Loughborough University Specifications for Networking Standards
Part 2 – Communication Rooms

1. Introduction
This document is intended to act as guidance for the installation of a Communications Rooms required to support the network infrastructure for Loughborough University.

Adherence to this document should ensure potential problems are minimised and handovers completed in a straightforward and timely fashion.

Deviations from this document will only be allowed by written permission from Loughborough University IT Services Network and Communications Team Manager, IT Services Director, or their nominee.

This document is one of several covering different aspects of the IT infrastructure:

- Part 1 Structured Data & Fibre Optic Cabling
- Part 2 Communication Rooms
- Part 3 Wireless Installations

This document is issued by Loughborough University IT Services.

1.1 IT Services Contacts

The following IT Services staff can be contacted for further information:

Anthony Tunley	Network & Comms Team Manager	a.tunley@lboro.ac.uk	01509 226043
Jonathan Oakden	Senior IT Services Specialist	j.p.oakden@lboro.ac.uk	01509 226070
Pranay Pancholi	IT Services Specialist	p.m.pancholi@lboro.ac.uk	01509 226067

1.2 Document Control

Date	Version	Author	Comments
29/06/20	1.0	Pranay Pancholi	Initial Draft
01/07/20	1.1	Matthew Cook	Comments on draft
10/07/20	1.2	Pranay Pancholi	Final revision

1.3 Abbreviations

LU – Loughborough University
IT – IT Services
CR – Communications Room
AP – Wireless Access Point
UTP – Unshielded Twisted Pair
OTDR – Optical Time Domain Reflectometer
IP – IP Protocol

1.4 Review

To be reviewed every 12 Months

Author: Pranay Pancholi, IT Services Specialist
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Table of Contents

2. Standards

All cabling work for the University must be undertaken to the most recent version of the following standards:

2.1 British and International Standards

Standard	Description
BS 7671:2018 - 18th Edition	Requirements for Electrical Installations. IET Wiring Regulations
BS 6701:2016 +A1:2017	Telecommunications equipment and telecommunications cabling. Specification for installation, operation and maintenance
BS 8492:2016	Telecommunications equipment and telecommunications cabling – Code of practice for fire performance and protection

2.2 European (CENELEC) Standards

Standard	Description
BS EN 50173-1:2018	Information technology. Generic cabling systems. General requirements
BS EN 50173-2:2018	Information technology. Generic cabling systems. Office Spaces
BS EN 50173-3:2018	Information technology. Generic cabling systems. Part 3: Industrial Spaces
BS EN 50173-4:2018	Information technology. Generic cabling systems. Homes
BS EN 50173-5:2018	Information technology. Generic cabling systems. Data Centre Spaces
BS EN 50173-6:2018	Information technology. Generic cabling systems. Distributed building services
BS EN 50174-1:2018	Information technology. Cabling installation. Installation specification and quality assurance
BS EN 50174-2:2018	Information technology. Cabling installation. Installation planning and practices inside buildings
BS EN 50174-3:2013 +A1:2017	Information technology. Cabling installation. Installation planning and practices outside buildings
BS EN 50310:2016	Application of equipotential bonding and earthing in buildings with information technology equipment
BS EN 50346:2002+A2 2009	Information technology. Cabling installation. Testing of installed cabling

2.3 Other Standards

EIA/TIA 598	Optical fibre cable colour coding standard
EIA/TIA T568B	pin/pair assignments for eight-conductor 100-ohm balanced twisted pair cabling

3. Project Management

It is important to establish an early and clear dialogue with IT Services on projects that have any sort of IT impact. Failure to do so may result in delays to the project or incorrect installation which will not be accepted.

3.1 Communication

All large-scale projects should contact the following:

Anthony Tunley	Networks & Communications Manager	a.tunley@lboro.ac.uk	01509 226043
Jonathan Oakden	Senior IT Services Specialist	j.p.oakden@lboro.ac.uk	01509 226070
Pranay Pancholi	IT Services Specialist	p.m.pancholi@lboro.ac.uk	01509 226067

Any miscellaneous projects should contact the University IT Services Service desk to ensure your request is directed to the correct person.

Email: IT.Services@lboro.ac.uk
Phone: 01509 222333

3.2 Documentation

Where suitable IT Services should be issued with the following documentation:

- Floor layout plans in Autocad format and PDF
- Communication room locations and layouts
- Cable containment route plans
- Number of data outlets terminated at each comms room
- List of building network connected services (e.g. BMS, Door Access Control, Intruder Alarms etc)

3.3 Costs and Budgets

The project is responsible for funding all IT costs.

This includes but is not limited to:

- Construction work to connect into the data duct system, including contingency to address collapsed or blocked existing duct work.
- Installation of specified fibre optic cables as a single piece of unjointed cable between locations
- Installation of internal building fibre and copper cabling
- Purchase and installation of data cabinets
- Purchase and installation of power distribution units within each rack
- Purchase of active networking equipment (switches, wifi and optics)
- Purchase of patch cabling
- Purchase of network installation equipment

4. Design

IT Services are the design authority for all IT infrastructure within the University and must be included in the design stage of any installation. IT Services will work together with project members to agree a network design that includes the size, location and number of communication rooms (CR); and the required quantity, capacity of cabinets and containment.

The CR must be dedicated for IT Services network equipment and agreed other services such as building management systems equipment. It must not be shared with other services other than by written agreement from IT Services with appropriate signage and security. It must not be used as storage area for any purpose as this represents a Health and Safety hazard and is not acceptable to the University insurers.

4.1 General Design Principles

- The number and location of comms rooms for any building will be defined by the requirements of the structured cabling scheme. The Cat 6A specification stipulates a maximum length for the fixed cabling at 90 metres.
- To limit cable lengths in multi-storey buildings, comms rooms should be located adjacent to risers.
- Connections between comms rooms, and from comms rooms to the network backbone, must be via fibre optic. OS2 Single mode and OM3 Multi mode fibre with LC-LC Duplex connectors should be used.
- Small out buildings with limited data requirements may be serviced by a dedicated cabinet housed in a suitable location, rather than a separate comms room, subject to written agreement from IT Services.
- Design life for a CR can be up to 25 years or more, with a typical active equipment life of 8 - 10 years. Allowance should be made for expansion and re-equipment.
- Room design must consider physical access for staff and equipment, illumination, temperature and humidity, sound isolation, floor loadings and physical security.
- Drawings and specifications must be submitted to the IT Services project manager, for comment, prior to the work commencing and as revisions are made. All drawings etc. must have unique identification and be dated with version numbers.
- All CRs should be directly accessible without requiring access via occupied rooms. Typically, this will be off a public corridor. External access is permitted providing security cameras monitor the entrance and the door is a heavy-duty security door.
- Each main CR should be served by two physically separate and diverse cable routes for optical fibre. The routes must be agreed at the design stage with the IT Services project manager.
- Water ingress is a proven risk to comms facilities. Piping systems such as water supply and drainage, other than those providing necessary services to the space (e.g. sprinkler systems and cooling systems), should not pass through the space.
- All CRs should not be located under toilets, kitchens or any other space that will have a running water supply.
- BMS services such as BMS, lighting, bold and fire panels maybe shared with within the CR. However, these devices but remain separate to any IT Services networking equipment and racks.

4.2 Detailed Design Principles

4.2.1 Cabinet Space

The size and location of any CR should be agreed with the IT Services project manager.

Each dedicated CR needs to accommodate floor mounted rack cabinets to house:

- Category copper patch-panels (24 outlets per 1U)
- Optical fibre patch-panels (up to 48 cores per 1U)
- Access layer switches (48 ports per 1U)
- Cable management bars (1U)
- UPS equipment (if required). This will be either floor mounted free standing or cabinet mounted.

Where more than 1 cabinet is installed in a single comms room the cabinets can be joined together at the side to form a row.

- There should always be 1 metre of clear space around each side and to the rear of each rack, or row of racks to allow for people and installation/maintenance of equipment. Any protrusions in the room should be deducted from this allowance.
- There should always be 1.2 metres of clear space to the front of each rack, or row of racks. Any protrusions in the room should be deducted from this allowance.
- Walls should be painted white for maximum light.
- Lighting shall be 500 lux in the horizontal plane and 200 lux in the vertical plane, measured 1 m (3 ft) above the finished floor in the middle of all aisles between cabinets.
- Sufficient lighting must be present in the room to illuminate every side of the racks. If motion detection is used to control the lights the sensor must be able to detect a single person in any position in the room.

4.2.2 Cabinet

The ‘Prism’ range of cabinets are preferred but others may be considered by approval of IT services.

- Floor standing 48U cabinets are much preferred however it is understood that this is not always possible or practical. In such situations a smaller floor standing cabinet is preferred to a wall mounted installation.
- No more than 336 room outlets shall be terminated in a single 42U rack without explicit permission from IT Services.
- The cabinet will have 19” rack mounting strips to both the front and rear.
- Free standing cabinets should not be installed against a wall.
- The front mounting strip will be recessed at least 150mm from the front door.
- Where more than one cabinet is in any one location, all cabinets shall be connected together side by side using the manufacturers baying kit. All internal sides shall be removed.
- Cable tray/basket will be mounted inside the rack and to the side for the full height of the rack. A clearance space in the centre of the rack of 450mm must be maintained to allow fitting of equipment.
- Each cabinet must be lockable and should be supplied with a minimum of set of two keys which should be supplied to IT Services.
- At handover a CR should allow for future expansion within the cabinets as follows:

  - If a single cabinet, then there must be a minimum of 50% free U space or 20% free U space plus the adjacent floor space to accommodate a further full size cabinet if required.

  - If multiple cabinets have been installed then the above applies to the final cabinet only.

Where a floor standing cabinet is used:

- The cabinet must be at least 800mm x 800mm

Where a wall mounted cabinet is used:

- The depth of the cabinet must be at least 800mm
- The cabinet must either hinge away from the wall for access or allow the side panels to be removed. Removable side panels must be able to be locked.
- The cabinet must not be mounted with the top of the cabinet at a point higher than 2.1m above floor height.
- The cabinet must have adequate ventilation and cooling

4.2.3 Typical Cabinet Layout

1	blank space for rack top fan
2	OS2 LC patch panel
3	OM3 LC patch panel
4	cable management bar
5	building aggregator switch
6	building aggregator switch
7	cable management bar
8	UTP patch panel
9	cable management bar
10	access switch
11	cable management bar
12	UTP patch panel
13	UTP patch panel
14	cable management bar
15	access switch
16	cable management bar
17	UTP patch panel
18	UTP patch panel
19	cable management bar
20	access switch
21	cable management bar
22	UTP patch panel
23	UTP patch panel
24	cable management bar
25	access switch
26	cable management bar
27	UTP patch panel
28	UTP patch panel
29	cable management bar
30	access switch
31	cable management bar
32	UTP patch panel
33	UTP patch panel
34	cable management bar
35	access switch
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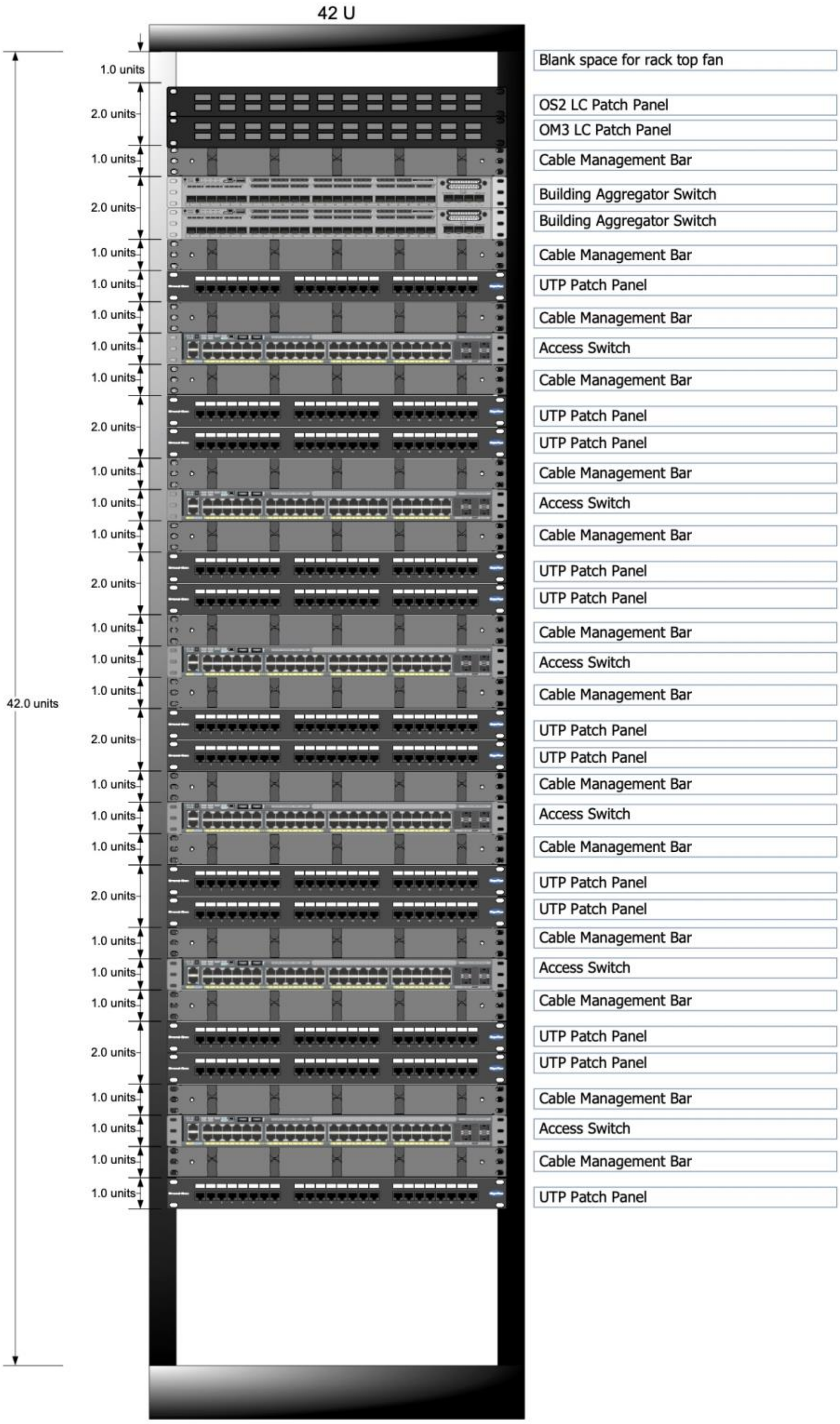
37	UTP patch panel
38	UTP patch panel
39	cable management bar
40	access switch
41	cable management bar
42	UTP patch panel



4.2.4 Electrics & PDUs

- Each cabinet within the comms room shall be provided with two dedicated 16A BS4343/IEC309 outlets. These need to be of the switched/interlocked type and provided with a suitable plug for each piece of equipment installed. Each socket must be on a dedicated radial. Also, where these socket outlets are installed beneath raised floors, the socket outlet must be fully accessible once the data cabinet is in place. Exceptions may be made in small installations to use one or more 13A BS1363 outlet instead under agreement with IT Services.

- If the room has a raised floor the outlets can be mounted beneath the raised floor. In this instance the electrical outlets must not be mounted under any tiles that cannot be lifted.

- In the absence of a raised floor the outlets can either be mounted immediately above the rack at a height not exceeding 2500mm or on a nearby wall. If wall mounted it must be possible to feed a suitable cable from the rackmount PDU to the outlet in such a way that the cabinet can still be fully closed, and the cable does not present a trip hazard. All cabling must be installed in suitable containment where necessary.

- Each cabinet must be individually earth bonded in accordance with BS7671.

- Each cabinet must be fitted with a suitable 16A input APC switched unmanaged PDU. In a 42U floor standing rack this should be a ZeroU PDU vertically mounted at the rear of the rack with a minimum of 12 x C13 outlets and 4 x C19 outlets. In a wall mounted rack this should be a 1U PDU mounted horizontally at the front of the rack with C13 outlets.

4.2.5 Earthing

The following instructions shall apply:

- A suitably sized earthing cable shall be installed from the closest distribution board capable of meeting the electrical requirements and terminated under the instruction of the university's electrical engineers.

- All cabinets to be fitted with proprietary earthing kits. Each cabinet should be earth bonded to a suitable earthing point. Where more than one cabinet is installed within a CR, each cabinet should be individually earthed back to the earthing point. Earthing in the form of a daisy chain is not acceptable.

- Each earth cable connection is to be accessible for maintenance, inspection and testing purposes.

4.2.6 Lighting

- The room should be provided with lighting to enable good visibility of all installed equipment. Fittings should be positioned parallel to the front and rear of the rack to ensure good working illumination. If the lights are controlled by motion sensors the number and position should be such that full room coverage is provided for a single person working at any position or elevation within the room. Manual light switches should be located adjacent to the entry door. Emergency lighting should be provided within the room. All fittings should be provided by one of the approved suppliers nominated within the LU Engineering Specification and be fit for the environment in which they are installed.

4.2.7 Air Conditioning

- Any air-conditioning equipment must be installed in a way to avoid any potential leaks to the CR to affect the equipment. A permanent drain for any condensation collection should be installed and equipment including pipe work must not be installed above the equipment racks.

4.2.7 Security

- Access control should be using the University's door access card system or plant room specific park keys.

4.2.8 Fire Regulations

- Cable installers must ensure any penetration through walls is provided with suitable fire stopping.
- Responsibility and relevant specifications for appropriate fire control rest with the University Facilities Management department.

4.3 Secure Communication Rooms

Certain communications rooms on campus have enhanced security requirements depending on their contents or strategic importance.

Where required the additions below must be specified for the location.

Loughborough University IT Services will advise whether or not these considerations will be required.
These locations will not be shared with departmental or tenant's equipment.

- **Construction**
  Masonry walls or studding reinforced with steel mesh
  Metal door and frame to insurance standard LPS 1175:
  Internal door with alarm - level 1
  external door with alarm - level 2
  external door with no alarm - level 3
  High security lock cylinder of type - Assa C4 Cliq Contact Key (CLIQ-CON) (LU Suite PRS)
  Metal security bars to any windows
  Shelf for visitors log book

- **Services**
  Cooling appropriate for IT equipment load
  G4S proximity card access with PIN keypad
  Door ajar sounder
  G4S electronic door lock (Abloy 3 point)
  Security alarm (Honeywell Galaxy panel)
  Intruder PIR movement detectors
  Wall mounted trembler alarms
  BOLD alarm interface unit
  CCTV to external view of door + internal to room
  PIR control of lighting

- **IT**
  IT cabinet with lockable door and side panels
  High security cabinet chains as appropriate