

Installation of Voice and Data Cabling



Technical Guidelines & Specification

Installation of voice and data cabling Contents

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Installation of voice and data cabling

1. Introduction

1.1. Scope of these guidelines and specifications

These guidelines apply to new installations and refurbishments of data networks at the University of Sussex. The Director of the University of Sussex Information and Technology Services department (IT Services), or his authorised deputy must explicitly approve any installations, including repairs that apply to more than one workplace outlet.

Where a new data network is to be installed, it is deemed cost-effective for the voice distribution cabling in the area affected by the installation to be replaced at the same time: both voice and data will share the same data-quality distribution cabling.

1.2. Outline specification

Siemon's Z-MAX™ system range of Category 6a is the de-facto minimum currently approved cabling system on campus, all new builds, refurb and cabling refreshes will use this specified Category 6a.

Only Category 6a components from the Z-MAX™ system range from the Siemon Company are to be used, this is to ensure compatibility with existing installations, maintain manufacturer's installation warranty and reduce the cost of cable maintenance, any other proposed installation must be demonstrated to be compliant with the current approved system, clearly identified in the tender response, and supported by manufacturer's documentation and test certificates.

Note: Standard Category 6 (not the same as Category 6a) is explicitly not approved for use on Campus.

Where needed, the currently approved legacy Category 5e cabling system on campus is a Category 5e unshielded twisted pair (UTP) system using components from the Siemon Company's MAX™ system range and cables from the Siemon Company, this is only to be used where the current cabling system is also Category 5e and needs to be added too, this is not an alternative to installing Category 6a for new builds, refurb and cabling refreshes.

Installers must be Siemon certified installers (CI) and be accredited with Siemon;

Siemon's Category 5e MAX™ or Category 6 A Z-MAX cabling solutions are backed by Siemon's exclusive 20-year warranty, providing 100% coverage of products, cabling performance and applications when installed by Siemon certified installers.

1.3. Other relevant documentation

This set of generic guidelines must be read in conjunction with a detailed project specification document, which will list exceptions and clarifications to the requirements set out here. It must also be read with the relevant building services regulations and recommendations published by the Sussex Estates and Facilities (SEF) division in Annex 1 Arrangements for Contractors. The contractor should use this document to produce a specification for the individual project.

2. Specification of cabling

2.1. Premises cable

Premises cable is that which runs from the cable concentration point patch panels to the workplace outlets in offices, laboratories, etc. The containment and management systems used to organize and protect premises cable is generically referred to as “trunking”.

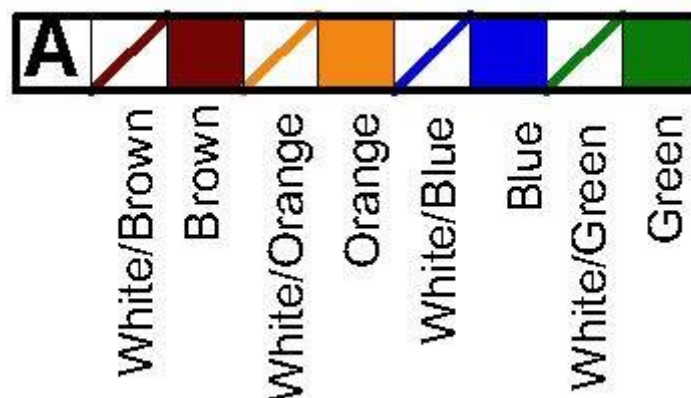
The design of the cable installation for Cat 5e will comply with ISO/IEC 11801 (2000-01) Consolidated Edition including ISO/IEC 11801 FDAM 3 and TIA/EIA-568A including TIA/EIA-568A-5.

For Cat 6 (6a) the cabling should exceed ANSI/TIA-586-C2, IEC 61165-5 Ed2.0 and ISO/IEC 11801 Ed 2.2 Class EA requirements.

When terminating the Siemon MAX Modules, the colour code **A**, printed on the clear plastic section of the module, shall be used. Below is the T 568A wiremap as used on the Siemon MAX modules.

Application Support, dependent on end user requirements

10GBASE-T, 1000BASE-T, 100BASE-T, 10BASE-T, HDBASE-T, IEEE 802.3af (Poe), IEEE 802.3at (Poe+)



Installations on campus must use connecting hardware from the Siemon Company’s “MAX™ System 5e” Category 5e UTP product range or the Cat 6 (6a) Z-MAX™ system range. Premises cable used for installations must be compatible with the Siemon Company’s list of approved Cable Allies:

http://www.siemon.com/cable_allies/default.asp

Premises cable must be compatible with Draka/Cardinal Cables’ CardiLAN 5120 900106 LSOH purple sheath, which is the University’s currently approved premises cable.

All premises cable must have a low smoke, zero halogen sheath. The preferred sheath

colour is Purple. Non-plenum premises cable (such as CardiLAN 900106) will be suitable for most installations on campus, but installers must identify any proposed cable routes through forced ventilation airways prior to work commencing. In such instances, the University may wish to specify an alternate premises cable with superior fire-resistant properties.

When premises cables are being terminated, the mapping of individual to workplace and patch panel outlet pins must follow TIA/EIA 568A to comply with existing voice and data cabling on campus.

If the cable becomes damaged during installation it must be completely removed and re-installed to the satisfaction of the Project Manager.

2.2. Trunking

Routes

The installer shall agree the routes to be taken by trunking, in particular the main containment systems, in consultation with representatives of the University.

- The Safety Office will advise the installer of unusual risks posed to workers in certain areas of the University campus. For each installation, the installer will lodge a Risk Assessment and Method Statement with the Safety Office at least 24 hours before commencing work, and will obtain a Permit to Work on campus from SEF. The installer will have responsibility for identification of and testing for asbestos contamination as part of the installation contract.
- The SEF division must be consulted to ensure that trunking routes are compatible with service space grid allocations. The installer shall lodge plans of major trunking routes with SEF subsequent to installation as part of the contract. The installer shall also consult SEF to ensure that the trunking systems and routes comply with site regulations, in particular where the main trunking systems are visible. The installer will work with SEF to obtain any necessary Listed Building consents required to perform the installation.
- IT Services will recommend the number and location of concentration points to be used in the installation. IT Services will also identify any exceptions to the rules governing the number of workplace outlets to be installed in each area of the installation. The installer will be expected to apply these rules, with any identified exceptions, to derive a recommended number of workplace outlets to be installed for each office, laboratory or other space prior to the commencement of the installation.
- Installers will be responsible for the movement & replacement of all furniture and other items required to gain access to trunking and containment systems, in negotiation with the office occupants. Any difficulties should be reported to the project manager. In certain lab areas access may be difficult or even hazardous and a list of these rooms will be supplied with special instructions for each.

Where there is more than one trunking route compatible with the constraints imposed and advice offered by representatives of the University, the installer is expected to recommend the choice that results in the lowest total system cost.

The installer is obliged to ensure that no premises cable has a length of more than 84m from concentration point to workplace outlet. Where a choice of trunking route or concentration point location presents a significant risk that this 84m limit will be exceeded, the installer must obtain consent from IT Services prior to the commencement of the installation.

Materials

Where compatible with site regulations, building use and installation environment, the University prefers that major trunking, i.e. for more than 25 cables, be provided using galvanised steel baskets. Unless specifically authorised, such baskets should be no less than 125mm wide and no less than 50mm high. Basket accessories including jointing pieces, supports, and corner units are load-spreading plates must be used in accordance with the manufacturer's specification for the *maximum* load of the system. Explicit authorisation must be obtained prior to the installation of an alternate type of major containment. Where visible, major containment may have to be disguised to meet site regulations.

Where major trunking is required to manage vertical runs of premises cable, open tray should be installed and bundles of premises cable tied to it in such a way that the weight of the cable is supported without impairing the transmission characteristics of the cable.

In workplace areas such as offices and laboratories, premises cable should be contained within two or three compartment white, unless prior permission is obtained from the Project Manager, PVC-u trunking mounted at dado level or on workplace benches. In exceptional circumstances skirting level trunking can be used after consultation with the Project Manager. Where multi-compartment trunking is used, one compartment, capable of taking a British Standard single gang 85mm wide by 85mm high by 35mm deep back box, shall be reserved for power cables; the other compartments can be used for voice and data premises cable and should have an internal cross-sectional area of at least 9.5cm², e.g. 38mm by 25mm. Bus bar power distribution must not be used unless an alternate compartment capable of taking 35mm deep back boxes for voice and data outlets is available. The manufacturer's accessories for the multi-compartment trunking must be used to ensure that the premises cable is fully contained, protected from sharp edges such as inside the trunking as it negotiates a corner and not subjected to a bend radius of less than 40mm. Any joins, junctions or cuts to trunking or lidding must be hidden behind manufacturers accessories.

The University's approved dado trunking system is the Marshall Tufflex Sterling range, with Sterling Profile 1, 3 and 4 being appropriate for small, medium and large distributions of premises cable, respectively. The installer must detail trunking compatibility and agree

method of installation with the ITS Project Manager.

The Universities approved Power/Data pole is the MK Prestige Power Pole and it's accessories. This pole should normally be supplied in the white version.

Where trunking made from a conducting material is employed, an approved electrical contractor must connect the trunking to earth. In particular, where basket, tray or galvanised box is used for major trunking, an earth conductor complying with BS 7671:1992 will be connected to the major trunking.

The use of trunking with a self-adhesive backing is not permitted in University buildings and will not be tolerated by the Project Manager.

Design

Wherever containment is installed or used by the installer, a free capacity of 20% must be maintained. In some installations, the installer will be expected to design cable containment systems to cope with much more premises cabling than is to be installed as part of the contract. In such cases, IT Services will advise the contractor at the design stage how many cables will ultimately follow each trunking route; the installer is then expected to ensure that a 20% surplus is maintained over this ultimate utilisation.

With authorisation in advance from the Project Manager, the installer is free to use any existing trunking systems in the areas covered by the installation provided a 20% spare capacity is maintained. Closed trunking or conduit must not be used unless the Project Manager has given explicit prior permission.

Wherever closed trunking systems, which do not have lidded access, are installed, the installer must install draw ropes in the trunking to permit additional cables to be pulled through the trunking at a later date.

Premises cables are to be aggregated into bundles of no more than 48 cables. Bundles of premises cables, like individual cables, must exhibit a minimum interior bend radius of 40mm. Where this is deemed to be not practical consultation should be made to the Project Manager.

Upon completion of the initial cabling all holes and methods of entry shall be filled with a suitable firebreak material. In major trunking, it is preferred that a material is used which can be easily removed and reused when required. Where access holes are drilled into workplace areas from major trunking areas, the size of the holes made should be sufficient for an additional 20% cables to be installed at a later date. Upon completion of the initial cabling, the holes shall be filled with intumescent mastic or Rockwool.

The installer shall provide British Standard 85mm by 85mm back boxes at each required workplace outlet location. The back boxes should normally be flush fitted in multi-compartment trunking and have an internal depth of 35mm. In exceptional circumstances, surface mounting back boxes may be used where no trunking system is available. Where surface mounting back boxes are used, the contractor should endeavor to position the back boxes in adjacent rooms such that it is possible to feed one from the trunking feeding the other, i.e. by drilling through the separating wall. The aim of this is

to minimise the use of low capacity trunking in offices.

2.3. Workplace outlets

Components

The faceplates and termination modules used to present outlets in the workplace must be from the Siemon Company's MAX™ System 5e range or the Cat 6 (6a) Z-MAX™ system range. MAX™ and Z-MAX™ faceplates, which are designed to fit a British Standard 85mm by 85mm back box with an internal depth of at least 35mm, are available in 1-, 2-, 3-, 4- and 6-gang versions. The University considers single gang faceplates not to be cost effective, and does not permit the use of 4- and 6-gang, except in exceptional circumstances. Double and triple gang outlets are commonly used, with doubles being favoured in office environments.

For workplace applications, white coloured, rubber shuttered, and angled termination modules should be used. White modules are less obtrusive when fitted in a white faceplate; where non-white faceplates are used, alternative colours will be acceptable, but must match. All termination modules should be fitted with the white, by preference, rubber shutter to protect the module's pins from moisture. Angled modules should be used by default as these reduce the torque on the socket and the connected RJ45 jack by angling the socket aperture down. When fitting Siemon termination modules, the white Siemon termination module icon should be fitted with the PC icon outermost; an equal number of red and blue coloured termination module icons should be supplied loose and presented to the Project Manager at the end of the job.

Location and Quantity

The location of outlets in office space should be chosen to achieve maximum distribution of double outlets around the usable space, for the convenience of the office users. The current layout, occupancy level or function of an office space are not relevant to the positioning and number of outlets to be installed, and the installer should generally disregard such factors. Where cables in offices are not contained in multi-compartment trunking, the location of outlets should be chosen so as to minimise the number of holes drilled in the office fabric.

By default, outlets in office space are to be located wherever it is reasonable to place equipment that has a voice or data requirement. In general, this means that outlets should

be provided wherever power is available. Rooms fitted with permanent benching should have outlets distributed along such benching, ideally in bench-top multi-compartment trunking. Rooms which do not have furniture, or which have movable benching, should have outlets distributed around the perimeter of the room. Unlike office space, outlets in such rooms should be concentrated together in the expectation that benching will be arranged in peninsulas connected to the perimeter wall at the outlet concentrations. In such situations, the use of 3-, 4- or 6-gang faceplates is appropriate, but only in liaison with the Project Manager, to achieve the required density of outlets. Laboratory space with abnormally high,

e.g. IT Services PC cluster rooms, or low, e.g. biological sciences “wet labs”, will be identified to the installer prior to the survey being conducted.

In addition to offices and laboratories, the University wishes to have workplace outlets installed in certain plant rooms, in entrance foyers, and in recreational spaces such as common rooms. Information on these unusual requirements will be given to the installer prior to the survey being conducted.

The installer is expected to perform the initial survey of the installation area and suggest a number of outlets to be installed in each area according to rules specified elsewhere in this document. As a guide, the University considers eight workplace outlets per typical office to be a reasonable installation density. The installer must present a plan of the number and location of outlets to IT Services prior to commencing any installation.

More detailed information on typical numbers of outlets for different types of space can be found in section 3 below. Design proposals that significantly vary from these quantities should be flagged for the attention of IT Services and the Project Manager, and specific approval should be sought from the Project Manager before the installation proceeds.

2.4. Concentration points

Each installation will involve establishing or expanding one or more network concentration point. Each concentration point will consist of multiple 19” racks, catering for up to around 400 premises cable terminations per rack, one or more data uplinks, one or more voice uplinks, active data equipment units, and ancillary equipment such as filtered commando power supply protection (behind racks) and cable management units. The Project manager will need to ratify the planned layout before installation work begins.

Concentration point doors will have the ITS concentration point Mul-t-lock key suite locks and keys installed on each door.

Concentration point doors without AC will require vents installed in the top and bottom to aid venting, these need to be intumescent.

Location

As technical staff will regularly access concentration points, the locations chosen must be unrestricted areas without dangerous services such as high voltage electrical supply. Further, to minimise the cost of premises cabling required in the installation, concentration points should be roughly in the centre of the area served by premises cabling running from them.

Prior to the installer undertaking a survey of the installation area, the Project Manager will identify a number of candidate locations for premises cabling concentration points. Where

the installer has a choice of equally acceptable concentration points, the installer is expected to choose those which offer the University the lowest overall installation and maintenance costs. The Project Manager must approve such choices.

Environment

Whilst the space used for a concentration point does not need to be air-conditioned, extremes of temperature and humidity will damage active data equipment. Persistently high levels of airborne dust will reduce the reliability of active data equipment units. Condensing moisture will also reduce the life span of patch panel outlets.

Each 19” rack or cabinet in the concentration point should be supplied with a separate at least 16 Amp radial circuit from the nearest distribution board. Each radial circuit should terminate in a surge suppressed, filtered, switched, 16A commando socket (preferred) or a BS white double socket. These should be located at the back wall of the rack, The circuit shall be wired in mineral insulated cable. A vertical power distribution unit (commando) shall be installed within the rack or cabinet, each distribution unit offering a minimum of five 13 Amp sockets, arranged so that plugs can be inserted in all sockets without their power cords fouling each other. The location of this power bar is to be agreed with the ITS Project Manager.

An earth conductor complying with 2002 Blue Book regulations will be connected to each rack or cabinet.

The floor beneath the racks should be safe and comfortable for easy access by staff who will maintain the racks. Racks must not be wall-mounted in inaccessible locations. Where more than one rack is installed in a concentration point, the racks should be strapped together using the manufacturers bonding accessories. The connection must provide both mechanical rigidity to the built structure and to establish a common electrical potential across all the racks.

Racks should be assumed to need a floor area of 1m by 1m each, and a height of 2.5m. At least 1m of free space should be allowed clear directly in front of each rack to allow active data equipment to be installed and removed as some such equipment will require the full depth of the rack. Ideally, 1m of free space should be left at the left and right hand side of a series of racks, and at the rear of the racks. Where space is limited, space at the rear and at the left or right of the rack but preferably not both can be sacrificed.

Design

The choice of 19” racks to be installed in a new concentration point will depend on the type and size of available space. In secure areas, which are dedicated to technical use, open patching frames should be installed. These are the preferred 19” rack system for network installations. Each frame should be fitted with at least ten management arms. The frames should not have sides or doors. The IT Services preferred 19” racks are the Siemon RS3 range.

In other spaces, conventional, fully enclosed, 800mm wide by 800mm deep, 19” cabinets with lockable, removable steel sides and rear doors, and lockable, removable front glass doors should be supplied. In corridor spaces, the glass front door should be replaced with a lockable, removable steel front door. Vertical runs of cables within the cabinet should be managed using a system of tray/basket with either plastic or Velcro cable fastenings. Cabinets

should stand on mounting plinths, chosen from the manufacturer's list of accessories, to facilitate low-level entry of cables to the cabinet.

In most installations, 42U, approximately 2m, high racks should be used. On rare occasions, smaller racks may be appropriate, but this should be agreed with the IT Services Project Manager.

Where the IT Services Project Manager indicates that a wall cabinet would offer a suitable solution, a cabinet with a minimum useable height of 15 U. The cabinet should be non-swing frame but with removable doors and side panels. The cabinet should be secured to the wall with a suitable fixing system that is capable of taking the weight of the cabinet when fully laden.

All cabinet and frames should be earthed in accordance to the 2002 Blue Book regulations.

Suitable slack should be left on all cables entering a rack to enable it to be moved up to 0.5m from its initial location. This slack should be neatly coiled and suitably restrained.

Premises cable should be terminated using connecting equipment from the Siemon Company's MAX™ System 5e or Cat 6 (6a) Z-MAX™ range. Termination modules should be black, unshuttered, and flat and fitted into 24-way patch panel carriers. The blue Siemon termination module icon should be fitted, with the data symbol visible. At least 1U of horizontal cable management should be installed for each 2U of premises cable terminations.

Components installed into the racks should be placed in specific zones. By default, IT Services would prefer the racks to be laid out as indicated below:

Fibre optic data uplink	<i>Typically 1U</i>
Space for active data	<i>10U</i>
Premises cable	<i>As required</i>
Voice uplink terminations	<i>Typically 5U</i>

The installer should allow 10U of space for active data equipment units and cable management units in each 42U rack or cabinet. Four 1U horizontal cable management units should be supplied with each 42U rack or cabinet for use with the active data equipment units. Where multiple racks or cabinets are used, final layout approval should be gained from the Project manager first.

In exceptional circumstances, it may be necessary to share the network rack with other equipment, such as a rack-mounted server. This must be approved in advance of installation with IT Services. If approved, such equipment should be installed into the bottom of the rack below the voice uplink terminations.

Where more than one concentration point is involved in an installation, it may be appropriate to link the concentration points using a minimum of 8 cores of fibre optic and 24 UTP cables. These cables provide resilience for the installation and some flexibility in managing the load presented in each concentration point. The UTP cables should be identified with the black icons provided with the modules with the PC icon showing.

The installer should assign a number, starting from 1 and unique within each concentration point, to every patch panel used to terminate premises cable. A label prominently displaying this number should be attached to each patch panel. Cables should be terminated using a top down topology, with the uppermost floor at the top of the concentration point. The cables should be terminated numerically in sequence from left to right.

Identification

Each concentration point will be identified by a combination of the building in which it is located, e.g. Arts A, Shawcross, Hastings, etc and the room number containing the concentration or adjacent to it, if the concentration point is in a corridor space.

Where there is no obvious room adjacent to a concentration points, a scheme based on the floor number, **G** for ground, **1** for first floor, etc and the geographical location, **E** for eastern wing, etc will be used. Such schemes must be agreed with the Project Manager.

Further, each cabinet or rack within each concentration point should have a unique identifier, typically a letter.

For example, the first cabinet, **A**, in the concentration point in room **168** in building **Arts C** would be identified thus:

ArtsC,168,A

Whilst the **second** cabinet in **second** floor corridor of the **northwest** corner of **Falmer House** could be identified as:

Falmer,2NW,B

Concentration points should display the identification number in a prominent position using a permanent label. Notice should be taken of environmental conditions within which the concentration point is located and measures taken to ensure that the label will not fail or become obscured.

2.5. Uplink cabling

Data uplinks

Each concentration point will require one or more data uplinks. These uplinks provided

will be a minimum of 9/125 micron, single-mode (SM) OS3 fibre optic cable. Each uplink cable will be of tight-buffered construction, with the optical cores surrounded by Kevlar reinforced yarns, and sheathed with a coloured waterproof UL/LSOH outer jacket. This colour is to be approved by the Project manager before installation, although green or orange is the IT Services preferred colour. Cables, which have to run in external ducts or pipes, may need to be further reinforced, and the installer is invited to make appropriate recommendations to IT Services.

Fibre optic cabling must not be subjected to a bend radius of less than 100mm.

Eight cores of fibre should be provided for each 250 workplace outlets to be served from a concentration point, with a minimum installation of 16 cores being normal. Data uplinks should be provided using only 8 and 16 core multi-core cables. The fibre optic cores must be terminated in duplex LC connectors, in 1U high AMP fibre management panels. AMP LightCrimp Plus is acceptable. Full cable management should be fitted and used in the fibre management panel.

Where a splice box has to be used, the design should incorporate a lock and be of secure design and construction. The IT Services Project Manager must approve the design before it is used.

Where fibre optic cable runs are expected to exceed 225m, this must be brought to the attention of IT Services prior to installation.

Where there will be more than one concentration point in a building, each concentration point will be linked to its closest neighbour using a group of single-mode fibre optic and, distance permitting, UTP premises cables. No more than two of these groups of inter-link cables should be installed per concentration point. The capacity of the fibre optic inter-link cable should be approximately 25% of the uplink capacity, with a minimum installation of eight cores. The capacity of the UTP premises cabling inter-link, where fitted, should be approximately 5% of the number of workplace outlets served by a concentration point, rounded to the nearest non-zero multiple of 24. These links provide an element of resilience, and improve the overall flexibility of the data cabling installation.

Where more than 16 cores of data uplink cabling is to be installed into a concentration point, and the concentration point does not have any inter-concentration point data links, the contractor should propose that the data uplink is divided between two diverse upstream locations (ie. Connected to fibre concentration points in different buildings).

Fibre cables should be labelled at each end with a unique Circuit Number that will be provided by the Project manager. The fibre termination panel must also be labelled with the circuit number at both ends.

Where UTP cables are run between concentration point locations, there should be a minimum of 24 individual cables. These outlets should be clearly labelled as per the scheme set out in this document and should use the black icons in the modules.

Voice uplinks

Each concentration point will require one or more voice uplinks. Each uplink will be

provided over a separate CW1308 multi-pair cable. Within buildings, interior grade cables may be used. Where cables are to be routed through underground ducts or outside of buildings, exterior grade cables must be used. Exterior grade cables must not be used inside buildings, and so voice uplinks must transfer from exterior to interior cables within five metres of entrance to a building.

Voice uplinks should be provided using 50-pair or, preferably, 100-pair cables. Voice uplinks should be presented in concentration point racks using patch panels compatible with the Siemon HD5 range, e.g. HD5-24 for 50-pair, HD5-48 for 100-pair. Each voice RJ45 patch panel termination should be marked with a red icon, and a telephone symbol should be visible. The presentation at the end of the voice uplink away from the concentration point will depend on existing infrastructure, but will commonly take the form of a Krone punch down block.

The number of voice connections to be installed in each concentration point will vary according to the function of each building and the distribution of different types of room within that building. Typically, a well populated 42U rack in a concentration point, serving 250 to 350 workplace outlets, should be equipped with a dedicated 100-pair voice uplink offering 48 voice connections, estimating that approximately 15% of workplace outlets will be used for voice.

The contractor will agree the precise number of voice connections to be installed in each concentration point in consultation with the University's Communications Manager prior to commencing the installation.

Where there will be more than one concentration point in a building, each concentration point will be linked to its closest neighbour using a 50-pair voice cable, terminated in each rack using patch panels compatible with Siemon HD5-24 units. Each voice RJ45 patch panel termination should be marked with a red icon, and a telephone symbol should be visible.

The mapping between each core in the voice uplink cables and pins in the Siemon patch panels shall be determined in advance in consultation with the University's Communications Manager: Typically termination of the lowest patch panel port number will commence with the white/blue pair. All cable tie end to be cut clean and folded under cable where possible.

Voice System Earth Bar

Approx 50mm long copper earth bar mounted on insulated standoffs to be positioned immediately behind the voice patch panel on the manufactures pre drilled and fitted stainless steel strip on the frames left hand side. This bar must not be earthed.

Pin 3 of voice patch panel RJ45 sockets must be connected to the system earth bar together with voice multicore earth wire. The other end of the voice multicore earth wire is to be connected to the primary building DP earth bar only.

Safety Earth

All metal parts should be strapped to earth via the frames safety earth bonding connection.

2.6. Cable Identification

Cable

All cables, premises UTP, voice or data uplink, shall be marked with positively fixed, durable labels at the following locations:

- within 200mm of each cable end, preferably inside back boxes and frames;
- within 200mm on entry to buildings;
- within 200mm of each side of a joint or splice box.

Lettering and numbering shall be black, longitudinal to cables, shall be typed, at least 4mm in height, permanent and smudge-proof. Cable labels shall have a white background unless specified elsewhere in this specification. Labels shall have waterproof jackets. Hand-written labels will only be acceptable on a temporary basis during installation. Numbering scheme will be to current IT Services specification.

Labels at the Communications rack or cabinet should identify the location, e.g. office number, of workplace outlet and to cable number. Labels at workplace outlet should identify the Communication cabinet and cable number.

Fibre cables should be labelled at each end with a unique Circuit Number that will be provided by the Project manager. The fibre termination panel must also be labelled with the circuit number at both ends.

Voice multicore, fibre and riser cables must also be labelled at each corner of their run, and at both sides of any physical obstructions such as walls or riser floors. Cable numbers are to be obtained from the University Communications Manager.

Outlets should be numbered in a clockwise direction in relation to the diagrams.

Workplace outlet

Labels on workplace outlets shall follow the following format: a horizontally split label, top half to show the *location of the concentration point*, ARTS C, room 168, rack or cabinet A, shown in the example below, bottom half to have unique sequential three digit *cable numbers*, one per port, 096 and 097, below. The cable numbers displayed on workplace outlets will be identical to those attached to the premises cables themselves.

Each cable will be further identified using a one character prefix to denote the floor, G for ground floor, 1 for first, etc, of the room containing the workplace outlet.

ArtsC,168,A	
1-096	1-097

At the concentration point, each patch outlet shall be numbered as follows. Each label shall be split into two parts separated by a horizontal line. The top half indicates the *number of*

room containing the workplace outlet, ArtsC 155, in the example below, whilst the bottom half indicates the *cable number* corresponding to the label attached to the premises cable.

ArtsC155
1-096

Where the contractor considers there to be insufficient space on the label, the Project Manager should be consulted before an alternative scheme is used.

See also notes on cable and outlet labels where Spring Points are used, in section 2.10.

2.7. Testing and documentation

Prior to completion of the contract, full test results and documentation shall be submitted to the IT Services for approval. The results should be delivered in native electronic format, not in a text editable format, though paper copies must be made available on demand. If any specialist software is required to read these results, this should be supplied free of charge by the contractor.

Two copies of any diagrams, electronic or hard copy, relating to the installation should be submitted, one for SEF and the other for IT Services. All other documentation should be submitted to IT Services.

Testing

Premises cable will be tested to ANSI/TIA/EIA-568-B.1. All premises cable will be tested for compliance to data cabling standards irrespective of its use.

Voice uplink cables should be tested to BS 6701.

Fibre optic uplink cables should be tested ANSI/TIA/EIA-568-B.3. Cable run length should be obtained using OTDR testing, and included as part of the documentation of the installation.

The installer must give IT Services no less than one week's notice for attendance when any testing is to be carried out. IT Services will wish to witness at least 10% of the total amount of installed outlets tested.

Documentation

The installer must prepare diagrams showing the locations and layout of the concentration points and the routes taken by the major trunking and uplink cables. These diagrams should be submitted in electronic AutoCAD and PDF format, and on paper. These diagrams should include floor plans, including room numbers, of the buildings with additional layers containing both data and voice copper cable and fibre cable routes. They should also contain the cable numbers in relation to room numbers.

In addition to the test results for the premises cables, the installer should submit a document identifying the relationship between each cable number used in the installation and the corresponding patch panel numbers and workplace outlet room numbers. It should be

trivial to correlate the cable numbers used in this document with the individual cable test results. This document should be submitted in electronic, Excel, format. A paper copy should be available on demand.

Each data point marked on a drawing will individually indicate the port/wire number (as the actual label) in close proximity without being obscured by other information.

2.8. Active data equipment

The University will independently source (funded by the project budget) the active data equipment units required for each installation for IT Services to commission. This commissioning will include:

- unpacking the units and disposing of the packaging materials;
- completing the manufacturer's registration and warranty documentation;
- fitting the units' rack mounting kits, if necessary, and installing them into the racks in the concentration points;
- labelling each unit with a unique management IP address or hostname;
- switching the units on and checking for normal operation;
- using each unit's management interface to assign the provided IP address, subnet mask and default gateway address to the management unit's network interface.

2.9. Consumables

Normally, the University will independently source (funded by the project) all consumable items required to activate a new network installation. IT Services will provide and connect data patch cables, data drop cables, fibre optic patch cables, and Velcro wraps for use in patch panels. The Communications Manager will provide and connect voice patch cables and RJ45-BT PABX master tail adaptors. The University will use Siemon branded Cat5e or Cat 6 (6a) consumables to comply with the Siemon MAX™ or Z-MAX™ system warranty.

From time to time, the Project Manager will request that the contractor supply these

consumables as part of their parcel of works, and this will be detailed within the tender package. The Project Manager will inform the contractor of the types and quantities of consumables required, if any.

If consumables are to be supplied, they should conform to the following specification:

Data Patch Cables

Data patch cables must be constructed from stranded copper, have yellow jackets and have half- booted plugs. Boot colours must not be green or red.

The contractor should provide IT Services with a sample of the patch cables to be used in advance for approval.

Voice Patch Cables

Voice patch cables are identical in specification to data patch cables, except that they must be supplied with blue jackets.

Tail Adaptors

These should be RJ45-BT PABX master tail adaptors.

Fibre Optic Patch Leads

Unless otherwise specified, fibre optic patch cables should be orange sheath, 9/125 micron, single- mode (SM), tight buffered, duplex patch leads with LC type connectors at both ends.

2.10. Field Termination Units (Spring points)

Under some circumstances (for example, Project Manager has knowledge of scheduled extensive refurbishment work), the Project Manager may inform the contractor that premises cabling is to be terminated short of workplace outlets using a Field Termination Units (aka Consolidation Points or Spring points).

Spring points may be used to facilitate future moves and changes in a workplace. Spring points should be fully populated with 24 terminated and tested premises cables from each Spring point to the Concentration point.

A cable from a Spring point to workplace outlet should bear the same cable number as that to which it is cross connected in the Spring Point. Workplace outlets should always be labelled as if Spring points did not exist. Where a cable terminates in a Spring point (i.e. has not been extended to a workplace outlet), the Concentration point outlet label should have the unique IT Services allocated

number of the Spring point in place of the workplace outlet's room number. Where cables from Spring points to workplace outlets are changed, removed, or added at a subsequent date, the Concentration point outlet labels must be updated accordingly.

The Project Manager will advise the contractor on the best location for Spring points, these being chosen for permanence (especially with regard to future refurbishment works), ease of access, and discreet impact on sight lines. As built drawings should

always indicate the location and unique identifying number of each Spring point.

Spring points should be fitted with lockable covers, and the keys passed to IT Services on completion of the installation with a record of which numbered key opens which Spring point.

3. Recommended workplace outlet quantities

The University will provide the contractor with plans showing the layout of offices and other workspaces. IT Services will provide the contractor with guidance as to which workspaces in the installation have abnormally high or low requirements for workplace outlets. The contractor will then survey the workspace to propose the number and position of outlets for each workspace, using the information supplied by IT Services and the rubric below. These proposals will then be reviewed and possibly modified by IT Services and representatives of the building users, before becoming the contracted number of outlets to be installed.

Where no other information has been provided, the contractor will propose the number of outlets per workspace using the following guidance:

- A typical office of no less than 15 sq.m. should have **eight** workplace outlets, typically configured as four double outlets, in the expectation that such an office could contain two people.
- Laboratory space should be equipped with **1.5 outlets per 1.2m of benching**. A slight additional allowance should be made for telephony, typically **one double outlet per major entrance** door to the laboratory.
- Laboratory space deemed “permanently unusable” e.g. wet labs, for data equipment should have a significantly reduced number of outlets installed, typically **one double outlet per 4m. of benching**.
- No usable space should have fewer than **four** workplace outlets (typically configured as two doubles), including entrance foyers, porters’ desks, photocopying rooms, and single occupancy offices (less than 10 sq.m.).
- At least **one double** is to be installed in each plant room. Additional points should be installed to ensure that it is possible to reach plant room equipment using at most a 10m. drop cable.
- Lecture theatres should be equipped with at least **two double** outlets, typically **three doubles** for use from the lecturer’s podium or front bench. An additional **one double outlet per non- emergency exit** from the theatre should be provided for telephony use. Where the lecture theatre is equipped with an enclosed audio-visual booth, no fewer than **two double** outlets should be installed in that booth.

Where no other information is provided, the contractor will propose the position of workplace outlets using the following guidance:

- Single outlets should only be installed in very exceptional cases, and only following explicit agreement from IT Services.
 - In offices and other standard accommodation spaces, it is preferred that outlets be installed in doubles i.e. two outlets per standard faceplate. The outlets should be evenly distributed around the room, unless it is clear that certain areas of the room are “dead spaces”.
 - Where laboratory spaces have been or are to be equipped with peninsular benches, and where those benches are not permanently fixed, the workplace outlets to serve each peninsula should be installed, using high density 4- or 6-way faceplates, on a fixed wall at the root of the peninsula. These should only be used in agreement with the Project Manager
 - The use of triple (3-way) or quad (4-way) faceplates in laboratory spaces is normal.
 - Where a workspace has a recently installed, well proportioned power system, workplace outlets should be installed close to power outlets.
 - In teaching space, outlets provided for use by the lecturer should be installed close to audio- visual equipment, any purpose built podia, and/or any teaching surface such as a whiteboard.
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- In teaching spaces capable of seating more than 150 people, thought should be given to providing and positioning a double outlet for use with short range wireless 802.11g networking. A position with line-of-sight access to all corners of the lecture theatre (and which can easily be reached by a technician) is appropriate.

4. Table of Updates

Version 4.04 Feb 2018

Update and refresh

Version 4.02 Nov 2017

Update and refresh

Version 4.01 13th May 2016

Commando Sockets for power.

Version 4.0 13th May 2016

Extended Lifetime of Document with changes to additions to cable spec (cat 6), fibre termination sockets (lc from sc) and rename of E&EF to SEF.

Version 3.18f 1st May 2013

Extended Lifetime of Document with no changes

Version 3.18e 1st November 2012

Extended Lifetime of Document with no changes

Version 3.18d 1st May 2012

Extended Lifetime of Document with no changes

Version 3.18c 8th November 2011

Addition of latest version location URL in footer and extended life of document with no changes

Version 3.18b 2nd August 2011

Extended Lifetime of Document with no changes

Version 3.18a 8th February 2011

Extended Lifetime of Document with no changes

Version 3.18 15th April 2010

Fibre type changed from MM to SM (9/125) for building links & patch leads

Version 3.17k 1st March 2010

Extended Lifetime of Document with no changes

Version 3.17j 2nd September 2009

Extended Lifetime of Document with no changes

Version 3.17i 26th March 2009

Extended Lifetime of Document with no changes

Version 3.17h 25th June 2008

Extended Lifetime of Document with no changes

Version 3.17g 2nd November 2007

Corrected typo in end date, and extended Lifetime of Document with no changes

Version 3.17f 31st May 2007

Extended Lifetime of Document with no changes

Version 3.17e 21st March 2007

Extended Lifetime of Document with no changes

Version 3.17d 2nd July 2006

Extended Lifetime of Document with no changes.

Version 3.17c 25th January 2006

Extended Lifetime of Document with no changes.

Version 3.17b 25th April 2005

Extended Lifetime of Document with no changes.

Version 3.17a 25th November 2004

Extended Lifetime of Document with no changes (apart from spelling and grammar check)

Version 3.17 20th January 2004

Updated:

Throughout

USCS and Computing Service becomes IT Services.

1.2 Outline Specification

Reference to the Cable Allies scheme removed. Scheme doesn't exist any more.

2.3 Location and Quantity

Reinforced use of cable quantity rubric set out in Section 3.

Table of Updates becomes **Section 4** and moved to end of document.

2.6 Cable identification

Reference added to 2.10 for impact of use of Spring points on outlet labelling.

2.9 Consumables

Default is now no consumables to be supplied.

3. Recommended workplace outlet quantities

Typical twin and single person office space sizes stated in square metres.

Added:

2.10 Field Termination Units to describe circumstances under which Spring points may be used.

Version 3.16 29th May 2003

2.7 Testing and Documentation

Updated electronic test result provision

2.7 Testing and Documentation, Testing

Updated test standards for premises cable and fibre cable

Version 3.15a 20th January 2003

Extended Lifetime of Document with no changes

Version 3.15 13th May 2002

Added:

2.1 Premises Cable

Added Siemon MAX Module wiremap

2.2 Trunking

Added clarification on use of self-adhesive trunking

Added Power/Data Pole spec.

2.4 Concentration Point, Design

Added wall cabinet spec.

Added Cabinet Earth spec.

2.5 Uplink Cabling

Voice earth specification

UTP inter-concentration point cabling icons

Fibre Circuit numbers

2.6 Cable Identification

Removed paragraph dealing with multiple cabinets on same floor

Version 3.14 3rd July 2001

Added:

Document expiry date.

2.1 Premises Cable

Damaged cable re-installation

2.4 Concentration Point, Design

Layout of terminated cables in cabinet/frame.

Cabinet/frame identification labels.

2.6 Cable Identification

Fibre cable circuit numbers.

2.7 Testing and Documentation, Documentation

Removed mention of Visio.

Diagram specifications.

Version 3.13 9th May 2001

Added:

Contents page.

Version 3.12 2nd May 2001

Added:

2.2 Trunking, Routes

Updated information of furniture removal.

2.7 Testing and Documentation, Testing

Attendance notice and percentage of tests viewed by IT Services