pull Tension or tight tie wraps cause Micro-
- Both cause unwanted light loss
Cable Bundles

- Cable stress should be minimized
- Do not over cinch bundles
- Recommend Velcro style wraps
- Stacking bundles can cause crush
- Separate Cu and Fiber
Horizontal Cable Managers

- Minimize damage
- Facilitate moves, adds and changes
- Improve performance
- Angled Patch Panels address some need
- Rear Managers are also needed
Vertical Cable Managers

- Must be appropriately sized
- Symmetrical Distribution
- Waterfalls
Cable Slack

- Slack loops or service loops help to accommodate future

- Recommended amount of cable slack:
  - TR or TE is 10ft (3m)
  - Ceiling about the TO is 3.28 ft (1 m)

- The recommended slack after termination
  - 1 ft (.3m) for balanced twisted pair
  - 3.28 ft (1 m) for optical fiber
Important Considerations

• Avoid over-bundling the cables or placing multiple bundles on top of each other

• Avoid blocking access to other equipment such as power strip.
Important Considerations

- Keep all cable runs under 90 percent of the maximum distance supported.
- For backbone and horizontal runs, install additional cables as spares.
Important Considerations

• Don’t stress the cable by:
  – apply additional twist
  – Pulling or stretching beyond load rating
  – Bending beyond the bend radius
  – Creating tension in suspended runs
  – Stapling or applying pressure with cable ties

• Avoid pipes and holes – limiting future runs
Best Practices

- Label cables with their destination at every termination point
- Test every cable as it is installed and terminated.
- Do not route cables in the way of fans or air flow
Best Practices cont.

- Allocate a port in the patch panel for each horizontal run
- Include sufficient vertical and horizontal managers in the design.
- Use angled patch panels in high-density areas.
Unique Solutions

- Using fiber cable assemblies that have a single connector at one end and multiple duplex break out at the other end.
- Corner bend radius
- Wire tray waterfall
Summary

• Cabling represents <10% of the overall data center investment
• Outlives most of the network components
• Most difficult to replace
• Requires versatility for current and future needs
• Since each environment is different, there is no single solution that will meet all your cable management needs.
Thank You