



Document Control

Rev	Date	By	Comments
A	Jun'16	L. Davies	Technical review update
B	Oct'17	L. Davies	Technical review update
C	Dec 17	UoL	Sign off for release
D	Apr 19	L. Davies	Technical review update
E	June 22	J. Thrupp	Technical review update
F	July 22	J. Thrupp	Technical review update
G	April 23	M. Frost	Update following Digital Services comments
H	Aug 23	M.Frost	Update following Digital Services comment.

Design Guidance

- This document shall be read in conjunction with the University structured network cabling specification.
- The structured cabling system shall be from a single manufacturer component matched throughout.
- Cable –
 - All internal telecommunications installation cabling shall as a minimum meet the requirements of EuroClass Cca –s1b, d2, a2, in accordance with BS EN 13501-6 and the flame propagation requirements of BS EN 60332-1-2 and the BS EN 60332-3 series.

This shall include cabling run externally where it enters and runs through buildings to equipment locations but does not apply to cabling run externally which terminates into equipment at the point of entry into a building.

 - All other telecommunications cabling shall as a minimum, either:-
 - Meet the requirements of EuroClass Eca, in accordance with BS EN 13501-6, or
 - Meet the requirements of BS EN 60332-1-2.

Under no circumstances shall these cables be run within buildings.
- The installer is to be accredited as a systems integrator/installer for the proposed solution and must offer a fully warrantied solution.
- The contractor shall provide a warranty for the complete installed structured cabling system from the date of handover for a minimum period of 25 years for both component durability and system performance. This warranty shall provide for the client to contact the installer in the first instance and if the contractor is no longer in existence for the manufacturer to fulfil the contractor's obligations.
- All outlets are to be labelled to an agreed scheme (maximum 240 per cab). The first communications room to be A with the second as B etc. Notionally this will be:
A/001 – A/***(for the first communications cabinet dependent on line count, after 240 carry on to the next cabinet)
A/241 – A/***(for the second communications cabinet in the first communications room and so on)
All labelling shall be machine/electronically produced. Handwritten labels are not acceptable.
- Horizontal cabling will connect the user outlet to the associated communications room in a star topology. To achieve this a fully RJ45 based cabinet patching system and outlet configuration will be installed.
- The horizontal cabling will consist of 4 pairs contained within its own sheath (LSZH) and will be of continuous length with no joints/splicing permitted for internal runs.
- Patch leads are to be provided to the same number as outlets installed and matched to the cabling system. Notionally this would be 2m grey snagless but should be discussed.
- The maximum permitted cable length from the communications room(s) to any given wall outlet served from that room is 90 metres. Ideally one comms room per floor will be provided within the building.
- IT and Telephony cabling shall be segregated in strict accordance with BS 5266, BS 5839, BS 6701, BS EN 50174, BS EN 62305, NJUG Guidelines, BS 8519, BS 7594, BS 7671 and all supporting IET documentation. Voltage Band I and



Design Guidance

Voltage Band II circuits must not be contained in the same wiring system as a circuit of nominal voltage exceeding that of low voltage.

12. Where wiring systems pass through floors, walls, roofs, ceilings, partitions, cavity barriers and other elements of the building construction, the penetrations through the building fabric shall be suitably sealed (e.g. fire barriers / stopping) to provide the level of fire resistance and acoustic properties required by the building element that has been penetrated. Manufacturers' proprietary cable transit systems and sleeves shall be utilised which have been tested in strict accordance with BS EN 1366-3. Other systems may be considered if based on sample construction details and written approval by Building Control and appropriate Fire Advisors. Under no circumstances shall expandable foam be used. All fire stopping must be carried out by an accredited and competent installer. On completion of the fire stopping works compliance certification shall be provided along with record drawings that detail all fire stopping locations. Technical specifications for all manufacturers' proprietary fire stopping systems and materials shall be agreed with University of Leicester Fire officer.
13. Prior to commencement of cabling installations, the Contractor shall also review the Client's Asbestos Register to become cognisant with all known locations of asbestos and any risks associated with the presence of asbestos
14. If more than one communications room is required to serve the building network infrastructure, then these rooms are to have link cabling installed between them in a star topology. This will comprise single mode fibre optic cabling fitted to dedicated panels. There may be a requirement to provide air conditioning to the room, particularly if the room houses a large number of cabinets/equipment. There may also be a requirement to provide a building Uninterruptable Power Supply (UPS) to the room as well. Detailed discussions regarding the IT topology will be held with UoL IT department during the design stage.
15. As installed drawings for the cable system must be provided showing outlet location, outlet numbering, cable routes and comms room location.
16. Cable outer claddings must be of the appropriate type and cater for the worst-case conditions to be expected on the various routes.
17. Installed cables must maintain the cable/system manufacturer minimum bending radii.
18. Telephones shall make use of the UTP cabling system. Generally, this will utilise IP Telephony technology and will be part of the data network. As such no additional dedicated cabling is required for desktop phones etc. Analogue telephony would be minimal and likely only required for services that have a need for externally provided BT PSTN lines. Unless these are classed as essential services, they will also use the UTP cabling system, otherwise they will be hard-wired end-to-end.
19. Depending on the way telephony is to be provided (IP Telephony or analogue telephony) it may be necessary to terminate & CW1308 copper pair cable between the patch cabinet and the telephone frame/DP in the building. The quantity of the copper pair cable will be dependent on the number of telephones supported by the comms cabinet.
20. The University operates an Attendance Management System (AMS). The purpose of the system is to enable undergraduate students to register electronically their attendance at all taught sessions. The system will be based on data collected using card reader technology from Salto Systems, similar to, but distinct from, the readers and controllers used for access control. The AMS system components are detailed in the following section.
21. The design of Wireless access points (WAP) shall be co-ordinated and discussed with the UoL ITS project manager at concept design stage. Each WAP shall be provided with a double data port and shall operate 'Power over Ethernet'. The number of WAPs per room or space will be calculated by UoL Digital Services, based on the capacity and intended usage of the space. WAP's must be positioned as directed by UoL digital Services.
22. Positioning of WAP's will be in accordance with the following.
 - In rooms or spaces with a "normal" height ceiling (one which could be reached with a step ladder) the WAP device will be mounted onto the surface of ceiling
 - In rooms or spaces with high ceilings (for example, large lecture theatres, atria) which would require a scaffold tower to reach the ceiling, the WAP placement would need discussed with UoL ITS.
 - WAPs will be surface mounted and not be in a ceiling void or behind a wall panel.
 - Wherever possible access points should be mounted clear of metal objects so as to avoid RF disruption of the



Design Guidance

Wireless Access Point signal.

- For ceiling mounted WAPs, each WAP should be positioned at least 1 metre away from any wall
- For wall mounted WAPs, each WAP should be positioned at least 1 metre away from any corner
- Where there are multiple WAPs in the same room or space, the WAPs should be positioned at least 2 metres away from each other
- WAPs must be positioned such as to be at least 0.6m from the any user of the device or general bystander.
- Where the composition of walls or ceilings in a particular room or space may cause issues with the standard positioning guidelines, suitable alternative locations within the room or space may be agreed between the contractor and UoL ITS.
- For ceiling mounted WAPs, the data point may be in the ceiling void, in a location close to the agreed WAP location where access to the data point is achieved through accessible ceiling. If this isn't achieved, the data point should be mounted on the surface of the ceiling at the agreed WAP location.
- For wall-mounted WAPs, the data point may be in a wall void, in a location close to the agreed WAP location where access to the data point is achieved through wall panelling, if this isn't achieved, the data point should be mounted on the surface of the wall at the agreed WAP location

23. Procurement and Installation of WAP's

- The number of WAPs per room or space will be calculated by UoL ITS, based on the capacity and intended usage of the space
- During the design stage, UoL ITS will mark on a plan where the WAP(s) should be positioned in a room or space, based on the positioning guidelines in (1) above.
- Where the composition of walls or ceilings in a particular room or space may cause issues with the standard positioning guidelines, suitable alternative locations within the room or space may be agreed between the contractor and UoL ITS.
- Within the electrical tender, data points are to be allowed for and are to be installed as per section (2) above
- The data cabling sub-contractor will install the data cabling from the cabinet to the data outlets and terminate in the agreed position. The data cabling installation should follow the standards prescribed by UoL ITS.
- UoL will purchase the WAP devices and any accessories (mounting kits, external antennas etc.)
- The WAP devices and appropriate mounting bracket will be provided to the contractor to be fitted to the ceiling and connected to the data outlet.
- The fitting and connecting of the WAP devices by the contractor will be agreed between UoL ITS and the contractor, subject to the composition of the ceiling (e.g., whether patresses are required etc.) and the location of the data outlets.
- The contractor will provide and fit an appropriate length and grade patch lead to connect the data outlet to the WAP.
- In some circumstances the access point may have an external antenna, such as a patch antenna which connect to the access point using antenna cables. These parts will be provided by UoL ITS where required and the fitting and connecting of the WAPs and antennas will be agreed between UoL ITS and the contractor.
- WAPs must have their mounting feet/studs secured into the mounting brackets provided.
- Wireless access points mounting brackets are manufactured to permit the use of metal pins, padlocks or cable ties to retain the WAP. A retaining method must always be used and will be communicated by UoL ITS.

24. Testing

- Full measurements must be performed on each Twisted Pair cable run after installation and termination using approved Category 6/6A test equipment. The test equipment will have a valid calibration certificate. Test results are required for each cable run in PDF format. As installed drawings for the cabling system must be provided showing outlet location, outlet numbering, cable routes and communications room location
- All fibre optic cores are to be tested utilising suitable OTDR test equipment. In addition, light source and test



Design Guidance

meter equipment measurements are to be provided. Test results are required for each fibre optic core in PDF format

25. Containment – this must be read in conjunction with UoL ES02 Containment Design Guide

- All data cables will be supported/contained throughout their length
- All Dado and bench containment shall be Cat 6A compliant and include provision for Approved Document Pt. M outlet identification via faceplate surrounds or inserts. Change of faceplate colour is not preferred.
- Basket containment may be used for Data, ELV cabling and T&E (6242Y) cabling only. Where basket is utilised, this shall be installed in accordance with the manufacturers details only including the use of couplers, bends, sets, and flanges.
- Galvanised conduits shall be used wherever services are exposed and visible including floors, walls and soffits. Where galvanised conduits are installed in surface/ exposed areas standard manufacturers installation methods shall be used throughout including the use of threaded couplers. Running couplers will not be permitted in surface exposed installations. Where galvanised conduit is utilised, it shall be threaded to form a continuous fixed wiring system. Where recessed, conduits may be installed using high impact PVC. The University's preference is to use Rigid conduits on all projects. However, on refurbishment projects only, where this may prove difficult and only where written confirmation is agreed with the University, flexible conduits may be used
- Manufacturers cable installation recommendations, cable pulling tensions and the standards shall be strictly adhered to. Wherever possible cabling shall be laid rather than pulled into containment systems
- Structured cabling will be installed in basket or tray will be fixed every 500mm (minimum 600mm) using Velcro straps. Maximum of 24 cables per bundle and air gap between bundles.
- Fibre optic backbone cabling shall be secured to cable basket or tray at a minimum of 600mm intervals using cable ties / strapping. Care shall be taken to ensure that cables are not damaged due to over tightening.
- Galvanised surface conduits shall utilise distance saddles throughout.

INSTALLATION METHOD (ALL CABLE SUPPORT & CONTAINMENT SYSTEMS ARE STEEL)		SEPARATION DISTANCE
DATA / SIGNALLING CABLING	LOW VOLTAGE CABLING	
Dedicated cable basket or tray	Free air, cable tray or basket	200mm
Dedicated cable basket or tray	Cable trunking	150mm
Dedicated cable trunking	Cable tray or basket	150mm
Dedicated cable trunking	Dedicated cable trunking	0mm

Notes: -

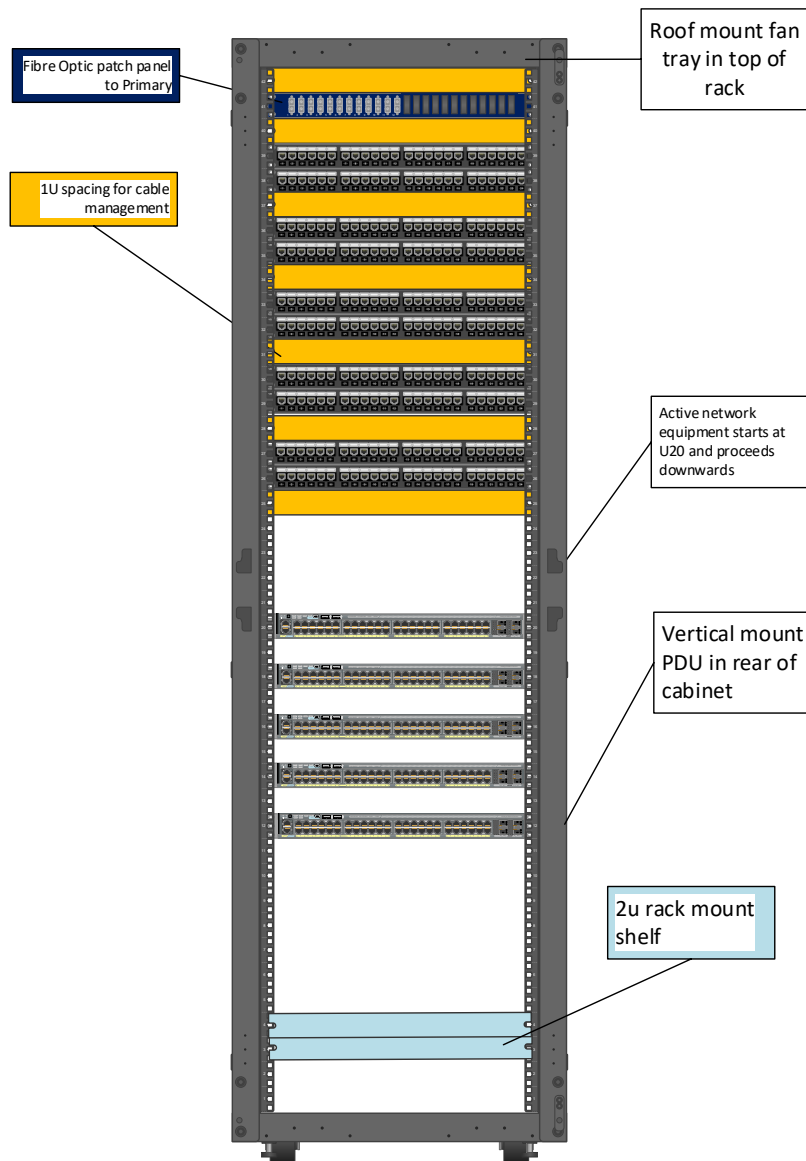
- 1) The minimum separation distances shall apply in three dimensions.
- 2) Signalling and data cabling shall not be installed within a common cable management system that contains low voltage wiring unless the dividers / partitions are manufactured from steel with a minimum thickness of 1.5mm.
- 3) Where signalling / data cabling and power cabling are required to cross each other and the minimum separation distances cannot be maintained, they must cross each other at 90 degrees for at least the minimum separation distance either side of the crossing.



Design Guidance

University of Leicester Centre Cabinet layout using
42U 800mmx800mm Racks

Maximum 240 outlets per cabinet: 10x24 port panels from U39 to U25 per cabinet with cable management as shown. Maximum panel and active equipment configuration is shown below for illustration.





Design Components

	Manufacturer	Comments
Cable	<p>Hellermann Tyton (Gigaband or Augmented if Specified)</p> <p>Brand Rex (Leviton) (Cat6Plus or Augmented if Specified)</p>	<p>Cabling shall be used throughout unless augmented Category 6 (or 6A) is specified by the UoL IT manager</p> <p>Unshielded twisted pair (UTP) cable shall be used with end-to-end component matched to Cat 6 (of 6A) Cabling.</p> <p>Cable sheath composition shall be LSZH (Low smoke Zero Halogen) and must consider current legislation for suitability of intended application. Each cable shall be continuous throughout its entire route length with no joints/ splicing.</p>
Outlets	<p>Hellermann Tyton</p> <p>Brand Rex (Leviton)</p>	<p>All outlets shall be provided in twin or quad formation. If single outlet modules are fitted then these are to be 'centred' by fitting matching quarter blanking plates to the single gang faceplate.</p> <p>Data faceplates shall be selected to match the surrounding general wiring accessories in all cases ensuring the same manufacturer and range is specified.</p> <p>Where contrasting faceplates are provided for DDA purposes for the general wiring accessories the data faceplates shall be selected to match also.</p> <p>The maximum number of outlets connected to one cabinet will not exceed 240.</p>



Design Components

	Manufacturer	Comments
Cabinets	Prism	<p>Cabinets shall generally be 42U high (800mm x 800mm) and Free Standing. Cabinets shall be steel construction with lockable hinged doors to side and rear with a hinged lockable tinted glass front.</p> <p>All cable entries to cabinets shall be via the bottom providing a 100mm cable plinth where no raised access floor is provided. Top Entry will only be allowed where written acceptance is given by the university.</p> <p>Cabinets to be provided with roof mounted 4-way quiet running fan tray, 12way PDU fitted with Commando type plugs socket outlets, levelling feet, vertical cable management and 1No cantilever shelf (400 deep).</p> <p>Where cabinets are installed in banks, dividing panels shall be removed and appropriate manufacturer baying kits must be provided to link the cabinets together.</p> <p>RJ45 patch panel density shall be 24-way occupies 1U of rack space or 48-way occupies 2U. Matching 1U horizontal patch cable guides shall be fitted between each 48-ways of patch panel, plus one top and bottom of the patching array. Patch panels are to be located at the top of the cabinet working down.</p> <p>The maximum number of outlets connected to one cabinet will not exceed 240.</p> <p>If a fibre optic cable termination panel is required, then this will be placed before any of the copper cabling panels at the top of the patching array. An adequate gap is to be left to ensure air-flow is not restricted to the roof mounted fan-tray by the fibre panel.</p> <p>Adequate provision is to be made to route/support the horizontal building cables within the cabinet to the patch panel without restricting equipment depth space.</p> <p>A vertical PDU is to be fitted to a rear upright as appropriate. Cabinet layout is to be agreed with the client at the time of installation.</p>



Design Components

	Manufacturer	Comments
Fibre Optic Cabling		<p>Fibre connectivity shall be single mode grade to specification ITU-T G.652.D. The number of fibre optic cores in a given fibre optic link will vary depending upon the application.</p> <p>External cable runs shall utilise a loose tube steel tape armoured construction for enhanced protection. The cable outer sheath shall be LSOH and be suitable for internal and external applications. Internal cable runs can use the tight buffered type if preferred, however these must be of robust construction.</p> <p>Termination shall be on 1 RU panels utilising LC connectors.</p>
Patch cables	<p>Hellermann Tyton (Gigaband)</p> <p>Brand Rex (Cat6Plus)</p>	<p>Four pair link cables that are fully compliant with the proposed cabling system are to be supplied only (fitting will be by the client). Colour and sizes would need to be agreed.</p>
Attendance Monitoring (AMS) Controller	<p>Salto CU42EO (Main Controller)</p> <p>Salto CU4200 (Slave Controller)</p>	<p>Dimensions Approx. 180 x 240 x 56mm and weight is 700g</p> <p>Controller typically installed into a ceiling void or behind a wall panel where possible. Where this is not possible, the controller should be installed at a height which would allow access for maintenance using a step ladder, but which would prevent casual interference by users of the room.</p> <p>A power supply and single data outlet should be provided in close proximity.</p> <p>This controller will be connected (using standard cat5e/cat6) to either card reader(s), slave controller(s) or both. Maximum cable length to a card reader or slave controller is 400m</p>
Attendance Monitoring (AMS) Card Reader	Salto WRx	<p>Dimensions Approx. 95.5 x 95.5 x 22mm</p> <p>The card reader will be installed in a location suitable for students to register easily their attendance, based on the flow of people into the room. Larger rooms will require two or more readers. The exact location of the reader(s) within a room will be advised by the specialist Salto installer and agreed with the AMS project manager and/or service owner.</p> <p>The card reader is connected via a 4-wire twisted pair (typically using standard cat5e/cat6) to either a master or slave controller. Maximum cable length for this is 400m.</p>