Structured Cabling System
Generic Project Requirements

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1. DESIGN OBJECTIVE

1.1. GENERAL BACKGROUND
This document is issued as a detailed technical reference guide to the design and installation of a structured communications cabling system for University of Bristol which shall be referred to as UoB within this document.

This document describes the system requirements to be met in the proposals of the communications cabling vendors and integrators to ensure under contract that the materials, design, engineering, installation, supervision and training services for the structured cabling system are compliant with the design requirements as specified by UoB.

It is the intent of any systems integrator or cabling contractor to provide a complete workable communication cabling system ready for use by UoB. Any item not specifically shown on the Drawings or called for in the Specification, but normally required for a complete system, are to be considered a part of the contract.

It is therefore essential that any contractor who wishes to engage with UoB fully understand the environmental credentials of the work carried out by UoB and compliance to these very strict design and management documents will ensure that all technical, safety and environmental measures are met.

UoB uses their own networking terminology which is similar to that used in the structured cabling standards, but it is important for contracted telecommunications designers and installers that they are fully conversant with the UoB terminology and all questions, answers and other technical responses uses this terminology as detailed within section two of this document.

1.2. PHYSICAL DESIGN CONSIDERATIONS
This document will further detail and prescribed the internal & external wiring design of the structured cabling system from the UoB Communication Rooms across the site as a whole. If the contractor wishes to contest any part of this design document, applications may be made to the UoB Estates Department for approval.

1.3. ENVIRONMENTAL SUSTAINABILITY
UoB operational ethics are based on sound environmental policies and as such suppliers are required to give manufacturing figures based on carbon emissions used in the production of products and the energies used in the recycling after the product has fulfilled a) its purpose or b) reached the end of its serviceable life.

1.4. CONVERGENCE
UoB wishes to wherever possible to converge all applications such as CCTV, door access controls, audio visual, building management controls, lighting etc onto the structured cabling systems and actively invites selected contractors to propose solutions wherever possible for consideration by Estates Department and the Facilities team.
1.5. TERMINOLOGY

Access Point | Access points are located in locations along an ICT pathway where the cabling within a containment system can be accessed for the purposes of installation and maintenance.
---|---
AP | Access Point
BMS | Building management systems
Cable tray | Cable trays consist of a perforated sheet metal containment system suitable for carrying telecommunication cables.
Cat 5 | Copper grade of cable capable of supporting data rates up to 100BaseT to the published requirements of EN 50173-1 and ISO 11801.
Cat 5e | Copper grade of cable capable of supporting data rates up to 1000BaseT to the published requirements of EN 50173-1 and ISO 11801.
Cat 6 | Copper grade of cable capable of supporting 1000BaseT and compliant to the requirements of ISO 11801, Amendment 1, 2 & 3 and EN 50173-1
Cat 6A | Copper grade of cable capable of supporting 10GBaseT and compliant to the requirements of ISO 11801, Amendment 1, 2 & 3 and EN 50173-1
CR | Communications Room
CMET | Central main earth terminal
Communications Room | Generic term used by UOB to describe a room otherwise known as telecommunications room
DP | Distribution Point
External Grade Cable | Offers protection against water ingress and extreme temperature variations. Note dependant on cable type jacket this may need to be terminated within 2m of building entry.
FD | Floor Distributor
Floor Distributor | Floor serving telecommunications cabinet or area
G652.D | ITU specification for low water peak Singlemode fibre (maximum loss of 0.4db/Km)
HDG | Hot dipped galvanised
Horizontal Cabling | Horizontal cabling that runs as horizontal cabling in a building
IDF | Intermediate distribution frame
Internal cable | Fibre or copper telecommunications that run internally to a building, must conform to EN fire standards such as low smoke (LSOH)
LC Connector | Preferred small form fibre connector used on-site
LSOH | Low smoke zero halogen cabling
MDF | Main distribution frame
MPO | Multi-fibre push on connector
MTP | Enhanced MPO style connector
OSP | Outside plant
POP | Point of presence
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3. PROJECT OVERVIEW

3.1. PROJECT SCOPE OF WORKS
4. DESIGN STANDARDS & REFERENCE DOCUMENTS

4.1. DESIGN STANDARDS

The following standards have been prescribed as the main structured cabling design standards for the building internal and external wiring covering both fibre and copper cabling. Latest versions of the standards prescribed below shall always take precedence.

ISO/IEC 11801: Information Technology – Generic Cabling for Customer Premises - All Amendments

EN 50173-1: Information technology. Generic cabling systems: General requirements.


EN 50173-5: Information technology. Generic cabling systems: Data centres.


BS EN 50174-3: Installation technology. Cabling installation. Installation planning and practices outside buildings.

EN 50310: Application of equipotential bonding and earthing in buildings with information technology equipment.

EN 50346: Information technology. Cabling installation: Testing of installed cabling - All Amendments

EN 60950-1: Information technology equipment. Safety: General requirements.

BS 6701: Telecommunications equipment and telecommunications cabling - Specification for installation, operation and maintenance.


IEC 15018: Information Technology – Generic Cabling for Homes- All Amendments

IEC & HD 60364-4-444: Electrical installations of buildings – Protection against voltage disturbances and electromagnetic disturbances

HD 60364-5-54: Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding
BS 8492: Telecommunication equipment and telecommunications cabling - A Code of Practice for fire performance and protection shall be observed.

5. DESIGN SCOPE

The design specification and guidelines for the buildings within UOB shall encompass the following elements:

5.1. DISTRIBUTORS (COMMS ROOMS)

Room Size
Earthing & Bonding
Security
Lighting: Normal & Emergency
Fire Protection & Suppression
Flooring
Access Controls
Communication Room Specification
Cabinet Specification

5.2. PATHWAYS

Vertical
Horizontal
Fire Stopping
Conduit
Cable Tray
Power Separation
EMC Compliance
Earthing & Bonding

5.3. TELECOMMUNICATIONS CABLELING INFRASTRUCTURE

Media Types
Pathways
Electrical Separation
General Installation Guidelines
Testing Requirements

5.4. DISTRIBUTORS (COMMUNICATION ROOMS)

The Communications Room (CR) is a room located within the building where UOB IT Services active and passive equipment shall be located.

Whenever possible these spaces should be located as close as possible to the “core” area of the building and on the same floor as the space to be serviced. This helps to keep the cables that service the work area voice & data locations as short as possible. This also reduces the time required to repair service outages.

The CR should be connected to the building entrance facility which shall be located immediately adjacent to the primary external pathways to reduce the length of any infrastructure entering from one UOB site buildings to another. Whenever this is not possible and the CR is close to the building parameter but greater than 2m of building entry facility all external grade voice and data
communication cables shall be terminated and a transition made to internal LSOH fibre cabling. Any change to this requirement will need explicit approval from UOB Estates Department in writing.

Dependent upon the type of building units there should be ideally two CR rooms/locations to provide redundancy to each within the same building, therefore each of the two CR rooms shall also be connected together to allow full redundancy; unless otherwise stated by UOB Estates Department.

Consideration shall be given to equipping all new office buildings with two CR locations to future proof the building should the building(s) use change at a later date. This approach may not be required to retail sites due to the physical size of each location.

Within a typical office building the CR rooms should be located at opposite extremities of the buildings to enable improved redundancy.

The CR must be readily accessible to authorised UOB personnel and equipment 24 hours/day, seven days a week and secured from unauthorised entry. It is required that the CR be located away from sources of high voltage (such as electrical, plant, lift rooms etc) and not be in close proximity to any rooms that contain large amounts of water, such as main water risers and toilet blocks etc.

All CR Rooms are to be completely free of utility piping carrying any form of liquids; no location above the room shall have any water or liquid carrying services. If wet area exists above the CR a physical drain away system will be required (note requirement for 3 metre clear height). Mains voltage cables shall not be routed through this room.

The CR shall not be located below water table level unless preventative measures against water ingress are employed. The CR shall be free from all water and drainage pipes not directly required in the support of the equipment within the CR. Preventative measures shall include a floor drain fitted with an automatic submersible pump shall be provided in the case of any risk of water ingress, supported by an environmental and water detection system.

Wherever possible the door opening direction should be to the outside, ramped entry at equal height of raised floor with anti dust coating, entry to the CR shall be managed as detailed by UOB security policies. The CR entry door shall be fire retardant with a minimum rating of two (2) hours.

An Auto Door closer is to be provided on the opening leaf. The minimum required door dimension (clear opening) is 1800 mm (W) x 2100 mm (H) with no or removable centre post and no door sill.

The CR should be free of all safety hazards and shall have no suspended ceiling.

The CR environmental control requirements shall include but are not limited to:

- Air conditioning, Temperature control, Humidity control, Fire detection, Fire protection, Power supplies (Mains & Uninterruptible Power Supplies), Lighting (normal & emergency)
- The temperature of the CR room must be maintained at a temperature that meets the UOB IT and Facility Services environmental policy.
- Relative humidity (non-condensing) must be maintained at a level that meets the UOB Estates Department environmental policy. The room must contain a manual / auto control air-conditioning switch and must digitally display temperature for operators.
5.5. ROOM SIZE

The CR has to be sized to accommodate all UOB IT Services equipment both active and passive.

The sizing of the room shall be dependent on the demographics of the area it shall serve.

Diagram one (1) is an example of how the room should be ideally laid out.

Each cabinet shall be supported by an operational clearance distance of 1.2m on all sides where access is required.
Diagram 1: Example of a Communications Room Layout
6. TELECOMMUNICATIONS CABBING INFRASTRUCTURE

The cabling standards define topologies that shall be followed. Recent developments in the IP convergence technologies have led to the introduction of BSEN 50173-6 which defines cabling infrastructure to support these technologies. A mixture of the definitions of BSENS0173-1 and BS 50173-6 can be used depending on the circumstance.

If the infrastructure refers to Users then BSEN 50173-2 is to be followed;

![Figure 1; BS EN 50173-2 Generic Cabling System](image1)

If the infrastructure is for other services, such as BAS then BSEN 50173-6 shall be followed;

![Figure 2; BS EN 50173-6 Type A Generic Cabling](image2)

The different approaches will help in planning the volumes of infrastructure

7. EARTHING & BONDING OF CABINETS

There are two elements regarding earthing and bonding of any telecommunication system, these being safety earth connections and equipotential earth connections. The safety earth connections shall be based on the requirements of BS 7671, but shall also take into account the latest published versions of standards listed below for telecommunications cabling.

- BS 6701
- BS EN 50174-1
- BS EN50174-2
There is no restriction for the use of the cabinets, frames and telecommunications pathways having to contain, or being intended to contain, information technology equipment or metallic information technology cable – but this has to be assumed to be the intention therefore UOB Estates Department require that:

The cross sectional areas of the protective conductor shall be chosen according to HD 60364-5-54:2007, and the cross-sectional area of the protective conductor shall not be less than the following:

- 4 mm² for a cabinet smaller or equal to 21U with a maximum length of 3m with a green & yellow sheath
- 16 mm² for a cabinet larger than 21U with a maximum length of 3m with a green & yellow sheath
- 25 mm² to an earth bar for multiple cabinet locations with a green & yellow sheath
- 4 mm² for patch panels connections back to the cabinet with a maximum length of 10cm with a green & yellow sheath
- The bonding conductor shall not be coiled or doubled back on itself
- A vertical earth bar shall be fitted within each
- Earth bar(s) shall be fitted within each CR
- Each cabinet shall be connected to the earth separately
- The length of the earth bar shall be sufficient for the immediate requirements or UOB Estates Department and have at least a 20% allowance for future growth
- Multiple bonding conductors shall be separated by a minimum distance of 150mm
- The earth bar should be fitted with a disconnection/test point
- All precautions shall be made to ensure that all connections shall have a low impedance path
- All elements, such as side panels and doors shall be bonded.
- All Earthing points shall be labelled “SAFETY/TELECOMMS EARTH DO NOT REMOVE"

8. SECURITY

Security of the CR Rooms shall be managed by the UOB Estates Department Security Procedures and Requirement Policy Documents.
9. LIGHTING: NORMAL & EMERGENCY

An average illumination level of 500lux measured one metre above finished floor is required in the PER. Lighting shall be minimum of 500lux measured “at the point of termination”. The lighting shall be controlled by one or more switches or automatic sensors located near the entrance doors to the room.

Generator or power back up should be considered for protection against power failure where at such the minimum emergency light level shall be as a minimum 1lux.

NOTE: The lighting fixtures shall not be powered from the same electrical distribution panel as the telecommunications equipment in the CR. Dimmer switches shall not be used and emergency lighting and signs shall be properly placed such that an absence of light will not hamper emergency exit.
10. FIRE PROTECTION & SUPPRESSION

Properly installed fire-stop systems shall be installed to prevent or retard the spread of fire, smoke and gases throughout the building. This requirement applies to openings designed for communications cables that may or may not be penetrated by cables, wires, or raceways. The requirements of BS 8492: Telecommunication equipment and telecommunications cabling - A Code of Practice for fire performance and protection shall be observed.

Fire-stops shall be appropriate to type of applicable opening and in compliance with the latest requirements of the Building Regulations.

All material shall be compliant with EN 1366-3:2004 Fire Resistance Test for Service Installations.

10.1. FIRE DETECTION

The CR shall be provided with an approved UOB fire detection system.

10.2. PENETRATION SEALS

- All fire-stop entries shall allow for 50% growth.
- All fire-stop seals shall be designed so as to be fit for purpose and for the correct application.
- All fire seals will be labelled with a unique identifier.
- Fire seal documentation shall state and record the date of MAC (moves, adds, changes) and changes to the fire seal by the cabling contractor.
- All fire penetration seals shall be non-permanent to allow future growth

UOB Estates Department require that products should be specified in terms of:

- The fire rating, construction details and orientation of the fire compartment structure (e.g. plasterboard wall or concrete floor are outside of the scope of this document.
- The type and size of cable management system to be fire-stopped and what it is manufactured from (e.g. 50mm x 50mm PVC electrical trunking)

The following shall be taken into account and any issues shall be reported back to the UOB:

- The size of the hole
- The percentage of cable fill within the hole
- Where there is a cable management system
- The size of the hole externally around the cable management system
- The size of the hole internally within the cable management system
- The percentage of cable fill within electrical trunking or conduit
- Detailed description of the fire-stopping system including any additional supports required for the cable system.
The fire barrier solution applied should meet the requirements of EN 1366-3 in accordance with the principles and application of BS 476-20 based upon the above criteria. It should be noted that fire barrier solution based upon Interacting components should be regarded as a complete system and should only be used as such.

11. FLOORING

Flooring in the CR shall be of a smooth material (carpet is not acceptable), such as a floor tile that does not produce dust, static and shall have a non-reflective surface (BS EN 60825).

The specifications should be consulted for recommendations on preferred treatments, paints, or other coatings for floors, walls, and ceilings that minimize dust and static electricity that meet with UOB environmental requirements.

When suspended floors are used within the CR floor the floor loading shall accommodate the intended weight of the equipment cabinet, electronic devices (switches etc) and current and or future intended telecommunications cabling over the life of the building.

The flooring manufacturer shall be responsible for the design of the suspended floor in regard to weight etc taking into account the cabinet and cabling manufacturer's specifications to ensure a compatible floor rating before installation.

The shielding effect of a raised floor is directly linked to its equipotential performance. If there is no contact between the flooring slabs (slabs with anti-static rubber seals), or if the contact through support brackets is not guaranteed (pollution, corrosion, moisture, etc., or no bracket at all), a frame ground grid shall be added by providing electrical connections between the metal uprights as shown in the drawing below. BSEN 50310 refers.

The frame ground grid shall be installed with a maximum cell size of 2 metres in each horizontal direction. The minimum cross-sectional area of the conductors that create the frame ground grid shall be 10 mm² min. Spring-operated clamps may be used for connecting the metal uprights to the frame ground grid.
The frame ground grid shall be connected to the earthing network at multiple points, where available. If the raised floor is installed with a surface that is intended to provide protection against electrostatic discharge, the DC resistance between the raised floor surface and the earthing grid shall be in the range 1 MΩ to 10 MΩ.

The minimum floor depth of the floor shall be 300mm.
12. CABINET SPECIFICATION

- Have overall dimensions of 1000mm (40") deep by 760mm (30") wide and 2130mm (84") tall.
- Be available with fully perforated front and rear doors to maximize air flow efficiency.
- Both front and rear doors must have the ability to open from the left and right without the need for any field modifications or tools.
- Cabinet to be designed with structural corner posts recessed back from both front/rear and sides.
- Have standard CEA-310E mounting holes having a full 45 RMS.
- Both front and rear doors available in split door option with same left and right opening feature.
- When “bayed” together, the cabinets shall create a 7” space between cabinets that can be used for the installation of a variety of vertical cable management and vertical (Zero U) patch panels.
- Be constructed of steel with a total static load capacity of 1000kg (2200lbs).
- Have a top lid that offers multiple cable entry points as well as features for the installation of a ventilation fans, blank panels and cable entry brush guards.
- Have an open access floor enabling maximum airflow as well as cable routing.
- Offer a full variety of internal cable management accessories.
- Offer a full variety of integrated vertical patch panels that offer solutions for UTP, F/UTP, Fiber and Power distribution.

Siemon VersaPOD™ Cabinet System Recommended

12.1. OPEN FRAME SPECIFICATION

12.1.1. OPTION 1

- Have 76 mm (3 in) by 152 mm (6 in) vertical cable channels as side rails in both .9 m (3 ft) and 2.1 m (7 ft) heights.
- Have channels capable of utilizing and re-locating ten high capacities, reusable hook and loop cable managers provided with rack, and have additional managers available in bags of ten.
- Have ten high capacity cable managers provided for the front, side or back of the rack, which can be used for horizontal, or vertical cable management and easily twist and lock into place without the use of screws or tools, and have additional managers available in bags of ten.
- Have standard CEA-310-E mounting holes having a full 45 RMS on front and back of rails. Cable routing openings shall be available in the front and rear of the channels.

- Have ladder channel, which acts as a top bracket to easily nest a standard 304.8 mm (12 in) ladder tray. The channel must have carriage bolt holes for attaching to the ladder system.

- Have available an optional rack top cable tray which manages cable bundles routed above the rack, and eliminates the need for installing a ladder rack for routing cables. The tray is mounted without the need of tools or hardware and includes up to three (3) separate cable paths featuring removable quarter-turn hook and loop cable managers.

- Be available in two versions, either aluminium or steel with a black finish and utilize black grommets for unused cable openings.

- Have two optional vertical cable management channels 152 mm (6 in) x 2.1 m (7 ft) and 76 mm (3 in) x 2.1 m (7 ft), which can be located between racks. The channel shall come with cable retainers, which can be hinged left or right and be located in any position along the channel.

- Have cable access holes in the side channels that line up with the same access holes found in the VPC-6 & VPC-12 vertical cable managers.

- Have floor mounting holes and a ground lug for 0-6 gauge ground cable provided.

- Have optional 10-outlet (4 ft) power strip for mounting onto the rack.

Siemon RS Series Rack System Recommended

12.1.2. OPTION 2

- Be of 4-post design, 2.13m (7 ft.) tall with the ability to adjust in depths from 559mm (22 in.) to 914mm (36 in.) in 25mm (1.0 in.) increments

- Be constructed from 12 gauge steel with a Black Powder Coat finish

- Be self leveling and squaring

- Have standard CEA-310-E mounting holes having a full 45U on front and back of rack

- Have a static load rating of 2000 lbs (907 kg)

- Utilize symmetrical components to reduce orientation errors and allow for ready assembly in less than 20 minutes

- Have features on the top to allow interface and support of ladder and wire basket style cable tray systems entering in both perpendicular and parallel directions

- Have footers that are in-facing to maximize floor space

- Have the ability to interface to the VPC-6, VPC-12, RS-CNL and RS-CNL3 vertical cable managers as well as all VersaPOD Zero-U products
• Have available optional baying brackets to properly align adjoining racks for the purposes of aligning rows of racks and proper operation of Zero-U products

• Have floor mounting holes and (8) ground attachment points for ground lugs

• Include (2) ground lugs for use with AWG 6 gauge

• Be listed for compliance with UL 60950-1

Siemon VersaPOD™ 4-Post Rack Recommended

All cabinets and frames shall be bonded to a local earth/ground connection by a suitably qualified electrician and in accordance with section 7

13. PATHWAYS

Pathways, and all entry points to the telecommunication pathways and the selected cable management system shall ensure that all cables (fibre or copper) are installed following the manufacturers and UOB Estates Department installation requirements and are fixed in accordance with the applicable minimum bend radius during the installation and through the operational life of the cabling system by using identifiable techniques including pre-fabricated curved corners, drop-outs and radius limiters. Where multiple cable types are involved, the largest minimum bend radius shall apply.

The minimum bend radius for shielded 4-pair balanced cables shall be 50mm during installation and for operational use.

The minimum bend radius for optical fibre cables shall be 50mm during installation and for operational use.

All pathway systems shall be supported at intervals of at least 1m, but no farther apart than 1.5m.

If threaded rod is used to support cable tray then a protection collar shall be installed to prevent damage to cables during installation.

Appropriate space shall be allocated to draw-boxes and the storage of cable loops (service loops) if utilized.

The maximum stacking height in pathway cable management systems such as cable tray shall not exceed 150mm and remain 10mm away from the top level of cable tray.

All above ceiling cable pathways shall be installed at least 75mm above any suspended ceiling grid with a further free space above the pathway of 125mm.

All metallic cable tray and cable management systems (including conduit) shall be earthed in accordance with the latest requirements of BS 7671.
13.1. VERTICAL PATHWAYS

Vertical fibre pathways shall be enclosed within 360° shielded trunking (lid and tray) to aid in the physical protection of the building fibre from damage caused by adverse environmental conditions, unwanted contaminants, personnel or rodents.

The fibre shall be supported with spools at distances no greater than 1.5m and each spool shall be selected to ensure compliance with the minimum bend radius as specified by the fibre manufacturer.

Where transitions are made from the vertical to horizontal paths to the all bends shall be managed to support the fibre manufacturers minimum bend radius and protect the cables from sharp edges.

13.2. HORIZONTAL PATHWAYS

Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations. These should be designed and installed so as not to have any detrimental effect on the proper air flow of the space. This will insure that equipment maintains it’s proper operating temperature and any excess heat is allowed to be vented away.

Containment and cable management systems for telecommunication cables are generally available including ladder rack, basket and cable tray. UOB may use any combination of these for electrical services only, but for telecommunications cables the choice has been restricted by the telecommunications standards for EMC protection and available service area size.

Cable tray shall be installed following the manufacturer’s guides and as a minimum conform to EN 1461 (HDG, slotted steel).

Initial fill rates for cable tray shall not exceed an initial rate of 40%

Cables shall be restrained only where necessary using either plastic cable ties or hook & loop ties

All metallic cable tray and cable management systems shall be earthed in accordance with the latest requirements of BS 7671

Pathways shall not have exposed sharp edges that may come into contact with communications cables as prescribed in EN 50174-2.
13.3. **FIRE STOPPING**

Fire stopping shall be applied as per the requirements of Section 10 Fire Protection and Suppression.

13.4. **CONDUIT**

Conduit pathways shall be of a steel construction with a minimum wall thickness of 1.5mm for electromagnetic compatibility.

All conduit pathways shall be earthed as per the latest requirements of BS 7671.

Conduits shall not: contain more than two bends of up to 90° max between pulling points (e.g., outlets, telecommunications rooms). Be subject to cumulative changes in direction of more than 180° between pulling points.

Pull boxes shall be installed no more than 12m apart in any given length of conduit.

Bends within conduit shall be accessible and able to act as pulling points unless:

No additional cables are to be installed within the conduit, following the initial installation of cable;

Cables are to be removed before any additional installation takes place.

The inside radius of a bend in conduit shall be at least 6 times the internal conduit diameter.

Bends in the conduit shall not contain any kinks or other discontinuities that may have a detrimental effect on the cable sheath during cable pulling operations.

13.5. **CONDUIT FILL FOR COPPER CABLES**

<table>
<thead>
<tr>
<th>Conduit Size</th>
<th>No. of Copper Cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>20mm</td>
<td>2</td>
</tr>
<tr>
<td>25mm</td>
<td>4</td>
</tr>
<tr>
<td>32mm</td>
<td>6</td>
</tr>
<tr>
<td>50mm</td>
<td>16</td>
</tr>
<tr>
<td>75mm</td>
<td>37</td>
</tr>
<tr>
<td>100mm</td>
<td>67</td>
</tr>
</tbody>
</table>

13.6. **CABLE CONTAINMENT PATHWAYS**

13.7. **CONTAINMENT SYSTEMS**

Copper cables can be contained within either plastic or metal wall mounted trunking or conduit fixed to solid walls and ceilings. For installations where dado containment systems are employed, communication cables shall only be installed in the top section of the dado containment system.
Two compartment trunking shall have all faceplates mounted in the lower section with date running in the top section. Data cables shall then be directly routed into the back box from above.

### 13.8. CABLE PATHWAYS TO TELECOMMUNICATIONS OUTLET

From the horizontal pathway to the TO, the cables shall be contained in an earthed flexible metal Kopex (1.5mm wall thickness) throughout the cable run to the telecommunications outlet(s) and or distribution (consolidation) points as shown below in Diagram 2 for links longer than 1.5 meters.

![Diagram 2: Links from cable pathway to the telecommunications outlet > 1.5meters](image)

If the distance is less than 1.5 meters, than the contractor will be permitted to cleat the cables to a solid wall using a retaining system that will not cause damage to the installed cabling. UOB have approved the use of the
14. POWER SEPERATION

The design of the structured cabling system shall be based with safety as a paramount requirement at all times in regard to:

- The electrical safety of equipment (covered in the earthing & bonding sections of the document)
- The safety of all personnel who may contact into contact with the telecommunications cables.
- And as such all telecommunications cables shall not be installed into any compartment of a cable management system with un-shrouded electrical supply cables or terminals.
- For electricity supply cabling which operates at nominal voltages exceeding 600V a.c (900V d.c. to earth) the separation distance between power cables and electricity supply cables shall be:
  - A maintained physical distance of not less than 150mm and or, a maintained distance of not less than 50mm provided a suitable divider meeting the requirements of BS 7671
  - Where electrical supply cables are installed inside a building with a nominal operating voltage between 50V and 600V a.c. (120V d.c. – 900V d.c. to earth) the telecommunications cabling and electricity supply cabling shall be separated by either:
    - A maintained physical distance of not less than 50mm or, separated by a physical divider meeting the requirements of BS 7671

Exceptions to this rule for nominal voltages for 50V and 600V a.c. are:

- The electricity supply cables are of flexible a double insulated type supplying 240V to telecommunications equipment in the cabinets (e.g. a kettle lead)
- In situations where electrical supply and telecommunication cables cross it is a requirement of this specification document that a cradle guard is installed to separate the cables by the required distance for safety and electromagnetic compliance and to prevent broken electrical conductors or supply cables coming into contact with the telecommunications cabling.

14.1. EMC COMPLIANCE

The systems integrator and cabling contractor shall take the appropriate measures to ensure that electromagnetic compliance is attained for the structured cabling system. In order to achieve EMC compliance by design EN 50174-2 prescribes the correct measures to ensure compliance.
15. ELECTRICAL ROOMS

For the purposes of this document the electrical rooms fall out of the scope of this document.

16. HORIZONTAL CABLING IN THE BUILDING

16.1. MEDIA TYPES

All pathways for telecommunications cables (conduit and cable tray) shall be designed to allow for future proofing, i.e. the ability to accommodate more cables of the same type so that no damage occurs to the already installed cabling or contravening any associated requirements of the standards.

Designs should be based on a maximum fill rate of 40% for any new installation. A further 20% is available for use, thus meaning that the maximum fill rate of any cable management system shall not exceed a total fill rate of 60%.

The media types selected by UOB Estates Department will utilise the latest cabling technology available on the market to suit their business needs. This technology shall encompass both copper and fibre structured cabling systems and products which are fully compliant with the latest requirements of ISO 11801 & EN 50173-1.

The technologies approved at this time for deployment for new buildings within the UOB Estates Department are:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Environment Usage</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre</td>
<td>OS1/2 LWP (G652.D) Tight Buffered LOSH</td>
<td>Internal Fibre Cable</td>
<td>Black</td>
</tr>
<tr>
<td>Fibre</td>
<td>OS1/22 LWP (G652.D) Loose Tube Polyethylene</td>
<td>External Fibre Cable</td>
<td>Black</td>
</tr>
<tr>
<td>Fibre</td>
<td>OM3 (12 or 24 core) Loose tube LSOH internal/external grade cable</td>
<td>Internal/External Fibre Cable</td>
<td>Blue</td>
</tr>
<tr>
<td>Fibre</td>
<td>OM3 (12 or 24 core) Tight Buffered LSOH internal grade cable</td>
<td>Internal Fibre Cable</td>
<td>Blue</td>
</tr>
<tr>
<td>Copper</td>
<td>Cat 5e U/UTP, Cat 6A F/UTP</td>
<td>Internal Copper Cable</td>
<td>Mauve/Purple</td>
</tr>
</tbody>
</table>

Notes:

External grade communication cables shall be terminated within 2m of building entry.

Must conform the more stringent requirements of ISO 11801

Older buildings may contain other cable types such as Cat 5e, Cat 6, OM1, OM2 etc. If these cable types are required then the project specific scope of works issued by the UOB Estates Department will state where this are required.

The UOB preferred Solutions are listed in the appendices (Section 18) of this document.
17. TECHNICAL COMPLIANCE

Contractors wishing to be engaged in the ICT structured cabling are required to complete a compliance table to this document. This table shall include references to all major and minor sections with statements indicating compliance, non-compliance or understood if a technical response is required. If the responding contractor indicates a non-compliance issue, UOB Estates Department requires full details on why that section of compliance was not attainable.

<table>
<thead>
<tr>
<th>Section Title</th>
<th>Ref No.</th>
<th>Statement</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PER</td>
<td>5</td>
<td>Understood</td>
<td></td>
</tr>
<tr>
<td>Room Size</td>
<td>5.1</td>
<td>Compliant</td>
<td></td>
</tr>
<tr>
<td>Earthing &amp; Bonding</td>
<td>5.2</td>
<td>Non-Compliance</td>
<td>We shall refer this section to qualified electrical engineers</td>
</tr>
</tbody>
</table>
18. TRAINING

18.1. FIELD INSTALLATION STAFF

On-site field installation staff shall have attended and met the requirements as specified by the structured cabling manufacturer in terms of installation techniques. The UOB Estates Department teams require that 50% of all contractors whether involved directly or indirectly shall be trained by the structured cabling manufacturer.

18.2. PROJECT MANAGEMENT & SENIOR ENGINEERING STAFF

On-site project management staff shall have attended and met the requirements as specified by the structured cabling manufacturer in terms of both design and installation techniques. The UOB Estates Department require that 100% of all project managers and senior engineering staff whether involved directly or indirectly shall be trained by the structured cabling manufacturer.

19. TESTING

19.1. FIBRE OPTIC

UOB Estates Department only requires testing of link attenuation using a calibrated light source and power meter at both 1310nm and 1550nm in both directions for any G652.D fibre. For multimode fibre 850nm and 1300nm the same testing shall apply.

While other fibre optic cabling system parameters such as bandwidth are equally important, they are not normally affected by the quality of the installation and therefore, do not require field testing.

19.1.1. FIBRE OPTIC LINK TESTING

Attenuation testing should be performed on each passive link segment of the cabling system. A link segment consists of the cable, connectors, couplings, and splices between two fibre-optic termination units (patch panels, information outlets, etc.). Each terminated fibre within a link segment shall be tested.

The link segment attenuation measurement includes the representative attenuation of connectors at the termination unit interface on both ends of the link, but does not include the attenuation associated with the active equipment interface.

All results shall be recorded in an electronic format showing the result, date and time of the test. A link loss budget calculation shall also be saved for the link segment based upon the ISO standards requirement to the higher requirement(s) as specified by the manufacturer's fibre optic warranty requirements:

- Fibre loss budgets figures shall be recorded in an electronic format and compared to the physical test results.
- Fibre loss budgets for Singlemode (G652.D) shall be based as a minimum on the following technical guidelines:
  - Mated Pair (Connector to Connector) better than 0.5dB
- Optical Splice (Fusion or mechanical) 0.2dB
- Fibre Length are standard or manufacturers guidelines for loss per Km (0.4dB for 1310nm & 0.3dB for 1550nm)

![Diagram of a cable with splices and mated pairs]

**Total Fibre Length 500m**

Splices X 2

Mated Pairs X 2

**Standards Figures**

- OS2 Loss per Km: 0.4dB \( \times 1\text{Km} = 0.2 \)
- Optical Splices: 0.3dB \( \times 2 = 0.6 \)
- Mated Pairs: 0.75dB \( \times 2 = 1.5 \)
- Total Acceptable Loss \( \times 2 = 2.3 \)

**Example of Fibre Loss Budget**

### 19.1.2. GENERAL TESTING GUIDELINES

- **SAFETY NOTE:** Un-terminated connectors may emit radiation if the far end is connected to a laser or LED.

- Do not view the end of a cable until absolutely sure that the fibre is disconnected from any laser or LED source.

- Singlemode vertical link segments should be tested in both directions at BOTH 1310nm and 1550nm wavelengths.

- Singlemode horizontal link segments should be tested in both directions at BOTH 1310nm and 1550nm wavelengths.

- Multimode vertical link segments should be tested in both directions at BOTH 850nm and 1300nm wavelengths.

- Multimode horizontal link segments should be tested in both directions at BOTH 850nm and 1300nm wavelengths.
19.2. COPPER

All copper cables installed within UOB Estates Department shall be tested with the relevant up to date calibrated tester and be able to from Cat 5e cabling through to Cat 7A.

The tester shall be approved by the manufacturer and shall be calibrated by an authorised calibration company no more than 1 year prior to testing.

Copper permanent links shall be tested as a permanent link as a minimum, but channel tests will be permitted if patch cords are left in place at either end of a channel.

The calibrated tester shall be capable of testing to the requirements as specified by UOB Estates Department (Such as EN 50346) and or any requirement as specified by the cabling manufacturing.

Please note: Marginal passes shall not be accepted

All test results shall be saved in electronic format by the structured cabling contractor and shall be archived for reference for the lifetime of the warranty period offered by the manufacturer.

20. LABELLING

All elements of the infrastructure should be labelled in line with the standard and using a numbering scheme which meets with the UOB approval.

All floor outlets, consolidation points, patch frames, and horizontal and vertical cables will be labelled. Pathways and spaces shall also be numbered using an approved numbering scheme, i.e. trays, rooms etc.

No handwritten labels shall be accepted. All labelling shall be fixed 30mm behind faceplates and patch panels.

Sample labels shall be supplied for approval by UOB Estates Department prior to any works commencing on site.

Room labelling plans shall always be planned and allocated in clockwise direction from the main door.

20.1. LABELLING SCHEME

The labelling plan currently adopted by the UOB follows a simple labelling convention of building name and location, cabinet number, patch panel number and port number etc as shown in the examples below:

<table>
<thead>
<tr>
<th>Building Name</th>
<th>Location</th>
<th>Room Number</th>
<th>Cabinet</th>
<th>Patch Panel</th>
<th>Port Number</th>
<th>Unique Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>97WR</td>
<td>97 Woodland Road</td>
<td>21</td>
<td>A</td>
<td>02</td>
<td>14</td>
<td>97WR/21/A/2/14</td>
</tr>
</tbody>
</table>
20.2. CABINET LABELLING

Within the communications room each cabinet will be labelled appropriate to the building code including room location and cabinet number. All cabinet numbers typically run sequentially from left to right.

- DURD equates to the building identifier
- 22 Equates to the room location identifier
- 4 Equates to the Cabinet number

20.3. PATCH PANEL & OUTLETS

Each cable run will be uniquely and individually identified by an identical label at each end (i.e patch panel and telecommunications outlet) in accordance with the following:

- DURD equates to the building identifier
- 4 equates to the cabinet number
- 22 Equates to the room location identifier
- 4 Equates to the Cabinet number
- 3 equates to the patch panel number within cabinet number 4
- 22 equates to the port number located with patch panel number 3 within cabinet 4 with the Durdham Hall etc

21. WARRANTY

All cabling infrastructure deployed in any UOB Estates Department projects for both fibre optic and copper shall be covered by a minimum of 20 year product and applications assurance warranty supplied by the manufacturer.

It is a requirement of any warranty that the installer is a registered business partner with the given manufacturer and as such met the training requirements of this document and the manufacturer. The business partner is also responsible for meeting any other specific requirements of the manufacturer that fall outside the scope of this document.
The business partner shall be responsible for recording the warranty with the manufacturer but the warranty shall be directly between the manufacturer and UOB Estates Department.

Any future claims will be dealt with by the business partner but in his absence directly with manufacturer or any other partner supported by manufacturer working within UOB Estates Department.

22. UOB ESTATES DEPARTMENT REQUIRED DOCUMENTATION

UOB Estates Department require the following documentation from the structured cabling contractor on completion of the installation:

- Approved “As Built” building drawings. All new trunking, containment routes and telecommunication outlet positions to be clearly identified on the supplied drawings.

- Test certification for every cable (copper or fibre) installed. Certificates shall be provided in both paper and electronic format.

- Red Line drawings showing ‘as installed’ to be presented to Estates Department and held by the structured cabling contractor for the length of the warranty

- All fibre and copper jumping and patching schedules

- Schematic of all fire stopping penetrations and materials used – Including all data sheets

- Work Authorisation Forms

- Full and detailed method statements and risk assessments
23. PREFERRED CONTRACTOR STATUS

All communications connecting hardware and cable must be made by an ISO 9001:2000 Certified Manufacturer. The preferred manufacturer by UOB Estates Department is The Siemon Company who has proven themselves technically across all UOB environments. If other communications and structured cabling vendors are able to quote provided, that they can successfully:

- Technically demonstrate a higher technical performance at component and channel configurations by providing guaranteed ‘worst case’ performance figures. Typical performance figures will not be considered.

- Demonstrate clearly the levels of technical support that can be made available to UOB, including all time scales.

- Guaranteed 100% pass marks on all fiber and copper solutions – No marginal results are acceptable by UOB Estates Department.

- Provide samples so that UOB can create a test bed for their own evaluation.

- Meet with UOB’s environmental policy requirements as stated in Section 1.3.

- No other manufacturer shall be used unless the above is proven and agreed in writing by UOB Estates Department.
24. APPENDIX A

24.1. LIST OF PREFERRED COPPER STRUCTURED CABLELING PRODUCTS

24.1.1. CAT 6A F/UTP

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat 6A Cable 500m</td>
<td>9A6L4-A5-5CR</td>
</tr>
<tr>
<td>Cat 6A Cable 305m</td>
<td>9A6L4-A5</td>
</tr>
<tr>
<td>Z-Max Outlets</td>
<td>Z6A-S-XX</td>
</tr>
<tr>
<td>Wall Mounted Face Plate</td>
<td>CTE2-02-FP</td>
</tr>
<tr>
<td>1 Gang Angled Adapter Plate</td>
<td>CTE-MXA-01-02</td>
</tr>
<tr>
<td>2 Gang Angled Adapter Plate</td>
<td>CTE-MXA-02-02</td>
</tr>
<tr>
<td>Floor Box Flex Yoke (38X25mm - LJ6)</td>
<td>FY-MX-02</td>
</tr>
<tr>
<td>Z-Max Patch Panel (Loaded) 24 Port</td>
<td>Z6AS-PNL-24K</td>
</tr>
<tr>
<td>Z-Max Patch Panel (Loaded) 48 Port</td>
<td>Z6AS-PNL-U48K</td>
</tr>
<tr>
<td>Cat 6A Patch Cords (White) 1m</td>
<td>ZM6A-S-01M-02</td>
</tr>
<tr>
<td>Cat 6A Patch Cords (White) 2m</td>
<td>ZM6A-S-02M-02</td>
</tr>
<tr>
<td>Cat 6A Patch Cords (White) 3m</td>
<td>ZM6A-S-03M-02</td>
</tr>
<tr>
<td>Patch Cord Colour Clip Identifier 2U</td>
<td>Clip-XX</td>
</tr>
<tr>
<td>Cable Management Panel</td>
<td>WM-144-5</td>
</tr>
<tr>
<td>Cable Management Panel</td>
<td>WM-143-5</td>
</tr>
</tbody>
</table>

XXX Specifies UOB Estates Department Colours – 02 White (data), 06 Blue (Voice), 03 Red (Servers), 07 Green (Switches/Interconnects)

24.1.2. CAT 5E

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat 5e Cable 305m</td>
<td>9C5L4-E2</td>
</tr>
<tr>
<td>Cat 5e Flat Max (Work Area)</td>
<td>MX5-F-02</td>
</tr>
<tr>
<td>1 Gang single port face plate</td>
<td>MX-BFP-S-01-02</td>
</tr>
<tr>
<td>2 Gang single port face plate</td>
<td>10GMX-BFP-02-02</td>
</tr>
<tr>
<td>Cat 5e Patch Panel (Loaded with CM) 24 Port</td>
<td>HD5-24</td>
</tr>
<tr>
<td>Cat 5e Patch Cords (Un-booted) White 1m</td>
<td>MC5-8-T01M-XX</td>
</tr>
<tr>
<td>Cat 5e Patch Cords (Un-booted) White 2m</td>
<td>MC5-8-T02M-XX</td>
</tr>
<tr>
<td>Cat 5e Patch Cords (Un-booted) White 3m</td>
<td>MC5-8-T03M-XX</td>
</tr>
<tr>
<td>Cable Management Panel</td>
<td>WM-143-5</td>
</tr>
</tbody>
</table>

24.2. LIST OF PREFERRED FIBRE STRUCTURED CABLELING PRODUCTS

24.2.1. MULTIMODE

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM3 Fibre Indoor/External TB 24 Core</td>
<td>9GD5H024L-OM3M1</td>
</tr>
<tr>
<td>OM3 Fibre Indoor/External TB 12 Core</td>
<td>9GD5H012G-OM3M1</td>
</tr>
<tr>
<td>Fibre Panel with Drawer</td>
<td>FCP3-DWR</td>
</tr>
<tr>
<td>Description</td>
<td>Part Number</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>LC Fibre Quad Adapter</td>
<td>RIC-F-LC24-01</td>
</tr>
<tr>
<td>Splice Protectors</td>
<td>Tray-3</td>
</tr>
<tr>
<td>OM3 LC Pigtail</td>
<td>HT-60</td>
</tr>
<tr>
<td>OM3 LC Patch cords – Duplex</td>
<td>FP1B-LC5L-01AH</td>
</tr>
<tr>
<td>OM3 LC Patch cords – Duplex</td>
<td>FJ2-LC5L-01AH</td>
</tr>
<tr>
<td>OM3 LC Patch cords - Duplex</td>
<td>FJ2-LC5L-02AH</td>
</tr>
<tr>
<td>OM3 LC Patch cords</td>
<td>FJ2-LC5L-03AH</td>
</tr>
<tr>
<td>Cable Management Panel</td>
<td>WM-143-5</td>
</tr>
</tbody>
</table>

**24.2.2. SINGLEMODE**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS2 Fibre Indoor/External</td>
<td>9GD5H024L-OS2M1</td>
</tr>
<tr>
<td>OS2 Fibre Indoor/External</td>
<td>9GD5H012G-OS2M1</td>
</tr>
<tr>
<td>Fibre Panel with Drawer</td>
<td>FCPW-DWR</td>
</tr>
<tr>
<td>LC Fibre Quad Adapter</td>
<td>RIC-F-LC24-01</td>
</tr>
<tr>
<td>Fibre Splice Tray</td>
<td>Tray-3</td>
</tr>
<tr>
<td>Splice Protectors</td>
<td>HT-60</td>
</tr>
<tr>
<td>OS2 LC Pigtail</td>
<td>FP1B-LCUL-01H</td>
</tr>
<tr>
<td>OS2 LC Patch cords – Duplex</td>
<td>FJ2-LCUL-01H</td>
</tr>
<tr>
<td>OS2 LC Patch cords – Duplex</td>
<td>FJ2-LCUL-02H</td>
</tr>
<tr>
<td>OS2 LC Patch cords - Duplex</td>
<td>FJ2-LCUL-03H</td>
</tr>
<tr>
<td>Cable Management Panel</td>
<td>WM-143-5</td>
</tr>
</tbody>
</table>