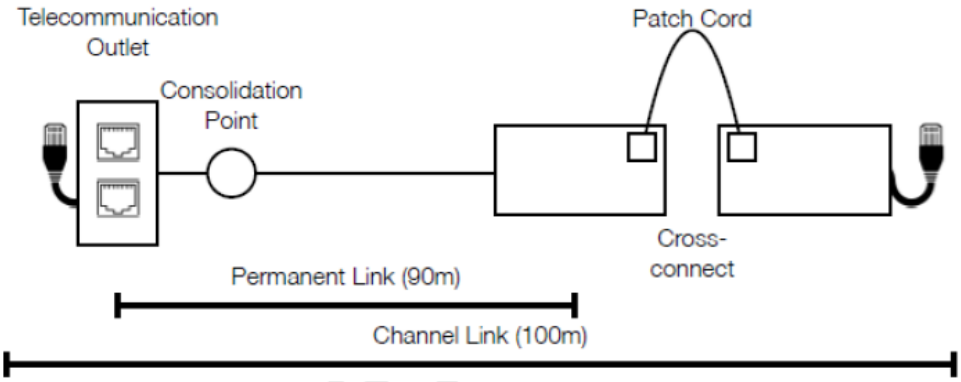

Permanent Link Performance

- A permanent link comprises the cable, consolidation/transition point, and a connector at each end.
- Stranded cables have more attenuation than solid cables. It is recommended to perform a return loss test on patch cords since they are the weakest link.

Multimode Fiber Optic

- Available core sizes: **62.5 µm** and **50 µm**.
- The **62.5 µm** core has higher attenuation, lower bandwidth, and is incompatible with the **50 µm** core.
- Operates at wavelengths of **850 nm** and **1300 nm**.
- Recommended maximum distance: **2 km**.
- Multimode fiber optic cables are categorized into five types: **OM1**, **OM2**, **OM3**, **OM4**, and **OM5**.

Single-mode Fiber Optic

- Available core sizes: **8 µm** and **9 µm**.
- Operates at wavelengths of **1310 nm** and **1550 nm**.
- Supports distances of up to **80 km**.
- Offers very **high bandwidth** and **low attenuation**.
- Single-mode fiber is categorized into two types: **OS1a** and **OS2**.

Electromagnetic Compatibility (EMC)

- **Electromagnetic Compatibility (EMC)** refers to a system's ability to operate within acceptable electromagnetic field limits without disrupting the functionality of other devices.
- **Electromagnetic Interference (EMI)** arises when unwanted signals from an electromagnetic source disrupt the normal operation of a susceptible device through a coupling path. EMI sources can be categorized as:
  - **Natural or man-made**
  - **Transient or continuous**
  - **External or internal**
- **EMC** serves as a method to manage and control **EMI**.

Measuring EMC

- **EMC** of a system or device is determined by two key factors:
  1. **Emission**
  2. **Immunity**
- The **FCC** mandates measuring electromagnetic radiation at:
  - **3 meters** for **FCC Class B**.
  - **10 meters** for **FCC Class A**.
- An **Electric Field Strength Meter** can measure the electric field around a device or system. The acceptable maximum field strength is **3 V/m**.

Simple Example

To calculate the sleeve quantity for a 6-floor building based on the given specifications:

Assumptions:

1. Each floor has a **usable area of ~3716 m² (40,000 ft²)**.
2. The baseline requirement is **4 sleeves per riser system**.
3. For every additional ~3716 m² (40,000 ft²) of usable space, add **1 sleeve**.

Steps:

Floor-wise Calculation (Single Riser System):

- **Base requirement:** 4 sleeves.
- **Additional area per floor:** 3716 m².

For each 3716 m² (or 40,000 ft²) beyond the first, add 1 sleeve.

Example for 6 floors:

Each riser system covers **half the usable area** on each floor:

Horizontal Pathways

- **Horizontal pathways** include all the structures that create a **path for the cabling system** extending from the **Telecommunications Outlet (T.O)** to the **Horizontal Cross-connect (HC)**.
- It also includes **pull boxes, splice boxes**, and all **accessories related to cable routing and containment**.

Sizing the Cable Pathways

Sizing depends on the following **6 factors**:

1. **Usable Floor Space**
2. **Maximum Occupant Density** - Consider **one work area of 9.3 m²** per person.
3. **Building Automation System (BAS) Density** - Consider **one BAS outlet** for every **23 m²** of total floor area.
4. **Cabling Density**
5. **Cable Diameter**
6. **Pathway Capacity**

Conduit Distribution Systems

- **Conduits** extend from the Telecommunications Room (TR) or Equipment Room (ER) to the telecommunications outlet serving a work area.
- They can serve outlets located in **ceilings**, **walls**, **columns**, **floors**, or within **furniture**.
- **Bends** in conduits must not exceed **90 degrees** per instance.
- The total bends between any two boxes must not exceed **180 degrees**.
- Conduit runs should not exceed **30 meters** without interruption. If necessary, **pull points** or **pull boxes** must be added.

Quiz: Chapter 4

1. What is the minimum recommended ceiling height for telecommunications rooms?
a. 2.0 meters
b. 2.4 meters
c. 3.0 meters
d. 3.5 meters

2. How much clearance should be provided for wall-mounted equipment?
a. 10 cm
b. 15 cm
c. 20 cm
d. 30 cm

3. What is the minimum aisle width required at the front and rear of telecommunications racks?
a. 0.5 meters
b. 0.75 meters
c. 1 meter
d. 1.5 meters

4. At what intervals should AC receptacles be installed around the perimeter of an equipment room wall?
a. 1.5 meters
b. 1.8 meters
c. 2.0 meters
d. 2.5 meters

13. Which type of access floor system is raised less than 15 cm above the floor?
a. Standard height
b. Low profile
c. Modular floor
d. Suspended floor

14. What is the recommended spacing for J-hooks in ceiling distribution systems?
a. 0.75 m to 1.25 m
b. 0.91 m to 1.52 m
c. 1.5 m to 2.0 m
d. 2.0 m to 2.5 m

15. What type of pathway is not recommended for horizontal distribution systems?
a. Over-floor ducts
b. Partition pathways
c. Poke-throughs
d. Modular furniture pathways

16. What is the minimum clearance above conduits and cables in a ceiling distribution system?
a. 5.5 cm
b. 7.5 cm
c. 10 cm
d. 15 cm

17. What is the maximum number of degrees allowed for bends in conduit between two boxes?
a. 90 degrees
b. 120 degrees
c. 180 degrees
d. 270 degrees

Study Notes on Chapter 5 - Backbone Distribution Systems

Cabling Topologies

1. Mesh is not a fundamental cabling topology.
2. The star topology is the best design for building backbones.
3. The topology generally used for OSP cabling is the star topology.
4. A fully connected mesh topology is commonly used in enterprise networks for router connections.
5. A hierarchical star campus backbone uses interbuilding or intrabuilding links between the MC (CD) and IC (BD).
6. Logical topologies like bus, ring, and tree can be implemented within a physical star topology.
7. Using a star topology for campus backbones introduces single points of failure.

Backbone Distribution System Components

8. A backbone distribution system provides connections between telecommunications spaces.
9. The main cross-connect (MC/CD) connects entrance cables, first-level backbone cables, and equipment cables and is also called a campus distributor.
10. The intermediate cross-connect (IC) is also called a building distributor.
11. The horizontal cross-connect (HC) is also called a floor distributor.
12. Campus backbone cabling offers the most design options for ICT designers.
13. Bridged taps are not allowed in building backbone cabling.
14. [illegible]