

IT Services Converged Network Installation Specification:

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Contents

Objective	3
Scope	3
Approved Contractors	4
Cabling systems:	4
Standards.....	5
Outlets in the Work Area	5
Horizontal Cabling System	6
Containment.....	7
Wiring Centres.....	8
Connection to the University Backbone	10
Fibre Optics	10
Labelling	10
Labelling Scheme	10
Commissioning and Testing	12
Documentation	13
Warranty	13
Maintenance	13

Objective

This document identifies the scope, standards and installation guidelines for extensions and changes to the Universities ICT infrastructure. This is for the purpose of achieving a consistent and reliable installation and operation.

This document is intended to be adhered to by all those involved with works in the University which impact the ICT infrastructure.

Scope

This document provides a system specification of the University's converged IP network. All details apply unless specifically agreed with the authorised representative of the University in advance. In overview the University network comprises:

- Structured cabling system linking user outlets back to Wiring Centres
- Wiring Centres that house the active network equipment e.g. switches, UPS
- Core locations that interconnect the Wiring Centres
- Resiliency, e.g. switch stacks with dual fibre optic links to the network core

This specification covers the design, supply, installation, testing and warranty of:

- Wiring Centres
- Category 6 or 6a structured cabling system
- Containment systems
- Ethernet Switches
- Resilient power supply to ICT network equipment
- Connections to the University Backbone

Expansion:

- The design shall allow for a growth of at least 50% in the number of outlets and
- The design shall allow for all outlets to be activated by dedicated switch ports.

Specific contracts and approved building plans will detail the quantities and locations of equipment e.g. of outlets, wiring centres and cable containment/support.

The following is out-of-scope of this specification:

- Campus Ducting
- Core Equipment

The Universities approved contractor and components shall be used for all works unless by agreement with IT Services Management.

This document identifies specific makes and models of equipment that should be used and is correct at the time of issue. These details may change from time to time, resulting in a new issue of this document; suppliers should ensure they have the latest version.

Some areas of the University may have specialised requirements for installation etc, such as an Aseptic area or the Aston Academy of Life Sciences; these shall be identified in the specific contracts.

All designs must be approved by the ISA department within Aston University prior to installation. Any changes to this specification shall be subject to change control procedures.

Approved Contractors

The following approved companies shall be used for all works relating to networking installations:

Cabling systems:

Electron Technical Services Ltd
1ST FLOOR,
BLOCK A
BRIDGE COURT,
BRIDGE STREET,
LONG EATON,
NOTTINGHAM,
NG10 4QQ

Tel: 03300 881320

Fax: 03300 881321

email: sales@electron.co.uk

These contractor's personnel must:

- Hold current accreditation for installing the proposed structured cabling system.
- Hold current BICSI RCDD accreditation
- Provide documentary evidence of the Manufacturer Accreditation and level.

Standards

All equipment and materials must comply with the most recent issues and revisions of all relevant British Standards current at the time of tender, and/or such other recognised standards as may be stated.

The design of the structured cabling system shall comply with the requirements of BS EN 50173:2011 "Information technology - Generic cabling systems".

The Quality Assurance provisions applied to the installation shall be compliant with PR BS EN 50174-1:2009+A1:2011 "Information technology - Cabling installation. Installation specification and quality assurance".

Installation practices shall be generally compliant with PR BS EN 50174-2:2009+A1:2011 Information technology - Cabling installation. Installation planning and practices inside buildings" and shall be wholly compliant with the installation practices laid down by the system manufacturer of choice.

Installation practices shall also meet ISO/IEC 11801:2011 and all applicable local and national codes, standards and ordinances.

Please note: The latest edition of any of the above standards (including any amendments) applies.

All cables must be manufactured from LSZH (Low Smoke Zero Halogen) materials and shall be flame retardant.

Where a conflict exists between these standards, it is the responsibility of the contractor to detail these conflicts to the client prior to installation commencing.

Outlets in the Work Area

Outlets shall be presented into the work area as an RJ45 connector. The outlet shall have a sprung shuttered cover to prevent the ingress of dust and other contaminants.

Outlets may be of the modular or fixed-plate variety and can be provided in single, double or quad arrangements, as agreed in the contract and must meet the relevant standards for the cabling system being installed. All outlets should include cable management facilities as standard.

All outlets shall have facilities for labelling and be labelled according to the labelling scheme identified in this document. The labelling must be robust to withstand some abuse; this could be protected by means of a clear plastic window if necessary to protect the label.

Horizontal Cabling System

The horizontal cabling installation is standardised on the Brand Rex Structured Cabling solution and shall follow all of the manufacturers and industry recommendations for installation e.g. observing bend radius, length, termination, bundling etc.

The cabling system must be component and channel level compliant to the full cabling system standard employed i.e. TIA/EIA 568B-1 & 2 and their appendices.

The horizontal cabling system shall use all components from the Brand Rex Structured Cabling solution, end-end and independently verified for compliance. The system that shall be used is:

- Brand-Rex Millennium Cat6Plus LSZH or 10GPlus S/FTP
- Brand-Rex 1U Cat6Plus 24 port patch panels or 10GPlus 1U 24 Port Patch Panel (use of Brand-Rex ½U 24 Port panels, or 1U 48 port panels, may be used with agreement from IT Services)
- Brand-Rex Millennium Cat6Plus or 10GPlus grey Fly leads, in a mix of lengths of 1m, 3m or 5m as appropriate to suite the location

The horizontal cable system comprises:

- RJ45 network outlets in the work-area
- Unshielded Cat 6 twisted pair cable, or shielded Cat 6a
- Outlets to be cabled back to an appropriate Wiring Centre (WC),
- WC patch panel presentation to be RJ45,
- Each patch panel must have its own dedicated cable management bar
- All cross-connect patch-cords shall be of the matching type for the Patch panels and are to be included, the length of each to be agreed with the University
- All work-area fly leads are to be provided, for each outlet, the length of each to be agreed with the University,
- The copper cabling system to be tested and passed for compliance with the relevant cabling standard and a 25 year manufacturer's warranty issued

One cable shall be run to each work area outlet. Sheath sharing is not permitted.

During and after installation all cables shall be protected to avoid damage.

Horizontal cable runs shall be continuous, from network outlets to the patch panel, without joins or splices, except where the use of a consolidation point has been approved. No run shall exceed 90 metres in length.

All cables used in the horizontal cable runs shall be flame retardant. Low Smoke, Zero Halogen (LSZH) cables are specified for this installation. LSZH cables shall be compliant with IEC 332-1c as a minimum.

The cabling must be kept appropriately separated from any other cables. Ensure that where power and information technology cables are installed in parallel, in accordance with EN 50174-2 at minimum:-

Containment

All containment systems used shall be appropriate for use with a Cat 6 and Cat 6a cabling systems and observe all relevant guidelines e.g. bend radius.

Reuse of any existing containment must be agreed with the University prior to commencement of works.

The MK Powerlink dado containment shall **NOT** be used to carry the cables unless explicitly agreed in advance.

The structured cabling system shall be run within its own dedicated containment (or compartment in multi-compartment trunking systems) provided within the building. Where structured cables are installed and supported on cable tray, cables will be secured by broad cable ties at intervals of not more than 600mm horizontally and not more than 300mm vertically. Bundles of cable will not contain more than 24 cables. Strain relief to be provided for all cables at their termination to patch panels or outlets. Cables in cable trays will not be installed to a depth greater than 50mm. Cables will be installed with a minimum of 200mm slack at each end to allow for re-termination; the slack is to be supported in the patch panel equipment cabinet.

Within dado containment all internal bend fillets shall be installed in each compartment. All appropriate matching bends shall be used to move around corners and divert vertically. Within two compartment dado containment, data cables shall be run in the data section and the outlet mounted on back-boxes in the same compartment as the power sockets. All back-boxes used to mount outlets (as part of the dado system or direct wall mount etc) shall be more than 35mm deep (non adjustable) to ensure that the cabling system can be installed to observe correct bend radii and be fully warranted.

Other surface Containment must be suitably sized not to infringe bend radius requirements.

The contractors designing/installing containment shall finalise the containment fully with the data cable installers for suitability and to ensure installation practices for the cable are followed and the system can be fully warranted.

Wiring Centres

Environmental, electrical, security and safety issues have to be considered in the design and installation of a Wiring Centre (WC).

The equipment in a WC (e.g. patching, switches and UPS) should be housed in either cabinets; the specific choice shall be agreed with the University in advance.

The layout of equipment in the WC must be agreed with the University prior to installation.

Doors to rooms dedicated to a WC shall have the University standard lock fitted.

Services and preparation of a WC includes:

- Installation of the cabinets.
- Positioning of all equipment such as cabinets must allow sufficient space for safe working access.
- After equipment (such as switches and UPSs) has been mounted in the cabinets and frames, a minimum clearance of 1m must be provided at the front and rear of the cabinets and frames unless specifically agreed with the University in advance.
- Safety earth.
- Installation of appropriate electrical power. Typically this is:
 - A distribution board in the area with individual breakers, minimum of 2 spare positions after initial installation.
 - One key switch operated outlet on its own power breaker (rated at least 20A type C), for each load
 - One fused, non-switched spur outlets on its own power breaker (rated at 20A type B), for each PDU strip in each cabinet
- Each cabinet/frame
 - All panels, doors, frames etc to be connected to the safety earth.
 - Cabinets to be key matched to University standard
- Suitable air-treatment to avoid excess of temp, humidity etc
- Suitable lighting.
- Any windows to have shading applied to prevent direct sunlight.
- Appropriate security to ensure authorised access only.
- The entry door into the WC must minimise loss of floor space and maximise the space available for locating the cabinets and frames etc
- Cable management system, specifics to be approved by the University
- Suitable anti-static floor preparation.
- Appropriate level of decoration.
- Walls, flooring and ceilings to be dust free.
- +++++ TO INSERT HERE - ADD ADDITIONAL ROOM REQUIREMENTS FROM ROOM SPEC DOC.

The WC's contain electronic equipment and cabling connection strips which are sensitive to the abrasive, clogging etc effects of air-borne dust, therefore air-borne dust must be avoided once such equipment has been installed. Thus cabinets and equipment cannot be installed until all building works have been completed and the area cleaned and secured.

The cabinet shall be sized to cater for the growth indicated, as a minimum.

Cabinets shall be designed to facilitate ease of access and installation and the maintenance of a controlled bend radius for incoming cables. They will include all vertical & horizontal cable management for copper and fibre cables.

Fibre optic cables terminating within the Wiring Centre shall be terminated onto patch panels mounted within the cabinets/frames.

Adequate horizontal and vertical cable management must be included for all cables. These should allow easy access to the cables for changes etc and not hinder access to plugs or sight of patch panel indicators/labels. It is anticipated that a minimum of 1U of horizontal cable management shall be required for every 24 ports of copper patch panel. A minimum of 1U of horizontal cable management shall be provided for every 1U of fibre patch panel.

Appropriate hardware required to dress and mount the panels shall be supplied.

Correct bend radii on the installed cables must be observed.

All panels and racks are to be earth bonded in accordance with IEE regulations, good working practice, prEN 50174 and any applicable local and national codes, standards and ordinances.

Plinths are to be provided to cover any cables crossing the floor.

It is the contractor's responsibility in siting the racks to ensure that there is adequate airflow and advise if additional ventilation is required into the Wiring Centre. There should be adequate clearance around the racks, to allow access for inspection and maintenance and meet safety requirements.

Separation between mains and telecommunications cables shall be maintained in accordance with good working practice and prEN50174.

Connection to the University Backbone

Each stack of switches shall be individually dual-home connected to appropriate campus core nodes, using fibre optic links. Diverse cable routing to the core nodes is preferred, options for this must be identified.

All patch cords and fly leads are to be included

Fibre Optics

All cores shall be terminated onto patch panels in the WC's.

An appropriate number of fibres shall be provided to each WC to support the dual-homing of each of the network switch stacks, as identified in the section discussing network switches, with spare capacity for an additional 2 stacks minimum.

The contractor shall make allowances for the diverse resilient routing of fibre optic backbone cables, where possible, to enable a service to be maintained in the event of a cable being damaged.

The fibre cables shall be BrandRex CST type:

- OM3 (multi, for intra building routes up to 300m) or
- OS1 (mono, for >300m and any inter building / external routes)

Labelling

There is a requirement to include a labelling scheme which will aid the end user in the maintenance and administration of the installed cabling system.

Contractors shall make allowance for the labelling of all cables at both ends, and for the full labelling of all switches, frames, patch panels and outlets with a unique circuit identifier.

Labelling should be of a high quality and permanently attached to the outlet, frame, patch panel, switch etc (to prevent being "picked off") - hand written labels are not acceptable.

Labelling Scheme

The objective is that the labelling scheme embeds minimal information relating to physical location; is to be regarded as a type of "indirect" reference. Room boundaries and naming changes over time; such information in a label could become incorrect and the burden of changing a labelling system is too great. Documentation, via a maintained database, shall identify the actual physical location from the label.

Outlets:

Outlets shall be labelled with the following four part code to identify the WC they are cabled to:

MB06	/	C	/	06	/	19
		One Char		Two digit		Two digit
Building reference and floor of WC		WC ID		Patch panel ID within WC		Patch Panel Port
		A-Z		(1-99)		(1-24)

The first two parts identify the WC where the outlet is terminated. In this example the outlet is connected to WC “C” on 6th floor of the Main Building.

The next part identifies the specific patch panel within the WC (patch panel no 6).

The last part is the port number (19) on the patch panel.

Horizontal Cabling Patch Panels:

Each patch panel used to terminate the horizontal cabling shall be labelled with a one part code:

06
Two digit
Patch Panel ID
(1-99)

This number identifies the specific patch panel within the WC and starts from ‘1’.

Each port on the panel does not need its own label as it is already labelled 1-24 from manufacture.

Service Cross-Connect Patch Panels:

Where provided each patch panel used to present services shall be labelled with a two part code:

DP	06
Two char	Two digit
Service Identifier: Data Panel	DP Data Panel ID
	(1-99)

The number identifies the specific patch panel offering the identified service within the WC and starts from ‘1’.

Each port on the panel does not need its own label as it is already labelled 1-24 from manufacture.

Cabinets/Frames:

Cabinets and frames shall be labelled with the following three part code:

MB	/	06	/	C
Two char		Two digit		One char
Building ID		Floor of WC		WC ID
		(0-99)(LG+GD)		(A-Z)

The two letter building identification shall be used e.g.

SW – South Wing

NW – North Wing

NB – Nelson Building

MB – Main Building

Switches:

Switches shall be labelled and dns named with the following code:

SW	MB	/	06	/	C	/	S	02
	Two char		Two digit		One char			Two digit
	Building ID		Floor of WC		WC ID		Denote stack	Switch ID
			(0-99)		(A-Z)			(1-99)

Commissioning and Testing

The installed systems (e.g. switches and UPSs) shall be commissioned into the University management systems, ensuring configurations are monitored, alarms reported.

All system shall be configured and the configurations to meet University standards, policies and local requirements. This shall include:

The installed copper cabling system will be thoroughly tested to confirm that the components and installation practices meet the defined standards. Test all copper horizontal and riser cables, following installation, for: pair polarity, crossed pairs, continuity, short circuits, length, attenuation, cross talk (near and far end), PS-NEXT, EL FEXT, PS-ELFEX, Propagation delay, Delay skew.

All tests to be carried out in accordance with an agreed methodology.

Full records shall be maintained of all testing carried out and the results of the tests.

Ensure each pair in each link is tested from both ends and the worst pair results used as the test result.

A valid calibration certificate to be provided, which is less than six months old, for each item of test equipment which is brought to site to measure performance data; the calibration certificate may be inspected on site.

All cables and components or a random selection will be witness tested. The extent of the witness testing will be at the discretion of the IT Engineer.

Rectify each failure identified during testing by replacing the faulty cable or component.

Ensure that all personnel who carry out any testing are demonstrably qualified, either by experience or by training for the test equipment to be employed.

Documentation

The system installation must be documented and be available in paper and machine readable formats detailing:

- Cabling schematics,
- Cable records,
- As installed drawings noting the location of all floor outlets and their circuit identifier, all cable runs to be marked on these drawings,
- Copper and fibre Cable test results,
- Patch schedules,
- Patch frame/cabinet layouts.

Warranty

The copper cabling system must be provided with a 25 year warranty (minimum), shown by the Cabling System Manufacturer's backed certificate to confirm the installation conforms to the relevant category performance specification.

Equipment and system warranty must be clearly stated.

Maintenance

All equipment must be added to the standard maintenance contract that the University has in place and arranged so that renewal dates are all co-terminus.