



Australian
National
University

Cabling Specifications

2013, Version 1.0

Optical fibre—SingleMode

UTP Cabling—Category 5e and Category 6a

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1 General requirements

1.1 Definition of terms

- > **The Project Officer**—the ANU representative responsible for the contract.
- > **Approved**—approved in writing by the Project Officer.
- > **Site**—a location utilised by ANU personnel on behalf of ANU.
- > **ACMA**—Australian Communications and Media Authority which replaces Austel and ACA.
- > **Carrier**—the holder of a carrier license in accordance with the Telecommunications Act 1997, such as, Telstra Corporation or Optus Communications.
- > **Contractor**—the company that has been contracted to perform the works detailed in the “Scope of Works”
- > **Structured Cabling**—any data cabling connected to the ANU Network.
- > **Category 5e/6a and Cat 5/6a**—Category 5e and/or Category 6a UTP cables

1.2 Scope of works

1.2.1 Intent

It is the intent of this Specification to call for the design, supply, delivery, installation, testing, commissioning, removal and certification of the equipment 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.

1.2.2 Extent of work

This Specification covers the installation, maintenance and removal of the structured cabling system for the ANU as specified in the “Scope of Works”. For the site “Scope of Works” refer to the Project Officer.

The work includes design, supply, installation, testing, commissioning, removal and certification of an integrated Structured Cabling System to conform to the following approved system.

The work will also cover any works carried out under the Molex/KRONE system warranties.

Any new works (New buildings or major refurbishments) shall be cabled with Cat 6, any repairs or minor works are to be either Cat 5e or 6 being consistent with the existing structured cabling.

Any Structured Cabling that is connected to the ANU Network shall be installed/removed by an approved ANU data Contractor. This includes, but is not limited to; CCTV, BMS, CARDAX, etc.

1.3 Approved manufacturers system

1.3.1 Approved manufacturers

The ANU will only accept equipment and systems from the following approved manufacturers:

1. MOLEX Premise Networks Australia Pty Ltd (ABN 93 079 002 707) herein referred to as MOLEX
2. KRONE Ltd (ABN 39 090 961 774), herein referred to as KRONE

1.3.2 Structured cabling system

The structured cabling system shall be the MOLEX PowerCat - Enhanced Category 5e/6a, 6a System or KRONE "ENTERPRISE" Category 5e/6a Structured Cabling System using the 'TrueNet' product range.

The horizontal cable between the Telecommunications Room and the Telecommunications Outlet, known as the Link, must be MOLEX PowerCat or 'TrueNet' Category 5e/6, 6a UTP 4 pair product.

1.3.3 System warranty

Twenty five Years for a certified system installed by a current MOLEX Installer or Twenty Years for a certified system installed by a current KRONE PremisNET 20/20 Installer.

1.3.4 Installation/removal contractors

The Contractor, and its employees, agents, and contractors, shall be familiar with the ANU buildings, its networking infrastructure and special and local requirements across the campus. The Contractor **must be one** of the following ANU approved contractors:

- > Stowe
- > MRB Communications
- > Pathway Communications
- > O'Donnell Griffin

1.3.5 Channel specification for optimum system performance

To maintain optimum performance the complete system, known as the Channel, must be MOLEX or KRONE product including all patch cords and all data flyleads.

1.4 Contract drawings

The work covered in this Specification is shown on the drawings accompanying the "Scope of Works".

The Contractor shall check all relevant dimensions on site before proceeding with the work and all measurements and other information required to carry out the works specified shall be obtained by the Contractor on the site. Under no circumstances shall dimensions be scaled from drawings.

The layout of plant and equipment as shown on the drawings shall be taken as diagrammatic with final positions to be determined on-site. No claim for extras arising from failure to obtain measurements and other information on site will be allowed.

The drawings applicable to these works are to be read in conjunction with this Specification.

1.5 Work by other trades or authorities

The following works are not part of the "Scope of Works" but are included for co-ordination information.
Provision of Telecommunications Room or Equipment Room
Provision of lighting and power supply requirements to the Telecommunications Room or Equipment Room

1.6 Examination of site

The Contractor shall visit the site prior to providing a response and shall familiarise them self with the access and site conditions, the existing installations and all work necessary to complete the works.

Ignorance of the existing conditions or installation will not be accepted as justification for subsequent variation to the Contract conditions or cost.

1.7 Dimensions and levels

1.7.1 Diagrammatic layouts

The layout of plant and equipment as shown on the Drawings is diagrammatic only. The Contractor shall obtain measurements and other information necessary to carry out the works. No claims will be allowed for errors due to sealing off drawings.

1.7.2 Levels

Spot levels shall take precedence over contour lines and ground profile lines.

1.8 Coordination

1.8.1 Detailed installation

All plant, equipment and fittings as described in this specification and shown on the drawings have been designed on the basis of available "as built" information. The Contractor shall consult the architectural details, reflected ceiling plans and construction drawings for spaces available and building details before installing any element. The Contractor shall allow for making any offsets and deviations from the location shown on the drawings, after obtaining approval, as is necessary or as instructed by the Project Officer, to construct to actual co-ordinated space conditions.

1.8.2 Other trades

Co-ordination shall be undertaken by this Contractor where plant and equipment is to be installed along with work being installed under other contracts. The Contractor must ensure that all equipment is installed to the best advantage, minimising any interference with other works occurring during construction. The Contractor shall be held responsible for any cutting, patching, etc. required to the building structure or relocation of this or other trades' services as a result of the lack of co-ordination.

1.8.3 Authorities

The Contractor shall be responsible for co-ordinating with the Telecommunications Carrier, Electrical authorities, Fire Brigade, the Project Officer and all other Contractors working on the project.

1.9 Contractor's documents

1.9.1 Time

Where the contract requires the Contractor to supply documents such as workshop drawings, technical schedules, or other written information; they are to be supplied in sufficient time for examination, and revised if necessary, before they are required for use.

1.10 Workshop drawings and samples

1.10.1 Submissions

Workshop drawings, or shop drawings, which have been co-ordinated with other services, shall be submitted by the Contractor as required by the Project Officer.

Dates for submission and examination shall be co-ordinated with the overall building program. Shop drawings shall be submitted for 'permission to use' a minimum of five (5) working days prior to the required return date, or as agreed otherwise.

Drawings shall include the Contractors company name and logo and the date the drawings were completed.

1.10.2 Number of copies

Two (2) printed copies of 'permission to use' drawings.

1.10.3 Contractor responsibility

'Permission to use' workshop drawings will not relieve the Contractor of its responsibilities for errors and incorrect setting out or from furnishing materials and performing work as required by the Contract.

1.10.4 'As built' drawings

The Contractor shall keep original workshop drawings unaltered during the construction period. At the completion of construction the original untouched shop drawings are to be used to prepare the 'as built' record drawings without any individual revision notations. All revisions and submissions shall be made on copies of these originals or alternatively new revised AutoCAD, or equivalent electronic drawing program, drawings may be produced. The minimum size scale of these drawings shall be at least equivalent to those used on the contract documents.

At the end of works and before final payment is made complete and accurate drawings indicating the installed position of all plant and equipment shall be provided. Drafting must be of an equivalent standard to the contract drawings. Drawings shall show all relevant information that would assist in carrying out the main tenancy, additions and alterations to the installation.

Drawings shall include the Contractors company name and logo and the date the drawings were completed. Drawings are to be in metric dimensions and for location plans need to be drawn at a 1:100 scale.

1.10.5 Requirement

The Contractor is to supply 'as built' drawings to include:

- i. Cabinet layouts.
- ii. Communications system including location of Equipment Rooms, Telecommunications Rooms, Distributors and cabinets.
- iii. Telecommunication Outlets detailing all outlet, cable, cabinet and patch panel numbering.

1.10.6 Number of copies

The Contractor shall provide two (2) printed sets of A3 drawings and two AutoCAD, or equivalent electronic drawing program, copies on two (2) different CD's to ANU Project Officer.

1.10.7 Contractor responsibility

All drawings, prints and electronic versions on CD shall be included in the Contractors' price.

1.11 Record drawings

The Contractor shall keep available at all times on site, a copy of workshop and 'as built' drawings, and where required, marked up in colour and dated to indicate the extent and chronological order of all work tested and approved by the local authorities having jurisdiction over the works.

1.12 Availability of design drawings

Reproducible drawings will be furnished upon request at ruling commercial value. The Contractor as an aid to drawing production may use these particular drawings for workshop drawings.

Drawings provided in this way might not incorporate post tender revisions or amendments.

1.13 Proprietary items

1.13.1 Definition

A proprietary item shall be any item identified by graphic representation on the drawings, or by naming one or more of the following: manufacturer, supplier, installer, trade name, brand name, catalogue or reference number, and the like. A proprietary item shall not jeopardise the MOLEX/KRONE Category 5e/6a Structured Cabling System warranty.

1.13.2 Implication

The identification of a proprietary item shall not necessarily imply exclusive preference for the item so identified, but shall be deemed to indicate the required properties of the item.

1.13.3 Alternatives

If the Contractor offers an alternative item having the required properties, the item may be accepted at the Project Officer's discretion, provided that:

The Project Officer shall not unreasonably refuse acceptance if the proprietary item is not reasonably obtainable, and

Any cost difference shall be treated as a variation.

The alternative item shall be within Molex/KRONE limitations.

1.13.4 Information

When offering an alternative for approval, the Contractor shall provide all available technical information, and any other relevant information requested by the Project Officer. If so requested, the Contractor shall obtain and submit reports on relevant tests by an independent testing authority.

1.13.5 Alterations

The Contractor shall state whether the use of the alternative will require alteration to any other part of the works, and any consequent variation to the Contract sum.

1.14 Items supplied by Project Officer

Where materials and other items are specified to be supplied free of charge to the Contractor for use in the execution of the works, the Contractor shall take delivery of the materials and thereafter be responsible for them.

1.15 Samples

1.15.1 Prior inspection

Samples produced by the Contractor or its supplier shall firstly be inspected for compliance with the documentation by the Contractor prior to submission to the Project Officer.

1.15.2 Catalogue in lieu of sample

Samples shall be submitted by the Contractor to the Project Officer for all equipment, accessories, and systems for inspection prior to installation.

However, subject to approval of the Project Officer, where an item of equipment is a standard item, copies of the manufacturer's catalogue or brochure may be accepted in lieu of a sample provided that all dimensions and relevant information are shown in the catalogue or brochure.

1.15.3 Identification labelling

Samples shall be labelled to identify their intended use and relation to these documents, e.g. Telecommunications Outlet.

The identified samples shall be submitted within sufficient time to permit modifications to be made without delaying the work if such are deemed necessary by the Project Officer and to provide the Project Officer with not less than seven (7) working days to make his comments.

1.15.4 Technical data

Samples shall be accompanied by all the manufacturer's relevant technical data.

1.15.5 Permission to use

Once inspected, samples will be marked or notated by the Project Officer giving permission to use and installation may then commence, or alternatively samples will be marked or notated "Resubmit", which will automatically require the sample to be amended as required and resubmitted.

1.15.6 Return of samples

Samples given permission for use shall be held on site after inspection and used as a standard for acceptance or rejection of subsequent production units and then be returned to the Contractor.

1.16 Safety

1.16.1 Accident reports

The Contractor shall promptly notify the occurrence, and furnish a written report, of the following:

- > Accidents involving death or personal injury.
- > Accidents involving loss of time.
- > Incidents with accident potential such as equipment failure, slides and the like.

1.17 Maintenance during defects liability period

The Contractor shall provide all maintenance for the works during the defects liability period specified in the conditions of the contract. The Contractor shall restore the cable system breakdown or repair the cable fault to meet the Specification. All maintenance work shall be completed in a timely fashion. If the Contractor does not respond within this time, the Project Officer will arrange for others to rectify the fault and charge the Contractor for this service

2 Standards and work practices

2.1 Qualified trades people

The whole of the work shall be carried out by, or under the full supervision of, fully qualified and experienced tradespeople, and shall meet, as a minimum, the requirements of this Section.

2.1.1 Contractor's Project Manager

The Contractor's Project Manager shall be on site or readily obtainable throughout the life of the works.

The Project Manager shall be fully qualified in installation and maintenance procedures to the manufacturers certified level for the manufacturers system being installed.

2.1.2 Contractor's Project Supervisor

The Contractor's Project Supervisor for day-to-day activities and supervision of staff shall be on-site throughout the life of the works.

The Project Supervisor shall be fully qualified in installation and maintenance procedures to the manufacturers certified level for the manufacturers system being installed and possess:

- i. a current relevant ACMA licence, or
- ii. a current ACMA Open Registration implemented from 03 October 2000.

The Project Supervisor shall be capable of managing and leading staff under their direction. The Project Supervisor will liaise daily with the ANU Site Contact.

2.1.3 Contractor's staff

All staff, excepting those designated as trainees, shall be fully qualified in installation and maintenance procedures to the manufacturers certified level for the manufacturers system being installed and possess:

- i. a current relevant ACMA licence, or current ACMA Open Registration implemented from 03 October 2000.
- ii. a Current MOLEX/KRONE Master Cabler Certificate

All staff shall be familiar with the Facilities and Services "Site Practises Handbook for Contractors" and shall have completed the Facilities and Services Site Practises course.

Trainees shall be fully supervised by a qualified supervisor of the Contractors at all times.

2.2 Manufacturers' recommendations

2.2.1 Requirement

The Contractor shall use manufactured items in the works in accordance with the current published recommendations of the manufacturer relevant to such use.

2.3 Standards

Materials, products and installation shall comply with the mandatory provisions of all applicable Australian Standards, ACMA (Australian Communications and Media Authority) requirements contained in Communications Cabling Manual 2000.

2.3.1 Minimum specifications

Where minimum specifications differ between ACMA and Australian Standards AS/NZS 3080:2003 and AS/NZS 3084:2003 then the greater requirements of Australian Standards shall apply.

2.3.2 Current editions

An Australian or other standard applicable to the works shall be the last edition published up to one month prior to the closing date of the Tender or Request For Quotation.

2.3.3 Standards applicable to work

The following technical standards shall apply, as a minimum, to the work:

2.3.4 ACMA technical standards

- i. TS001-1997 Safety requirements for customer equipment.
- ii. TS002-1997 Analogue Interworking and non-interference requirements for customer equipment connected to the public switched telephone network.

2.3.5 Australian standards

- i. AS/ACIF S003: 2008 Customer switching systems connected to the public switched telephone network.
- ii. AS/ACIF S006 General requirements for customer equipment connected to the non-switched public network.
- iii. AS/ACIF S008: 2006 Requirements for authorised cabling products.
- iv. AS/ACIF S009: 2006 Installation requirements for customer cabling (Wiring Rules). (v) AS/NZS 3080:2003 Telecommunications installations - Integrated communications cabling systems for commercial premises.
- v. AS/NZS 3084:2003 Telecommunications pathways and Spaces for Commercial Buildings.
- vi. AS/NZS 3085.1:2004 Telecommunications installations - Administration of communications cabling systems. Part 1: Basic requirements.
- vii. AS/NZS ISO/IEC 15018:2005 Information technology - Generic cabling for homes.
- viii. AS/NZS 3087.1:2003 Telecommunications installations - Generic cabling systems
- ix. Specification for the testing of balanced communications cabling in accordance with values set out in AS/NZS 3080:2003.
- x. AS 1199-2003 Sampling procedures and tables for inspection by attributes.
- xi. AS 2834-1995 Computer accommodation.
- xii. AS/NZS 3000:2007 Wiring Rules.
- xiii. AS/NZS 60950.1:2003 Safety of information technology equipment.
- xiv. AS/NZS CISPR 22:2006: Information technology equipment - Radio disturbance characteristics -Limits and methods of measurement
- xv. AS/NZS 3594:1994: Information technology - Telecommunications and information exchange between systems - Interface connector and contact assignments for ISDN basic access interface located at reference points S and T
- xvi. AS/NZS ISO 9001:2008 Quality management systems - Requirements
- xvii. AS/NZS 2053 Conduits and fittings for electrical installations - General requirements

2.3.6 Handbooks

- i. HB 29:2007 Communications cabling handbook.
- ii. HB 243:2007 Australian regulatory arrangements.

2.3.7 Code of practice

- i. ESAA/Telecom Australia Code of Practice for Earth Potential Rise.

2.4 Authorities' approvals

The Contractor shall obtain all required permits and pay any fee lawfully imposed by any Authority.

2.5 Manufacturers warranties and certification

A contractor with full Molex or KRONE endorsement and certification for the cabling system tendered shall perform the work. The Contractor shall provide the signed MOLEX or KRONE System Certification and Warranty on completion.

2.6 Licence

The work shall be undertaken by, or fully supervised by, person/s fully qualified in installation and maintenance procedures to the manufacturers certified level for the manufacturers system being installed and possess all the relevant qualifications as per Clause 2.1.3.

2.7 Records

The Contractor shall produce and maintain accurate records of all terminations, related Telecommunication Outlet locations and cable numbers to terminated positions.

These records shall form part of a comprehensive maintenance manual, identifying all parts of the system, the configuration of the system and final test results.

2.8 Testing and commissioning

2.8.1 General

The ACMA, or its representatives, reserves the right to inspect the installation at any time. The Contractor shall rectify and make good any faults or omissions detected as a result of these inspections at no extra cost to the ANU.

The tests shall comprise a thorough inspection of the entire installation and the operational and performance tests specified or necessary to confirm compliance with the manufacturers specification. A Quality Assurance manual shall be produced and shall include complete details of all required tests to be undertaken during the construction and commissioning stages.

The necessary skilled and competent personnel together with all equipment required to test and commission the works shall be provided.

The method of testing, and detail of the type and capabilities of the test equipment is to be provided to the Project Officer two weeks before testing and commissioning commences.

The Project Officer has the right to refuse any equipment or test methods that the Project Officer is of the opinion do not meet the specifications or current standards.

The installation shall be tested progressively as construction progresses and then finally on completion to ensure that the installation complies with the Specification and operates correctly under normal circumstances.

All testing and commissioning shall be carefully pre-planned and scheduled in order that it is fully coordinated with other relevant trades and shall be carried out in a safe and efficient manner with a minimum of inconvenience to all concerned.

All equipment or material found to be faulty during testing shall be replaced.

Should a trial or test be deemed unsatisfactory it shall be repeated at no further charge after necessary rectification until such time as a satisfactory result is obtained.

The Contractor will provide for the duration of the tests all instruments and appliances necessary to complete the test procedures specified.

Instruments or equipment provided as permanent parts of the installation may be used during performance testing providing evidence is submitted of their calibration accuracy.

All such instruments shall be checked and calibrated during commissioning and again after 6 months of normal operation. Any instrument that will not hold calibration shall be replaced.

2.9 Test report

All testing shall follow the procedures set out in AS/NZS 3087.1: 2003.

Test reports shall be submitted in electronic format on a single CD at the completion of the work.

The electronic format shall include, PDF format and the raw test data from the test equipment.

2.10 Damaged finishes

Surfaces of equipment damaged during delivery or erection shall be touched up or repainted to approval of the Project Officer.

2.11 Materials uniformity

Uniformity of type and manufacture of each individual fitting and accessory shall be preserved throughout the whole installation.

3 Telecommunication pathways and spaces

3.1 Penetrations

3.1.1 General

Where services are required to penetrate new concrete walls, ceilings, floors beams or columns, the Contractor shall provide sleeves for installation in conjunction with fixing of formwork and placing of concrete. Similarly, sleeves shall be provided for installation in conjunction with the construction of block work, brickwork and light weight walls.

In existing walls, the Contractor shall provide penetrations for his services by coring, drilling, cutting or other approved method, which produces a neat and appropriately sized penetration.

All penetrations of structural elements must be approved by the Project Officer before any activity is commenced.

3.1.2 Fire rating

Where walls, ceilings or other elements have been penetrated and these elements form part of the fire rating of a building compartment, the penetrations must be sealed to preserve the fire rating. This shall be either as specifically indicated on the drawings and detailed parts of this specification or in accordance with the Building Code of Australia requirements.

An approved fire consultant shall certify all sealed penetrations of fire rated structures.

3.1.3 Contractor to seal and make good

Where the walls, ceilings or other element of such rooms have been penetrated by the Contractor's services, these penetrations must be sealed as well as make good adjoining surfaces to preserve the integrity, fire rating and designed sound attenuation following approved methods and techniques.

3.2 Setting out, cutting away, and making good

The Contractor shall set out, at the earliest opportunity the position and sizes of all holes, recesses, chases, and so on, necessary for the accommodation of the work included in the Contract.

3.3 Fixing to walls, etc.

3.3.1 Acceptable fixings

All fixings shall:

- > Be of an approved type.
- > Comprise metal thread screws or bolts into expanding type masonry anchors for connection to concrete or masonry.
- > Comprise tapered wood screws for fixing to timber.
- > Comprise drilled and bolted connections or proprietary clamps for steel members.
- > Be electro galvanised finish for all bolts, nuts, washers and screws.
- > Be located at the neutral axis for bolted connections to structural members.

3.3.2 Unacceptable fixings

- > Made using explosive powered tools.
- > Made in the mortar joint of brickwork or block work.
- > Into plasterboard, ceiling tiles or similar friable battens to secure the connections.
- > Self-tapping screws into sheet metal.
- > Nails.
- > Steel structural members shall not be cut, drilled, welded or in any way altered without specific approval from the Project Officer.
- > Clamp type fittings to steel building structures shall be used for pipe supports wherever practicable.
- > The cutting of holes in any structural or support components using oxyacetylene equipment is prohibited.

3.4 Cables installed against obstacles

Cables that are installed pressured, wholly or partially, against new or existing obstacles like brickwork, concrete, woodworks and so on shall be protected from damage by these obstacles.

3.5 Cable trays

Cable trays designated for data / voice requirements shall be used exclusively for telecommunication cables. Trays shall be sized for the number of cables plus 30% growth. All trays shall have a minimum 25mm stand off clearance from walls and 150mm vertical clearance and have easy access for the installation and later addition of cables. Changes in tray direction shall use standard formed bends and joins in the tray shall butt to form a smooth finish. Bolts or sharp objects shall not protrude into the cable bearing surfaces.

Cable trays should be used in open or exposed areas. That is, where the cabling can be seen.

Approved trays shall be Cablofil.

3.5.1 Protective earth

All cable trays used in the installation of telecommunications cables shall be mechanically and electrically bonded together.

Trays shall be bonded to the building protective earth system. The connection shall be made using a minimum 2.5mm green/yellow conductor.

3.6 Catenary wire support systems

Non-integral catenary wire support systems securely fixed to anchored eye bolts via stainless steel turn buckles may be used where a cable tray is unsuitable or the number of cables does not warrant the use of a cable tray.

Telecommunication cables supported in this manner shall be secured with Velcro cable ties at the ACMA recommended spacing of a distance approximating 200mm.

There shall be a maximum of 24 four (4) pair Category 5e/6a cables in a bundle tied to each individual catenary wire.

Catenary wires shall be used in concealed areas only. That is, where the cabling cannot be usually seen.

3.6.1 Protective earth

All catenary wires used in the installation of telecommunications cables shall be bonded to the building protective earth system. The connection shall be made using a minimum 2.5mm green/yellow conductor.

3.7 Cable hooks

Cable hooks may be used where there is a need.

Approved cable hooks shall be the Erico Cablecat.

3.8 Single channel skirting duct

Single channel skirting duct shall only be permitted to be used where it is already installed, as this is not an appropriate system to install. The single channel shall be used for either Telecommunications cables only or Power cables only.

All sections of the duct shall be mechanically and electrically bonded together and there shall be no sharp edges or screws protruding into the channels

3.8.1 Protective earth

All metallic ducts used in the installation of telecommunications cables shall be bonded to the building protective earth system. The connection shall be made using a minimum 2.5mm green/yellow conductor.

3.9 Multi channel skirting duct

Dual Channel 150mm skirting shall be installed at the height specified and constructed of metal. The duct shall form at least two (2) channels, one for Telecommunication cables only and the other for Power cables only.

All sections of the duct shall be mechanically and electrically bonded together and there shall be no sharp edges or screws protruding into the channels.

The relative position of Telecommunication cables in the top channel and power in the lower channel shall be maintained throughout the building.

3.9.1 Protection of cables

The duct shall have grommets or bushes fitted to protect the cables that are entering or exiting.

3.9.2 Protective earth

All metallic ducts used in the installation of telecommunications cables shall be bonded to the building protective earth system. The connection shall be made using a minimum 2.5mm green/yellow conductor.

3.10 Service columns

Service columns may be used to provide power and telecommunications to modular open plan furniture and Island benches where required.

The service columns shall be securely fixed at top and bottom to provide vertical and horizontal stability.

3.10.1 Protective earth

Service columns shall be bonded to the building protective earth system. The connection shall be made using a minimum 2.5mm green/yellow conductor.

3.11 Trenches and conduits

All trenches and conduits shall comply with ACA S009, AS/NZS 2053 and AS/NZS 3084:2003 for depth, location and usage.

All conduits located in trenches shall be a minimum of 100mm diameter PVC, Class 12, white in colour. If the conduit is directly buried it shall conform to AS/NZS 2053, AS/NZS 2032:2006 and AS/NZS 2566.2:2002.

New buildings shall have dual entry points separated by at least 10m and shall be approved by Networks and Communications staff. If dual entry points to a building are not practicable there shall be a pole installed on the building roof with 10A power GPO and fibre optic cable connecting to the main cabinet.

3.11.1 Approval

The Contractor shall obtain all clearances in accordance with the ANU Facilities and Services Division before any work can proceed. The Contractor shall follow the "Dial-before-you-Dig" requirements at all times. Forms are available from the ANU Facilities and Services Division. The Contractor shall take all reasonable care not to damage existing conduits, irrigation pipes, sprinkler heads or any other services managed by any other ANU departments. The Contractor shall not trench within tree drop lines.

3.11.2 Draw wire

All conduits will have a draw wire of 7/0.67 PVC SI Building wire installed. There must be no joins in this drawwire. Galvanised draw wire will not be permitted.

3.11.3 Back fill

The Contractor shall dig trenches so that there will be at least 500mm of fill on top of the conduits. Trenches shall be back filled and compacted. The last 100mm of fill is to be topsoil and will be seeded by the Contractor. In the area within the Vice Chancellors residence where the ANU gardening staff will carry out all repair work to the grounds, the Contractor shall inform the Project Officer when the ground is available for restoration. This is to be co-ordinated by the Contractor. Unused fill will be removed off site and all stones must be cleared from the site.

3.11.4 Communications tape

A tape identifying that communications services are below shall be placed 150mm above the top of the conduits.

3.11.5 Pits

Any pits that are open at the time of the works shall have approved safety barriers surrounding them at all times. Any newly installed pits shall conform to the ANU's specification available from the Project Officer.

Any new pit installed in a existing and/or proposed garden bed shall have a communications locating marker installed.

3.11.6 Damage to ANU grounds and equipment

The Contractor will make good any damage to paths, roadways, lawns and gardens. Any damage caused by vehicles parking unnecessarily on lawns, gardens or grassed areas will be rectified by the ANU and all costs will be charged to the Contractor.

3.11.7 Inspection

The ANU Project Officer will oversee the installation and carry out inspections during the trenching procedure. A final inspection will be carried out by the Project Officer to ensure full compliance to the ANU requirements.

3.12 Risers for vertical cable

Vertical risers between wiring rooms shall for exclusive use of telecommunication cables. They shall be fitted with cable tray to provide adequate support for the vertical cables using them.

3.12.1 Protective earth

Metal cable trays shall be bonded to the building protective earth system. The connection shall be made using a minimum 2.5mm green/yellow conductor.

3.13 Equipment Room (ER)

The equipment room is a centralised space for telecommunications equipment, like Customer Switching System (CSS) or PABX, computing equipment or routers and switches and so on, which serves occupants of the building.

The room should house only equipment directly related to the telecommunications system and its environmental support systems.

Design of the equipment room should follow, but not limited to, the following document:

- i. AS/NZS 3084:2003 Telecommunications installations – Telecommunications pathway and spaces for commercial buildings.

3.14 Telecommunications Room (TR)

The telecommunications room is a transition point between the backbone and horizontal distribution pathways. The telecommunications room shall be able to contain telecommunications equipment, cable terminations and associated cross-connection wiring. The telecommunications room is where cabinets are normally installed to support Category

5e/6, 6aUTP horizontal cables.

Telecommunications room space shall not be shared with electrical installations, other than those for telecommunications, or with any other unrelated building service, for example plumbing.

Design of the telecommunications room should follow, but not limited to, the following document:

- i. AS/NZS 3084:2003 Telecommunications installations – Telecommunications pathway and spaces for commercial buildings.

4. Cable, outlet, and equipment installation

Note: Any new works (New buildings or major refurbishments) shall be cabled with Cat 6, any repairs or minor works are to be either Cat 5e or 6 being consistent with the existing structured cabling.

4.1 Telecommunication Outlets (TO's)

Telecommunication Outlets are those outlets located at each workstation or office location for the connection of all communication services.

Telecommunications Outlets shall comprise single – for emergency telephone and wireless access points, dual as standard, triple or quad RJ45 Flush Mount (FMK), Surface Mount (SMK) type outlet where the cavity behind is less than 70mm other wise they can be either on a flush plate or surface mount as specified or appropriate. Telecommunications Outlets shall have ACMA approval and shall conform to Category 5/6, AS/NZS 3080:2003 and the approved manufacturers system.

4.1.1 Voice and data outlets

There shall be no difference in installation between Data and Voice outlets. Where data and telephone outlets are shown adjacent they shall be mounted on a common surface or flush faceplate.

For convention the telephone should use the left hand socket.

4.1.2 Laboratories and damp areas

Telecommunication Outlets in Laboratories and other potentially damp areas should be mounted a minimum of 300mm above the bench or damp area. Telecommunication Outlets shall not be installed in the damp situation restricted zones defined in AS/NZS 3000: 2000.

4.1.3 Installation height of TO's

Telecommunications Outlets mounted on a wall should, if practical, be mounted no closer than 900mm to the floor level.

In any other situations the final height can be co-ordinated with the Project Officer.

4.1.4 Installation of wireless LAN access points

The location of all Wireless LAN Access Points shall be co-ordinated with the Project Office on site.

4.2 Cable routing

All horizontal cabling shall emanate from patch panels and be routed to outlets nominated through ceiling space, risers, skirting duct and workstation partition duct. Cable lengths shall be kept to a minimum. Individual Category 5e/6a, 6aUTP cable runs from each designated patch panel outlet (PMK) to the Telecommunications Outlet shall not exceed a total cable distance of 90 metres.

4.3 Cabling general provision

The following guidelines are to be adhered to at all times unless the building structure requires a variation. The Project Officer must approve variations prior to installation.

All cables shall be installed in a workman like manner, parallel to walls, floors and ceilings, as applicable. The Manufacturers cable form shall be maintained at all times. No distortion due to kinks, sharp bends or excessive hauling tension shall be allowed to occur during installation. Care shall be taken to prevent other trades damaging the cable by walking or storing heavy objects on them whilst laying out and installation. Cables should be run in a manner eliminating any possibility of strain on the cable itself or on the terminations. Cables entering or exiting trays, conduits, catenary wires and other fixed support shall have a small gooseneck or slack provided and shall be fixed at both ends to prevent the possibility of cable stress.

Cables shall be concealed except where nominated otherwise, and shall run in neat lines. Cables shall have no joints or splices.

Cables shall be kept at a minimum distance of 150mm from items liable to become hot or cold. The distance shall be consistent with the maximum or minimum temperature possible and the cable type. Cables shall at no point make direct contact with such items.

Cables shall not be embedded in plaster, concrete, mortar or other finishes unless they are in conduit and capable of being fully withdrawn and replaced after the building is finished without damage to finishes.

4.3.1 Bending radius

Bending radii shall not be less than the manufacturer's recommendation and in any case shall be not less than eight times the overall cable diameter.

4.3.2 Hauling tension

The recommended Manufacturers hauling tension shall not be exceeded at any stage during or after installation.

4.3.3 Cable ties and fixings

All cable ties and fixing shall be tightened to support the cable loom without distortion of the cable sheath. In the case of Category 5e/6a UTP cables shall be bound using Velcro ties only and be sufficiently loose so that the tie may be easily moved on the cable loom and without distorting the shape of the sheath.

4.4 Separation from high voltage electric circuits

Separation between power and telecommunications cables, including earthing cables, to minimise interference shall be as detailed in AS/NZS 3080:2003.

4.5 Separation from electromagnetic interference

Separation between power and telecommunications cables, including earthing cables, to minimise interference shall be as detailed in AS/NZS 3080:2003.

A minimum clearance of 300mm shall be maintained from fluorescent lights and other sources of electrical noise.

Where adequate separation cannot be provided, precautions and measures shall be employed to shield the cable using earthed ferrous metal duct or conduit. Permission should be obtained from the Project Officer before installation as to the suitability of recommended solutions.

4.6 Cables installed in false ceilings

Approved cable trays, ducts, conduits or catenary wires, shall support all cable in the false ceiling space.

Velcro ties shall be used in all locations to loom or tie the four (4) pair Category 5e/6a UTP cables.

Cables shall be securely fixed to catenary wires at intervals approximating 200mm and in a bundle not exceeding 24 of the four (4) pair Category 5e/6a UTP cables.

Cables shall be neatly grouped together and at no point shall the cabling rest on false ceilings, light fittings, air-conditioning duct or other equipment. Cables shall not be fixed to or supported by the false ceiling hangers.

Maximum separation from power cables is to be maintained. Long parallel runs with power cables must be avoided. At all times the minimum specified spacing shall be maintained from parallel runs of electrical cable.

Where this is not possible telecommunication cables are to be run in an approved earthed metal duct or conduit.

All cables shall not pass over fluorescent lights or near to sources of electrical noise e.g. electrical motors.

Minimum separation of 300mm is to be maintained from these services.

4.7 Cables installed vertically

Cables installed in a vertical run shall be supported on a cable tray with Velcro cable ties every 500mm and shall be fixed at the top and bottom of the vertical run in a manner to ensure no strain on the cable due to its weight.

A small gooseneck or slack in the cable shall be provided where the cables join and leave the vertical run support.

Bends less than the manufacturers minimum-bending radius shall be avoided at all times.

4.8 Cables installed in partitions

Where cabling is run in partitions or similar enclosures, cables shall be installed in spaces free from protrusion of screws and similar fasteners. All sharp edges shall be removed and the cables allowed to run slack.

Cables installed in wall partition "interstud space" (AS/NZS 3084:2003) shall have exclusive use of that space or shall meet the mandatory separation from electrical services as specified in AS/NZS 3080:2003.

4.9 Cables installed in skirting duct

Cabling installed in the skirting duct shall be routed via the dedicated Telecommunications channel.

Telecommunications cabling shall be run in the dedicated Telecommunications section of workstation partition ducts, ensuring cables are screened from other services in these ducts.

Where Telecommunications Outlets are installed directly onto the duct, the appropriate cable shall be routed into the termination shroud of the Telecommunication Outlet ensuring that the cable and termination is protected from other cables within the duct. Sufficient cable shall be provided for later removal of the termination for servicing subject to minimum bending radius

Where cables pass behind a terminated outlet in the duct, the Contractor shall ensure that no strain is placed upon the terminated cable or the termination.

4.10 CD, BD, FD and TPF installation (formerly known as MDF and IDF)

The Distribution Frames shall be located and installed as specified.

4.10.1 CD - Campus Distributor, BD-Building Distributor (MDF - Main Distribution Frame)

The CD / BD shall be a KRONE Profil Version sized to suit for 25% expansion or allow for the addition of two verticals of the same size, whichever is the lower number, on the right hand side of the existing frame. The CD /BD installation shall comply with all relevant requirements of ACMA TS009.

4.10.2 FD - Floor Distributor (IDF - Intermediate Distribution Frame)

The FD where required shall be a KRONE Profil Version sized to suit with 25% expansion. The FD installation shall comply with all relevant requirements of ACMA TS009

4.10.3 TPF - Test Point Frame

The TPF shall be a KRONE Profil Version sized to suit with 25% expansion where space allows. The TPF installation shall comply with all relevant requirements of ACMA TS009. The TPF shall be cabled to the PABX and voice patch panels in the cabinet using voice grade copper cables with one (1) pair terminated, as specified in the "Scope of Works", on each voice patch panel socket, unless otherwise stated.

4.10.4 Telecommunication Reference Conductor (TRC)

The Contractor shall install an insulated stranded copper cable TRC from the CD / BD to each FD and TPF. The TRC shall be exclusive to the telecommunication services and the conductor size, colour, earthing and installation shall conform to ACMA TS009. The TRC shall be bonded to the CD / BD Link Bar. The CD / BD Link Bar shall be bonded to the protective earth and where the Power Authorities require it to a Telecommunication Functional Earth Electrode (TFEE).

4.10.5 Protective Earth (PE)

The Contractor shall install and terminate a stranded copper cable PE to the metallic termination module back-mounts at every CD, BD, FD and Test Point Frame.

Each cable is to be minimum 6mm green/yellow insulated multi stranded conductor and the cable length should not exceed 10 metres.

4.11 Overvoltage (lightning) protection

4.11.1 Voice services

In lightning prone areas Over Voltage (Arrestor) devices should be installed on all Inter- Building and Intra-Building cables to protect the telephone services. The arrestors are to be installed at the CD, BD or FD on the KRONE LSAPLUS blocks that are earthed to metallic termination module back-mounts that are in turn earthed to the building Protective Earth (PE) system to the required Regulatory standards.

230 Volt arrestors shall be used at the Carrier's side of the CD / BD.

500 Volt arrestors shall be used for other applications that connect to the Carrier's network.

4.12 Inter-building (campus) backbone cabling

Introduction

The ANU requires both copper and optic fibre cabling for its inter-building backbone cabling. The optic fibre cabling is for the Integrated Communications Network and the copper cabling is for the Emergency Voice Service.

4.12.1 Copper cable

All Inter-Building copper backbone cables shall be MOLEX/KRONE approved and gel (jelly) filled to prevent the ingress of moisture and impurities.

The inter-building copper cables shall be of Outdoor Cable construction as in ACMA TS 008, which in turn refers to AS 1049-2003.

4.12.2 UTP tie cable

There must be a minimum of 6 Cat 6 UTP Tie cables between the main cabinet and remote cabinets, distance permitting.

4.12.3 Optic fibre cable

All Inter-Building optic fibre backbone cables shall be MOLEX/KRONE , loose tube configuration and gel (jelly) filled to prevent the ingress of moisture and impurities.

The inter-building optic fibre cable shall be of Outdoor cable construction as in ACMA TS 008, which in turn refers to AS 1049-2003. The Inter-Building optic fibre cables shall be SingleMode.

Note if the optic fibre cable is supplied to the Contractor by the Project Officer it must be Single Mode 9/125mm. Any cable that is to be supplied by the Contractor shall meet the following clauses.

4.12.3.1 SingleMode Optic Fibre (SMOF)

4.12.3.2 Cable

Configuration shall be nominal 9/125mm core/cladding diameter with nominal 1310 nm and 1550 nm optical wavelength that meet all technical specification as described in AS/NZS 3080:2003 and IEC 60793-1-1 Ed. 2.0

Cable used shall be MOLEX/KRONE optical fibre cable

4.12.3.3 Number of cores

The number of cores will be outlined in the "Scope of Works" or stated by the Project Office.

4.12.3.4 Termination

The optic fibre cable is to be terminated using "Fusion Splicing" to SC pigtails, which terminate on the optic fibre patch panel, using blue SC to SC duplex adapters with a safety shutter. The optic fibre patch panel is to be installed at the top of the equipment-mounting frame within the cabinet. Shall be terminated using the termination guidelines in AS/NZS 3080:2003.

Terminations are to conform to the manufacturers system installed.

4.13 Intra-building backbone cabling

Introduction

The ANU requires both copper and optic fibre cabling for its intra-building backbone cabling. The optic fibre cabling is for the Integrated Communications Network and the copper cabling is for the Emergency Voice Service.

4.13.1 Copper cable

4.13.1.1 Cable

The backbone cable shall be ACMA approved voice grade or Category 3 type copper cable. The minimum wire diameter shall be 0.40mm and 100 pair cables should be used where practical.

Backbone cabling shall be used to connect the CD / BD to all FD's where installed and the TPF in the PABX room. Backbone cables will also connect the Distributor to the voice patch panels in the appropriate cabinet in the Telecommunications Room.

4.13.1.2 Termination.

The backbone cable will be terminated on MOLEX/KRONE 10 pair Disconnection Modules mounted on the CD, BD, FD and TPF. The Termination shall conform to all ACMA regulations and the manufacturers recommendations.

The backbone cable to the voice patch panel shall terminate sequentially with one pair to each patch panel outlet (jack). Starting on the first voice patch panel, VA, outlet 1 and will continue to outlet 24. The next pair will then terminate on the second voice patch panel, VB, outlet 1. This sequence will continue until all the pairs have been terminated on the voice patch panels.

4.13.1.3 Spare pairs

Spare pairs that are left over on the last voice patch panel shall be terminated onto the last few patch panel outlets to allow for the connection of 4 wire telephone circuits.

4.13.2 Optic fibre cable

All Intra-Building optic fibre backbone cables shall be MOLEX/KRONE , tight-buffered construction.

Shall be of Indoor Cable construction as in ACMA TS 008, which in turn refers to AS 1049-2003 and rated for Riser use or for Plenum use, as required.

The type of mode i.e. Single Mode, will be specified by the Project Officer in the Scope of Works. And shall comply with the following clauses.

4.13.2.1 SingleMode Optic Fibre (SMOF)

4.13.2.2 Cable

Configuration shall be nominal 9/125m.m core/cladding diameter with nominal 1310nm. and 1550nm. optical wavelength that meet all technical specification as described in AS/NZS 3080:2003 and IEC 60793

Cable used shall be MOLEX/KRONE optical fibre cable

4.13.2.3 Number of cores

The number of cores will be outlined in the "Scope of Works" or stated by the Project Office.

4.13.2.4 Termination

The optic fibre cable is to be terminated using "Fusion Splicing" to SC pigtails, which terminate on the optic fibre patch panel, using blue SC to SC duplex adapters with a safety shutter. The optic fibre patch panel is to be installed at the top of the equipment-mounting frame within the cabinet.

Shall be terminated using the termination guidelines in AS/NZS 3080:2003. Terminations are to conform to the manufacturers system installed.

4.14 Horizontal category 6a UTP cabling

Horizontal cables are those cables, which connect the workstation Telecommunication Outlets to the patch panels located in the Telecommunications Room for each floor. Cable All horizontal cable shall be MOLEX/KRONE four (4) pair 100 ohm Unshielded Twisted Pair (UTP) to Category 6a specification.

Wire gauge shall be 24 AWG (0.5mm dia.) or 22 AWG (0.6mm dia.)

4.14.1.1 Installation

The horizontal cable runs shall be kept as short as practical consistent with the safety and interference issues and in all cases shall be no greater than 90 metres in total length.

Where the distance is greater than 90 metres then the requirements of a second

Telecommunications Room and cabinet being installed on that floor will need to be assessed.

4.14.1.2 Termination

The Category 6a UTP cabling shall be terminated at the Telecommunications Outlets and the patch panels using the pin / pair assignment EIA/TIA T568A as described in AS/NZS 3080:2003.

Terminated cables shall have no more than 13mm of sheath removed and the cable manufacturers twist rate shall be maintained to point of termination.

A gooseneck or slack in the cable shall be provided at each termination to prevent stress on the termination. Cable ties shall be used to support the cable to prevent strain on the terminations. Cable ties shall be tightened so that they support the cable without distorting the sheath.

Patch panel shall be used from the bottom patch panel to the top patch panel. This will only differ if the site has an existing system already in place.

Cable terminations are to start at the bottom left hand patch panel socket then move left to right, bottom to top when viewed from the front of the patch panel.

4.14.2 MATV coaxial cabling

MATV coaxial cabling is NOT required for TV reception as TV is now broadcast across the network.

4.15 Cabinets/rooms

4.15.1 Cabinet/room style

Rooms shall be a minimum of 1.5m x 2m for 1 cabinet. If more than 1 cabinet is required Room size shall be checked by Networks and Communications Staff.

Cabinets shall be 19" rack mount style 38RU in height and 900mm deep where there are no space limitations. Cabinets shall be complete with steel doors and side panels with vented top panel.

Cabinets shall be approved by the Project Officer.

If there is a need to place a cabinet in an area of limited space then the option of a 600mm deep cabinet may be used upon approval of the Project Officer.

4.15.2 Cooling

There shall be a: Door vent or; Ceiling Vent or; Extractor fan or; A dedicated Split system A/C unit.

4.15.3 Protective earth

All cabinets shall be installed with a dedicated protective earth back to the building protective earth system, to meet AS/NZS 3080:2003 and AS3000: 2000 specifications. The connection shall be made using a minimum 6mm green/yellow conductor affixed to the cabinet frame.

4.15.4 Power supply

There shall be a dedicated 15A single GPO with no RCD supplied from the nearest electrical distribution board, unless notified otherwise by the Project Officer. See Appendix A. regarding document procedures for the installation / modification to any electrical installations.

4.15.5 Equipment mounting rails

The cabinet shall have vertical rails capable of accepting cage nuts. The equipment mounting rails shall be adjustable. The front rails shall be set at 150mm from front and the rear rails set at 50mm from back. The vertical equipment mounting rails are to be of heavy-duty construction so they will not move horizontally or vertically, without equipment installed.

4.15.6 Joining of cabinets

Where more than one cabinet is required in the same location then the adjoining side panels shall not be installed and the cabinets are to be bolted together. This will allow patch cords to pass easily between cabinets.

4.15.7 Security

All cabinets are to be lockable, front sides and rear to prevent unauthorised access to communications equipment, patch panels and cabling.

Rooms shall be fitted with a Netcomms lock – to be organised with ICT Facilities Manager. Cabinets shall be fitted with L & F lock # 92268.

4.15.8 Patch panels

All patch panels shall be MOLEX/KRONE 1RU, Category 5e/6a , 6a24 port RJ45. The patch panels shall be installed starting from the position indicated on the cabinet layout diagram and then upwards leaving one RU between each patch panel for a patch cord minder.

4.15.9 Patch cord minder

Patch cord minders (Cable Tidy) shall be MOLEX/KRONE 5 ring patch cord minder, installed in the cabinet below each and every patch panel and above the last patch panel in each section.

4.15.10 Patch panel termination

All patch panels are to be terminated with sufficient cable (gooseneck) to allow for the movement and reasonable access to the front and rear of the patch panel.

Patch panel RJ45 sockets are to be terminated as per EIA/TIA 568A as described in AS/NZS 3080:2003.

Cable terminations are to start at the top left hand patch panel socket then move left to right, top to bottom when viewed from the front of the patch panel.

Velcro ties shall be used in all locations to loom or tie the four (4) pair Category 5e/6a UTP cables.

4.15.11 Optic fibre cable termination

Optic Fibre cable shall be terminated at the top of the cabinets by plugging into the Optic Fibre patch panel (FOBOT – Fibre Optic Break Out Tray). The excess fibre shall be neatly housed in the cable management tray directly behind. FOBOT to be of MOLEX/KRONE Manufacture

Terminations are to conform to the manufacturers system installed.

4.15.12 Backbone copper cable termination

The Backbone copper cables from the CD, BD, FD or PABXTPF shall terminate sequentially on the Voice Patch Panels one (1) pair on each patch panel 8 pin module as per EIA/TIA568A.

Terminations are to conform to the manufacturers system installed.

Pair allocation shall be as per the “Scope of Works” for the individual Site.

4.16 Typical rack layouts

Typical 38RU single cabinet layout using 24 port Patch Panels for termination of voice grade cables and horizontal cables. Use the same concept for smaller RU cabinets.

	Top of rack
38	Optic fibre tray. Order – top to bottom (as required)
37	Optic fibre tray. Order – top to bottom (as required)
36	Patch cord minder
35	24 port Patch Panel for horizontal cables. Order -bottom to top for link cables
34	Patch cord minder
33	Active equipment. Order – top to bottom
32	Patch cord minder
31	Active equipment. Order – top to bottom
30	Patch cord minder
29	Active equipment. Order – top to bottom
28	Patch cord minder
27	Active equipment. Order – top to bottom
26	Patch cord minder
25	Active equipment. Order – top to bottom
24	Patch cord minder
23	Active equipment. Order – top to bottom
22	Patch cord minder
21	24 port Patch Panel for horizontal cables. Order -bottom to top
20	24 port Patch Panel for voice grade cable. Order -bottom to top
19	Patch cord minder
18	24 port Patch Panel for horizontal cables. Order -bottom to top
17	24 port Patch Panel for voice grade cable. Order -bottom to top
16	Patch cord minder
15	24 port Patch Panel for horizontal cables. Order -bottom to top
14	24 port Patch Panel for voice grade cable. Order -bottom to top
13	Patch cord minder
12	24 port Patch Panel for horizontal cables. Order -bottom to top
11	24 port Patch Panel for voice grade cable. Order -bottom to top
10	Patch cord minder
09	Leave spare
08	Leave spare
07	Patch cord minder
06	24 port Patch Panel for horizontal cables. Order -bottom to top
05	24 port Patch Panel for voice grade cable. Order -bottom to top
04	Patch cord minder
03	24 port Patch Panel for horizontal cables. Order -bottom to top
02	24 port Patch Panel for voice grade cable. Order -bottom to top
01	Patch cord minder

4.17 Leads

4.17.1 Patch cords (leads)

Contractor shall supply MOLEX/KRONE Category 5e/6a specification patch cords in the length, colours and quantities specified in the "Scope of Works" or as stipulated by the Project Officer. All patch cords shall be ACMA approved, four (4) pair UTP 24 AWG 100 ohm certified Category 5e/6a , 6a and tested for continuity and wiremap. The nominal number of patch leads will be one per outlet installed if no details are provided in the "Scope of Works".

Each patch lead shall be composed of multi strand conductors and have an 8 pin module plug (RJ45) terminated to EIA/TIA T568A configuration at each end.

Patch cords shall conform to the manufacturers system installed.

4.17.2 Colours of patch cords

The Project Officer may request different colours of patch/fly leads. This will be outlined in individual 'Scopes of Works'.

4.17.3 Optic fibre patch leads

Optic Fibre Patch Leads shall be terminated at each end with SC Duplex connectors or LC Duplex connectors and supplied in the lengths requested in the "Scope of Works" by the Project Officer. The Optic Fibre Patch Leads and connectors shall be ACMA approved and meet all AS/NZS 3080:2003 and IEC 60793-2 electrical, transmission and DB loss requirements.

Core/cladding dimension shall match the optic fibre cabling used, typically

- > SMOF would be 9/125mm core/cladding diameter.
- > Optic fibre patch cords shall conform to the manufacturers system installed.

4.17.4 Fly leads

4.17.4.1 Telephone fly leads

Contractor shall supply the telephone fly leads in the length, colours and quantities specified in the "Scope of Works". The nominal number of telephone fly leads will be 25% of the total number of outlets installed if no details are provided in the scope.

These leads are for the connection of telephones to the Telecommunication Outlets. Voice use fly leads do not have to be MOLEX/KRONE , but must be ACMA approved.

Shall be ACMA approved four (4) wire flat cable composed of stranded conductors and have an 8 pin module plug (RJ45) at one end and a 4 pin populated module plug (RJ12) at the other end.

Terminations shall be to EIA/TIA T568A configuration as detailed in AS/NZS 3080:2003.

4.18 Labelling system

NOTE: Under no circumstances shall hand written labels be used.

Telecommunication Outlets (TO's), Patch Panels and Racks / Cabinets shall be labelled with engraved traffolyte white background with black writing, to size specified using the appropriate Labelling System.

The following labelling system shall be used to uniquely identify each Cabinet, Inter-Building (Campus) and Intra-Building Backbone cable, Telecommunication Outlet, Horizontal cable and Patch Panel outlet or jack.

4.19 Labelling

NOTE Under no circumstances shall hand written labels be used.

Telecommunication Outlets (TO's), Patch Panels and Racks / Cabinets shall be labelled with engraved "traffolyte" white background with black writing, to size specified using the appropriate Labelling System.

4.19.1 Telecommunication Outlets (TO's)

Each Telecommunication Outlet shall be uniquely labelled with 4mm lettering on a traffolyte label accepted by the Project Officer to suit the outlet.

The Telecommunications Outlet number shall be obtained from the Patch Panel outlet at the Cabinet. Newly installed outlets in an existing building shall be labelled using engraved "traffolyte" as above or 4mm black lettering on white background "Dymo" Tape.

4.19.2 Patch panels

Patch panels shall be labelled from the bottom to the top, from A to Z inclusive, on the left hand side of the panel. Each patch panel outlet shall be labelled using 4mm lettering placed in the relevant label holder for that port.

Each Patch Panel outlet shall be labelled with the Labelling System that identifies the outlet connected to it.

The Patch Panels outlets (jacks) shall number left to right, top to bottom when viewed from the front. The numbers shall start from the lowest panel and count sequentially upwards.

Example of labelling of a 24 port Patch Panel (partial) terminating Cat 5eE horizontal cables

L-001	L-002	L-003	L-004	L-005	L-006	L-007	L-008
L-013	L-014	L-015	L-016	L-017	L-018	L-019	L-020

Example of labelling of a 24 port Patch Panel (partial) terminating Inter-Building and Intra-Building backbone cables (voice circuits)

VA-001	VA-002	VA-003	VA-004	VA-005	VA-006	VA-007	VA-008
VA-013	VA-014	VA-015	VA-016	VA-017	VA-018	VA-019	VA-020

4.19.3 Horizontal category 5e/6a UTP cables

Each Horizontal Category 5e/6a UTP cable shall be labelled within 100mm from each end of each cable with a machine produced permanent label with the same designation as the Telecommunication Outlet it terminates onto.

4.19.4 Inter-building and intra-building backbone cables – copper and optic fibre

Each Backbone cable shall be labelled within 100mm from each end of each cable with a machine produced permanent label with source (near end) and destination (far end) distribution frame designation or cabinet location.

4.19.5 Fibre Optic Break Out Tray (FOBOT)

The front section of the FOBOT shall be labelled with a traffolyte label accepted by the Project Officer with the same identification as the cable(s) within and the number of cores terminated.

Single Mode Fibre Optic shall use traffolyte labels with red background with white lettering. Where required laser warning labels should be affixed to the FOBOT, safety shutters and the splice tray.

Each cable will be identified with source (near end) and destination (far end) distribution frame designation or cabinet location and the number of cores terminated.

4.19.6 Cabinets

Cabinets shall be labelled at the top of the cabinet frame with a 50mm high character on traffolyte plate or other permanent label accepted by the Project Officer.

Cabinets are to be individually designated as per the "Scope of Works" for that site.

Cabinets in the same Telecommunications Room are to be designated from left to right when viewed from the front.

4.20 Testing

All cabling, including associated terminated equipment, shall be tested for integrity of installation as specified. Continuity and pin configuration tests shall be carried out on all cables upon final termination to ensure cables are satisfactorily installed and terminated.

4.20.1 Horizontal category 5e/6a UTP cables, including associated terminated equipment.

All Category 5/6 components, UTP cable and terminations shall be tested to AS/NZS 3087.1:2003 and AS/NZS3080:2003 specifications.

Testing of each Category 5e/6a cable shall include test results documented and provided as part of the Certification report:

A 'Summary Report' of each test result for every four (4) pair Category 5e/6a cable shall be provided and form part of a signed Certification Report certifying completion of these tests with zero defects.

A copy of the 'Full Test' results shall be supplied electronically on CD in PDF format and raw test data from the test equipment as in Clause 2.9.

4.20.2 Inter-building and intra-building backbone voice

Cables, including associated Terminated Equipment.

All inter-building and intra-building backbone copper voice grade cable shall be inspected for correct colour coded termination with no split or transposed pairs. Continuity tests shall be conducted on all pairs.

4.20.3 Optic fibre cables, including associated terminated equipment.

All optic fibre cable cores shall be tested for continuity, attenuation and correct termination. SingleMode Optic Fibre (SMOF) shall be tested at nominal 1310nm and 1550nm. optical wavelength.

Each optic fibre core shall be tested for length, attenuation and defects using an OTDR and shall meet the minimum requirements of AS/NZS 3080:2003.

The results from the OTDR will form part of the test report and shall meet the requirements of Clause 2.9.

4.20.4 Failure to pass testing and retesting

For any tests, which fail to meet the specified requirements, the Contractor shall undertake necessary repairs or replacement of equipment and conduct retests to ensure correct operation.

4.21 Certification

Certification shall be covered by the manufacturer, MOLEX/KRONE, in concert with the Manufacturers Approved Installer and shall provide a system and product warranty from the date of Certification. The Certification shall be handed to the Campus Network Manager and form part of the practical completion of the works.

4.22 Final acceptance testing

Following testing a sample testing may be performed in the presence of the Project Officer. If so a random sample of Telecommunications Outlets on each floor shall be fully tested in the presence of the Project Officer.

If any fault is found then the test shall be aborted, the entire floor shall be retested and again acceptance tested. All costs associated with the retesting shall be borne by the Contractor.

Acceptance testing where required by ACMA or the Carrier shall be arranged to commence at least two weeks before Practical Completion. All costs associated with such testing shall be included.

4.23 Cabinet record book

A system for recording patching done in each cabinet should be kept.

AS/NZS 3085.1:2004 Appendix E has a Cabling Record form that may better suit your requirements and it is allowed to be copied for use.

Reference: AS/NZS 3085.1:2004 Telecommunications installations – Administration of communications cabling systems. Part 1: Basic requirements

4.24 Final acceptance and handover

Final acceptance and handover shall be as per Facilities and Services Department requirements. This will be the start of the liabilities period and the start of the Manufacturers System Warranty.

Appendix A Electrical Installations and Documentation

The Contractor shall ensure that any electrical work either undertaken directly or by sub-contract meets the following requirements:

All electrical work shall be performed by a qualified ACT A Grade licensed electricians. NOEW forms shall be submitted to BEPCON and the customer copy included in the handover documentation.

Outlet labelling shall conform with the existing labelling within the building.

Distribution board legends shall be upgraded in black pencil and a photocopy shall be included in the handover documentation.

A brief description of work executed shall be included in the handover documentation.

Before commencement of any electrical work, an authorised ANU Staff representative shall be notified so that an ANU “Zone Leader” may be informed of work in progress.

Where power points are provided for computers or associated peripherals they shall be red in colour.

Power points installed on any new sub circuits in places that are accessible to the public and students shall be protected by a “Residual Current Device” placed in the electrical distribution board.