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<th>Project Ref.</th>
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<td>Project Name</td>
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<td>Project Manager</td>
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1000. GENERAL OVERVIEW

1001 Requirement on All Tendering Contractors
It is a mandatory requirement that the Telecommunications Cabling System described in this specification is installed by a specialist Telecommunications Structured Cabling System installation Contractor from the Newcastle University list of approved Telecommunications Structured Cabling System installation Contractors. With the exception of new build the contractor shall visit the site of the installation before preparing his tender.

1002 Intent
It is the intent of this Specification to call for the supply, delivery, installation, testing, commissioning and certification of the Telecommunications Cabling System described in this Specification, together with all minor and incidental work not specifically mentioned herein, to the true intent and meaning of this Specification.

Any apparatus, appliance or material not shown on the drawings but which is mentioned in this Specification or vice versa or any incidental component, or materials or services, which are required to make the work complete in all respects and ready for operation shall be supplied, delivered and installed without any additional expense. All such items shall conform to the standards as outlined in this Specification.

The Customer's Cable Infrastructure Project requires a structured cabling system, and single-manufacturer solution. The cabling system shall be backed by a minimum of a 20 year System Warranty as detailed in the specification. The system warranty shall be facilitated by the Contractor and be established between the Customer and the cabling system Manufacturer.

1003 Compliance
The Telecommunications Cabling System shall be compliant with the BSI/CENELEC BS EN 50173 Standard, parts BS EN 50173-1:2007 and BS EN 50173-2:2007. Application Performance and Component Performance guarantees shall be supplied for the installed cabling system for all performance classes up to, and including, Class E operation over UTP cable and all applicable classes for optical fibre channels.

1004 Description of the Work
To be confirmed during project development in consultation with the ISS Telephony and Cabling Manager.

1005 Definitions
Throughout this section of the specification ( ) the following definitions shall apply, in addition to those defined elsewhere in this document and in the BSI/CENELEC standard BS EN 50173:

‘Shall’ is mandatory.
‘Will’ is informative.
‘Should’ is advisory.
‘Provide’ means supply and fix or install.
Appendix A

‘BS EN 50173’ is the BSI/CENELEC standard comprising BS EN 50173-1:2007 and BS EN 50173-2:2007 (Information technology – Generic cabling systems). The applicable version (including all addendum, errata, corrigenda and like documents) of the BS EN 50173 standard shall be the latest ratified version of the standard that is current when any tender or other document is prepared in response to this specification, irrespective of any reference to a particular version of the BS EN 50173 standard in this document.

1006 Special Requirements

a. All of the Structured Telecommunications Cabling System components must be chosen to suit their working environment, and their installation or use must not contravene any national or local Building Regulation, Health and Safety Regulation or Fire Regulation current at the time of installation.

b. The BSI/CENELEC Structured Telecommunications Cabling System standard BS EN 50173 shall apply with the following exceptions:

- Transition point connections shall not be used in any UTP Permanent Link. The UTP cable between a work area telecommunications outlet and equipment room interconnect patch panel shall be a single, uninterrupted, four pair, 100 ohm UTP cable.
- Consolidation Point connections shall not be used except in areas were their use has been clearly sanctioned and a written specification has been issued. All Consolidation Point components must be approved by the Newcastle upon Tyne University ISS department.
- All optical fibre connector terminations shall comprise a manufactured connector and pigtail assembly fusion spliced to an optical fibre cable core. All optical fibre connector pigtail assemblies shall be supplied by a recognised manufacturer of optical fibre patch leads and pigtailed connectors.
- All singlemode optical fibres shall be terminated in blue DUPLEX LC connectors.
- The return loss of singlemode connectors shall be better than -40dB. APC finish connectors shall not be used.
- Mechanical optical fibre splices shall not be used.
- Field terminated optical fibre connectors shall not be used.

c. The Contractor shall ensure that the following physical requirements are met:

   Cable shall be installed above fire-sprinkler and systems and shall not be attached to the system or any ancillary equipment or hardware.

   The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices

   Installed cabling shall be generally free of tension, and adequately supported throughout their length. Cable support shall be in compliance with the standards referenced by this document and the installation requirements of the cabling system warranty.

d. The following minimum separation between metallic telecommunications UTP data cables and ac electrical power cables shall be observed, however, standards or warranty compliance may require wider separation between UTP cables and power circuits:

   A minimum separation of 3 metres shall be observed between telecommunications UTP data cables, and ac electrical cables operating at voltages greater than 480Vrms.

   Unless completely enclosed in well earthed steel trunking the minimum cable separation between copper UTP or FTP cables and ac electrical power cables and fittings carrying less than 480Vrms shall be whichever is the greater of the following; as specified in the ISO/IEC-11801 standard, as specified by the warranty installation requirements or as listed in the following table.
### 2000. **DESIGN PARAMETERS**

#### 2001. **Performance Requirements**

The Telecommunications Cabling System shall, for the performance classes specified for installation, support all existing and future applications approved for operation over optical fibre or copper UTP Channels by either the ISO, IEEE, ATM Forum, ANSI or any standards body, or users forum, that specify operation over copper UTP cable or optical fibre cable compliant with the BSI/CENELEC standard BS EN 50173 (Information technology – Generic cabling system).

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<table>
<thead>
<tr>
<th>Cable Types</th>
<th>Distance</th>
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<tr>
<td></td>
<td>Free air or non-metallic Divider</td>
<td>Aluminium Divider</td>
<td>Steel Divider</td>
<td></td>
</tr>
<tr>
<td>Unscreened Power &amp; UTP</td>
<td>200 mm</td>
<td>100 mm</td>
<td>100 mm</td>
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<tr>
<td>Unscreened Power &amp; FTP</td>
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A minimum separation of 160 mm shall be observed between telecommunications UTP data cables and fluorescent or neon lamps.
3000. SYSTEM REQUIREMENTS

3001. System Description
The Contractor shall provide a Telecommunications Cabling System to BSI/CENELEC standard BS EN 50173 (Information technology – Generic cabling system), comprising work area telecommunications outlets, distribution/equipment room interconnect patching panels, 100 ohm UTP BS EN 50173 compliant Class E Channels, patch leads for BS EN 50173 compliant UTP Class E Channels, optical fibre channels and 19” rack mount cabinets with mains power distribution and cable management.
A warranty, which meets the stated requirements, shall be supplied for the Telecommunications Cabling System.

3002. Data Cabinets

a. 19” Rack Mount Cabinets and Patch Panels
   The ISS Telephony and Cabling Manager shall advise on the installation within or of new Data Cabinets. The installation shall follow the principles as set out in this section.

   Where new cabinets are to be installed they should be of Cooper B-Line Access 19 inch rack mount, or equal and approved, manufacture (front & rear) floor standing cabinets shall be used in all IT Distribution Rooms.

   Unless stated otherwise the cabinets shall be 47U high.

   The cabinets shall be 675mm deep, supported on jacking feet and fitted with the manufacturer's standard plinth. Side panels shall be fitted to single cabinets and to both ends of a row of cabinets. Cabinets arranged in a row shall be joined using the manufacturers baying kit and electrically bonded using the manufacturer’s earth continuity kit.

   Fully vented (perforated) steel front and rear doors shall be provided for each cabinet, both with locks, and the same key for all cabinets.

   The Contractor shall provide (supply and fit) two vertical mounting mains power distribution units to each cabinet which is to house equipment to the following specification: 15 way (min) socket strip to accept 13A BS1363 plugs, with 13 amp rated, 5 metre flexible lead fitted with a 13A BS1363 fused plug.

   The Contractor shall set back the front 19inch mounting rack in floor standing cabinets to allow the front door to close with 100mm deep vertical management installed.

   Cabinets shall be installed a minimum clearance at both front and rear of 0.7m from any wall or projection to allow access.

   Cabinets shall be securely fastened to a solid floor using fixing anchors drilled into the slab and secured to the cabinet using bolts and threaded rod. Cabinets shall not be directly fixed to raised floor tiles.

   Cabinet/s shall be earthed to a suitable good clean earth earthing point with a lugged 6.0mm² (minimum) Green / Yellow PVC jacketed cable terminated in the cabinet to a suitable good clean earth point.

   The Contractor shall supply wall mounted 19 inch rack mount cabinets to the following specification

   Wall Mounted Cabinets. Where used wall mounted cabinets shall be adequately sized to allow for the accommodation of the required equipment (MINIMUM of 12U) and an additional allowance of approximately...
Appendix A

30% made to accommodate future expansion. The physical size of the cabinet shall be calculated to ensure adequate space allocation. One twin switched 13A mains power socket compatible with BS1363 plugs shall be installed adjacent to the wall mounted cabinet on its own radial circuit back to the distribution board and clearly marked “IT Network Cabinet” at the power DB. The Contractor shall provide (supply and fit) one 5 way horizontal mounting mains power distribution units to the following specification: 5 way socket strip to accept 13A BS1363 plugs, with 13 amp rated flexible lead of sufficient length to reach the mains socket provided for the wall box and fitted with a 13A BS1363 fused plug.

Wall mounted cabinets shall be installed to allow a minimum of a 1.2m radius around the front of the cabinet to allow free and easy access

Wall mounted cabinets shall be securely fastened to a solid wall

c. Patch Panel & Cable Management.

The Contractor shall install the patch panels and provide cable management to the following specification. The patch panels shall be positioned in the equipment room cabinets as shown in the specification drawings.

The UTP (RJ45) interconnect patch panels shall comprise 1U panels of 24x sockets interleaved with 1U panels of horizontal cable management with nominally 65mm deep rings (alternating 1U cable management panels and 1U 24x connector panels).

The contractor shall install M6 caged nuts in standard 1U configuration in the whole of the front 19inch rack of all the cabinets, and supply an equivalent number of M6 steel pan/button head 15mm long screws.

The contractor shall install cable management in the cabinet reserved for equipment at the positions they are installed for the UTP patch panels in the adjacent right hand side cabinet.

The contractor shall supply an additional ten (10) 1U horizontal cable management panels and vertical cable management rings for each IT distribution room. These will be installed by others when the network switches are installed.

The Contractor shall provide one 100x75mm (min dimensions) single ring vertical cable management ring for each 1U, 24x connector panel and mount them on the right hand side only of the UTP and optical fibre patch panels at each 1U, 24x RJ45 or optical fibre connector panel. The contractor shall ensure that the front cabinet doors can be closed with the vertical rings installed.

3003. Link Identification

a. The Contractor shall number all of the work area telecommunications outlets. Both ends of each Permanent Link shall have the same link number.

All labelling must be permanent and completed prior to testing. The labels must be designed to have a minimum life of at least 25 years.
The numbering of the UTP Permanent Links from each patch/distribution room shall start from 1 and increment by one.
Additions to an existing patch panel shall follow on from the existing numbering sequence. In all cases the numbering sequence shall be unbroken and unused patch panel outlets shall be numbered.

An ID has been assigned to each patch/distribution room, this is to be shown on each work area connector (but not the network/distribution room patch panels) as a prefix to the actual link number. In addition a single label is to be affixed to each work area faceplate showing the building room number. The patch room ID is to assist helpdesk staff locate faulty outlets as they are reported and the room number label is to help staff on site find the respective patch room.
Details of the labelling scheme is as follows;
Appendix A

The UTP link number shall be prefixed with a patch room identifier as shown in the following table;

4000. Telecommunications (data/patch/distribution) Room Power and Cooling

The room in which the cabinets/racks are housed shall meet the following specification

For new builds the floor to ceiling height shall be no less than 2.6 metres. The lighting shall be a minimum of 500 lux. Light fittings shall be located a minimum of 2.6 metres from the finished floor level. When an existing room is being outfitted and the ceiling height does not meet the requirement above then the customer shall be notified.

A minimum of one light fitting with an emergency light situated above the main exit.

Positive air pressure to be maintained to prevent ingress of dust into the room, this condition may be relaxed if an existing room is to be used.

No false ceiling.

A minimum of one air change per hour is required if the room has no forced air ventilation or air cooling unit. The room free air ambient temperature should normally not exceed 25 deg Celsius and must never exceed 30 deg Celsius. If power dissipation figures are not provided then the network equipment dissipation in the room can be roughly estimated as follows; 2000 watts for each cabinet in which equipment is to be mounted, plus 2200 watts for router & distribution switches. This includes an allowance for PoE switches assuming a maximum of 10% of the data outlets may be used for IP telephones or wireless base stations.

A minimum of one easily accessible twin 13A power socket is required for maintenance and inspection purposes only.

Unswitched 13A mains power sockets, and unswitched IEC 60309 mains power sockets, shall be installed adjacent to the floor standing network cabinets, that is mount the socket within 2 metres of the equipment cabinet it is intended to serve.

For each cabinet in which equipment is to be mounted (see patch panel layout drawings in the appendix); one twin un-switched 13A mains power socket compatible with BS1363 plugs, and one un-switched switched IEC 60309 16A/240v socket (plus mating plug), ground position 6, P+N+E (2P+E) is required.

In addition, for the end cabinet on the right (front view) of the row only, one extra switched IEC 60309 16A/240v socket (plus mating plug), ground position 6, P+N+E (2P+E) shall be provided.

All single and twin sockets shall be on separate radial circuits with suitably rated wiring and circuit breakers and at the Distribution Board all shall be clearly marked “IT Network Room {plus room No}”, dedicated distribution boards are preferred.

All the mains supply power circuits supplying the equipment cabinets shall be controlled by individual local double pole contactors and the contactors shall be sited to be easily accessible and clearly visible to anyone working on the equipment cabinets, each contactor shall be clearly labelled.

The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential for acting as a current-carrying conductor. The TBB shall be installed independently of the building electrical ground.
5000. WARRANTY AND TESTING

5001. System Warranty

The Contractor shall provide a written performance and applications cabling system warranty covering the whole of the installed Telecommunications Cabling System. The performance and applications cabling system warranty shall meet the following requirements.

The full terms and conditions of any warranty offered shall be included in the tender.

The Contractor shall provide a Telecommunications Cabling System Application and Performance warranty that shall guarantee, for a period not less than 20 years from completion, that the Telecommunications Cabling System as installed shall, for the performance classes specified for installation, support all existing and future applications approved for operation over optical fibre or copper UTP Channels by either the ISO, IEEE, ATM Forum, ANSI or any standards body, or users forum, that specify operation over copper UTP cable or optical fibre cable compliant with the BSI/CENELEC standard, BS EN 50173. The Performance warranty shall guarantee compliance with the technical performance requirements of the BSI/CENELEC ISO standard, BS EN 50173.

The Contractor shall provide a Telecommunications Cabling System Application and Performance warranty from the manufacturer of either the UTP fixed cable (permanent link cable) or the patch panel and work area telecommunication outlet connectors, see the following clause for acceptable manufacturers and warranties. The warranty shall guarantee that should a problem arise with the Telecommunications Cabling System that the Contractor/installer is unable or unwilling to resolve then the manufacturer supplying the warranty shall, subject to reasonable terms and conditions, take responsibility for fault diagnosis and any subsequent repair, and bear all appropriate and necessary costs (including cost of labour) associated with any repair or replacement due under the terms of the warranty.

The Contractor shall provide the Telecommunications Cabling System Application and Performance warranty from those listed below. Only the cabling system warranties (or the manufacturers current direct equivalent) and system manufacturers shown below are currently acceptable. The Contractor shall note that not all the warranties from the companies shown below are satisfactory only the particular warranties listed, or the current direct equivalent, meet the requirements.

- Full AMP NETCONNECT 25–YEAR SYSTEM WARRANTY (Component Warranty and Performance Warranty) from Tyco Electronics
- Full SYSTEM 6 WARRANTY (Component Warranty and Performance Warranty) from the Siemon Company
- Full Class E, 25-YEAR, MISSION CRITICAL SYSTEM WARRANTY (Component Warranty and Performance Warranty) from Hubbell
- Full 25 Year Communications Systems Channel Warranty (Component Warranty and Performance Warranty) from Brand-Rex Ltd
- Full PANDUIT CERTIFICATION PLUS SYSTEM warranty and PANDUIT PAN-NET™ PERFORMANCE guarantee.
Appendix A

Full Global Warranty from Molex Premise Networks

Full 20 year Extended Product Warranty and Applications Assurance Warranty from Commscope/Systimax

Full Connectix 25-year system warranty (Performance and Applications) issue v1.1 or later

5002. Compliance Testing

All of Telecommunications Cabling System Channels, both optical fibre and UTP, shall be fully tested. The tests shall include all parameters required to show that the installed Telecommunications Cabling System is in compliance with the performance requirements of the BSI/CENELEC standard BS EN 50173 up to and including Class E 100 ohm UTP Channels and Optical Fibre Channel classes OF-300 to OF-2000 inclusive. If the System Applications and Performance Warranty does not guarantee Channel performance from the results of Permanent Link tests then Channel tests must be performed.

Optical fibre link attenuation and length measurements as specified in BSI/CENELEC standard BS EN 50173 shall be taken in both directions and at the following wavelengths. OTDR derived optical attenuation measurements are not acceptable.

Optical attenuation measurements shall be taken in both directions using an Optical Power Meter and compatible Light Source for all optical fibres, at 1310nm for multimode fibres, and 1310nm and 1550nm for singlemode optical fibres.

OTDR tests shall be performed for all optical fibres, in both directions, at wavelengths of 1310nm for multimode optical fibre and 1310nm and 1550nm for singlemode optical fibre. The length of the launch lead shall be documented if it is shown on the OTDR trace.

The Contractor shall undertake a full witness test to the University of Newcastle IT team for at least 25% of the telecommunication outlets on the project.

5003. Telecommunications Cabling System Documentation

The installer must provide within two weeks prior of practical completion of the project three sets of complete systems documentation, including floor plans indicating cable routing, and sketches or photographs for specialist areas such as patching/wiring frame and cabinet layouts. The Contractor shall provide a full Operating and Maintenance Manual for the telecommunication installation.

Patching is not part of this specification, but if any elements of patching are requested and undertaken it must be documented.

Acceptable electronic formats are;

AutoCAD DWG, MS Word compatible, MS Excel compatible and PDF

The Contractor shall include in the documentation a set of floor plans showing the position and circuit identifier of each work area telecommunication outlet. The Customer will, on request, provide an AutoCAD compatible electronic copy of the final floor plans for final documentation and a reasonable number of printed sets of floor plans for the Contractor to mark up on site. The floor plans shall be submitted in electronic form as AutoCAD DWG format files on MS Windows compatible DVD.
Appendix A

Hand-written test reports are not acceptable.

All test results must reference traceable circuit numbers that match the physical circuit identifiers.

The documentation shall include full tabular reports (plots not required) including all of the measurements of all the parameters included in all of the tests to verify compliance with the BSI/CENELEC standard BS EN 50173 to the required performance class for all UTP cable Channels. The documentation shall include OTDR traces and the results from optical attenuation measurements for all optical fibre Channels.

All UTP cable test results shall be submitted in electronic form with hardcopy summaries. Hardcopy summary reports shall contain, at the minimum, the following information on each row of the report; circuit number, equipment room, test specification, length, date of test, and pass/fail result. The OTDR traces can be submitted in electronic form if a Microsoft Windows compatible OTDR trace reader is also supplied.

Hardcopy reports of the test results shall be submitted in labelled two ring binders with a certificate attached signed by an authorized representative of the Contractor warranting the truth and accuracy of the report.

Electronic reports shall be submitted on Microsoft Windows compatible DVD media. If the electronic reports are not in Microsoft Windows Excel, Word, Visio, AutoCAD or PDF format, or cannot be displayed and interpreted easily using Microsoft Windows Excel or Word, then the DVD shall contain any necessary software required to view and print the test results. Electronic reports must be accompanied by a certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report.

The installation will be deemed complete only on receipt of the warranty certificates and the full documentation.