Communications Infrastructure Standards & Specifications

Copper and Optical Fibre Cabling Specification

Revisioning

Version	Date	Author
1.0	2/4/2013	Sean McHugh
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CHARLES DARWIN UNIVERSITY AUSTRALIA

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1. Introduction

1.1 Overview

Charles Darwin University have completed a revision of the CDU Communications Infrastructure Standards Specification. There are many updates to this document however the main changes are:

- Adoption of Category 6a Class Ea U/FTP as the standard for all horizontal cabling. Category 6A Class Ea F/FTP and S/FTP are acceptable and shall be considered for deployment where there is sufficient justification. This is subject to the ITMS Infrastructure representative approval
- Adoption of OS2 Single Mode Fibre as the standard for all core optic fibre cabling
- Adoption of Category 6a S/FTP 23AWG or 22AWG patch leads and
- Inclusion of requirements to meet the POE++ heat dissipation issue.

1.2 Purpose

The revised standards are designed to provide guidance. If there is any uncertainty it is recommended that you contact a representative of CDU ITMS and seek clarification. All work must comply with the relevant Australian/NZ and International standards and this document.

The CDU Communications Infrastructure Standards & Specifications document specifies the minimum installation and operational requirements for Charles Darwin University cabling systems.

These standards apply to all CDU ITMS data cabling, including vertical & horizontal cabling, backbone cabling, intra and inter-building cabling. These standards apply to all copper and fibre optical cabling within all Charles Darwin University campuses, buildings and sites regardless of their intended use.

1.3 Scope

The principles of the standards must be applied when conducting cabling projects for:

- The construction of new buildings
- Fit outs of existing buildings
- New vertical and horizontal cabling infrastructure
- Upgrades to existing cabling infrastructure Implementation of cabling infrastructure to interconnect new or existing sites, buildings and campuses.

1.4 Accountability and Management

These standards outline effective and consistent management of cabling throughout all Charles Darwin University sites, buildings and campuses.

All parties must ensure that:

- All cabling work conducted is consistent with regulatory and legislative obligations including relevant Australian and International Standards
- All relevant stakeholders are consulted prior to commencing every cabling project
- Comprehensive audits are conducted on completion of every cabling project
- Only authorised cabling systems offering a minimum of 20 Year Manufacturer warranty and approved by the Infrastructure Representative are to be used and
- Manufacturer Certification & Warranty Certificate and documentation for cabling infrastructure is kept up to date with electronic copies provided to the CDU ITMS Infrastructure representative and the Office of Property and Facilities.

Any conflicting information should be clarified with the CDU ITMS Infrastructure representative.

Any conflicting information should be governed by reference to the following documents:

- Relevant Australian Standards and Internationally recognised Standards
- This reticulation standard and
- Written Internal instructions by the CDU ITMS Infrastructure representative.

1.5 Acquisition of CDU ITMS Infrastructure Cabling Products and Services

This standard requires that all requests and purchases comply with Australian and Charles Darwin University standards.

All parties must ensure that:

- Where cabling is purchased as part of a major building project, contracts between Charles Darwin University and the contractor/vendor are formed in compliance with AS4000 and/or AS2124
- These standards are referenced as requirements in tender and contract documentation
- Tenders and contracts for infrastructure cabling are issued separately from any other electrical and/or building works
- Installers must be registered by one of the Australian Communications and Media Authority (ACMA) approved registrars with appropriate cabling endorsements
- Installers must hold current and valid Manufacturer Certification for the particular type of cabling being installed
- Installers have been inducted by the Office of Facilities and Property Services
- Installers must be selected in consultation with the CDU ITMS Infrastructure representative and
- Payments for new installations will be delayed until the Cabling Installation Certificates are generated by the Manufacturer and provided to the ITMS Infrastructure representative.

1.6 Implementation

The University employs a Structured Cabling System which consists of a flexible cabling infrastructure to support IP based communications. The structured cabling infrastructure has at the workstation, a telecommunications outlet that is wired to a central point using a star topology, providing flexibility for university personnel.

While the cabling infrastructure is primarily provided for the carriage of the CDU active network service, raw transmission media may be approved for non-Ethernet based applications after being reviewed in writing to the ITMS Infrastructure representative.

The requirements of the Structured Cabling System described in this

document apply to all cabling installations on all campuses, building and sites of Charles Darwin University. These guidelines also apply to the refurbishment of existing installations or any Moves, Adds or Changes (MAC's) to existing installations.

All exceptions shall be provided in writing and approved by the CDU ITMS Infrastructure representative.

All approvals requested within this document shall be provided in writing to the CDU ITMS Infrastructure representative prior to any installation work commencing, any quotations for telecommunications MACs being provided, any design work requiring telecommunications services being finalised, and any specification and associated documentation involving telecommunications services submission of tender.

The solution should define the method(s) of flexible patching for the telecommunications services to enable simple MACs without frequent rewiring of locations.

All new installation work must comply with the standards and specifications outlined in this document.

All communications cabling works done on CDU sites shall be managed in coordination with the CDU ITMS Infrastructure representative.

Any works which do not adhere to the guidelines contained in this document shall be deemed non-compliant and shall be rectified by the contractor responsible for the works at the contractor's expense.

This document shall be reviewed annually to reflect current industry standards and CDU ITMS requirements, and as such will be subject to version changes as required.

It is the responsibility of the contractor to ensure that they are familiar with the latest and current version of the CDU ITMS Infrastructure Standards and Cabling Specifications.

It is the responsibility of every ITMS Infrastructure staff, including all Project Managers from both the Office of ITMS and Office of Property & Facilities, to ensure all contractors have been provided with the latest version of this document prior to engaging in any work at CDU.

2. Standards

2.1 Conformity to Relevant Standards

All Structured Cabling work shall be installed in strict compliance with the Charles Darwin University's Communications Cabling and Infrastructure Specifications, to the latest standards listed below and the latest applicable. International standards shall be referred to where there is no applicable Australian Standard.

All cabling and connection equipment and materials supplied shall be products that are approved by the Manufacturer.

The current and latest editions of the following standards and specifications are to be complied with unless otherwise specified in this document. In all cases, where there is a discrepancy or clarification is required between this document and the following standards and specifications, clarification and approval in writing by the Charles Darwin University (CDU) ITMS Infrastructure Representative shall be obtained prior to submission of tender. No variation will be allowed after tender submission.

AS/CA S008: Current Edition	Requirements for Authorised Cabling Products
AS/CA S009: Current Edition	Installation Requirements for Customer Cabling (Wiring Rules)
NOHSC 1007 (2000)	NATIONAL STANDARD FOR OCCUPATIONAL

	NOISE
AS/NZS 3000: Current Edition	Electrical Installations Wiring Rules (Incorporating Amendments 1 &2)
ISO/IEC 14763-2: Current Edition	Information technology - Implementation and operation of customer premises cabling
AS/NZS 3084: Current Edition	Telecommunications installations — Telecommunications pathways and spaces for commercial buildings
AS/NZS 11801.1 to 11801.6: Current Edition	Generic cabling for customer premises General requirements. Replaces 3080, 24702, 15018 and 24764
AS/NZS 3085.1: Current Edition	Telecommunications Installations - Administration of Communications Cabling Systems
AS/NZS 4117: Current Edition	Telecommunications Standards - Surge Protective Devices for Telecommunication Application
AS/NZS 14763.3: Current Edition	Implementation and operation of customer premises cabling Part 3: Testing of optical fibre cabling

2.2 Approved Certified Solutions & Products

Copper Cabling Category 6a U/FTP products and Single Mode Fibre OS2 Products and Solutions shall be used in all Charles Darwin University campuses, sites and buildings.

The Structured Cabling Solution shall be designed and installed to provide the telecommunications infrastructure (patch panels, frames, patch leads, cables, faceplates and outlets) necessary to build a uniform premises distribution system, which will function for a multimedia communications solution to support 10 Gigabit Ethernet over the copper cabling deployment at a maximum distance of 80m including two patch leads of 5m each at the TR and the TO.

The solution shall be designed and installed to enable flexible point to point patching of the telecommunications services to allow for simple Moves, Adds & Changes, (MACs) without frequent rewiring of locations.

All the products supplied into installations must be new and not reused and/or recycled products. All the specified manufacturer's products supplied shall be genuine.

The horizontal copper cabling shall support the provision of 802.3bt Type 4 power to the Data Terminal Equipment as specified in the latest IEEE 802.3bt-2018 "Power over Ethernet" standard and in accordance with the relevant section of ISO/IEC 11801, the planning, installation and administration requirements of Category RP3 shall be applied.

2.3 Installation Company Quality Assurance

The cabling company contracted to implement the installation shall have a quality system in place that conforms to the requirements set out in the Australian Standards - AS/NZS 9000 or the installation company shall provide details of progression towards accreditation to this standard.

The installation company shall install, terminate, test and commission the cabling infrastructure to the relevant Australian Standard and in compliance with the Manufacturer's Standard.

2.4 Application Assurance and Warranty

All installations of Telecommunications Infrastructure in new and/or existing Charles Darwin University premises require a minimum of a 20 Year System Warranty and shall be provided by the Manufacturer from the date of successful completion of testing and commissioning of the Structured Cabling System.

The application assurance shall cover the failure of the offered cabling system to operate the applications that the system is designed to support, namely those identified in the current (at the time of tendering) versions of the Cabling Performance Specifications.

For any specifications not mentioned in this document, please refer to the latest appropriate Australian/NZ and Vendor specific direction to conform to the correct specifications and certifications.
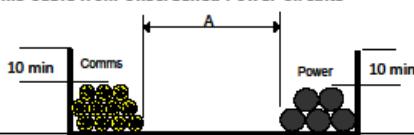
The CDU ITMS Infrastructure representative shall be notified of these instances prior to any action being taken associated with these.

2.5 General Cabling Installation Standards and Workmanship

The cabling system shall be planned and designed to ensure adequate segregation from electrical and other hazardous services, ensuring system integrity and performance, ensuring that it does not present problems of current and future maintenance or access, and ensuring there is no conflict with the operation and maintenance of other systems.

Refer to the following specifications for the mandatory separation of services.

Separation of Data/Comms Cable from Unscreened Power Circuits
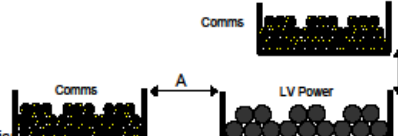
Steel Tray or Mesh –
With No Barrier or with a
Non-steel Divider

Table 1	Acceptable Separation Distance, A in mm					
No. Of 20 A Power≠ Circuits @ 230 Vac	2-9 Note 6	10-15	16-30	31-45	46-60	61-75
Free Space[1] No EMC Barrier — UTP	60	100	200	300	400	500
F/UTP	30 / 50*	50	100	150	200	250
S/FTP	6 / 50*	10 / 50*	20 / 50*	30 / 50*	40 / 50*	50

* 50mm min for AS/CA S009 mandatory safety compliance

Steel Tray or Mesh–
With Earthed Steel Barrier,
Solid or Perforated,
Or Separate Steel Trays,
Bonded & Earthed
Cables to be 10mm below sides & barrier

Table 2	Acceptable Separation Distance, A in mm					
No. of 20 A Power≠ Circuits @ 230 Vac	2-9	10-15	16-30	31-45	46-60	61-75
Containment [2] Steel Mesh or ≤1mm tk [3] Steel tray — UTP	45	75	150	225	300	375
F/UTP	23	38	76	114	152	190
S/FTP	5	8	16	24	32	40
Containment 1.5mm tk [4] Steel tray, No lid. No Mesh — UTP	30	50	100	150	200	250
F/UTP	15	25	50	75	100	125
S/FTP	3	5	10	15	20	25
Containment ≥1.5 tk [5] Steel with lid. No Mesh — UTP	0	0	0	0	0	0
F/UTP	0	0	0	0	0	0
S/FTP	0	0	0	0	0	0

Notes; Separations are based on ISO/IEC 14763-2 (2011). For >75 power circuits, contact CommScope.
1 Plastic, aluminium and other non-steel containment are the same as Free Space separation (without any electromagnetic containment barrier)
2 Containment is the barrier around the LV power cables or the communications cables
3 For steel mesh tray and for steel barrier <1mm thick and >20% perforations
4 For 1 mm thick and <20% perforated metal sheet and for steel conduits <1.5mm thick
5 For solid steel containment >1.5mm thick tray, barrier & lid, or >1.5mm thick steel conduit
6 For one LV cable <32Amps in domestic or E1 situations, separation is just the Safety compliance

≠ a) 3-phase LV cables are treated as 3 off 1-phase cables. Lay 3-phase cables in trefoil with neutral

The installer shall seal all openings in adherence to the relevant NT Standards. The openings may be either external or internal, made, or

provided through building walls, floors, ceilings or other fixtures after the cable has been reticulated to ensure the integrity of the barrier that has been penetrated. This includes but is not limited to the ingress of moisture/water, entry of rodents or other vermin and of fire where applicable. Applicable written certification will be required. All exposed cabling shall be mechanically protected to ensure protection from external forces.

The installation company shall be responsible for providing corrosion resistant products used in the installation of the structured cabling system and must ensure that any future corrosion of these products is limited. The installer is also responsible for the restoration of any damaged paintwork on equipment or accessories and this restoration must meet the original finish. If any damage occurs during the installation, it must be reported to the CDU ITMS Infrastructure representative immediately.

All communications equipment installed within Charles Darwin University campuses shall be installed in such a way that it is aesthetically pleasing and is in conformity to the equipment surrounding it. All exposed materials shall be consistent and shall not conflict with the surrounding décor.

The Contractor shall take responsibility for ensuring that after the work being carried out, the buildings / grounds / work areas are returned to their original state, as not to draw attention to the work that has been done i.e., installing the same duct work already existing in the area, painting, back filling, laying turf, etc.
The Contractor shall check the surface finishes and paintwork around the area of installation and touch-up or repair/replace all damaged parts after the installation of cabling and equipment.

The Contractor shall provide literature on maintenance and operation of all equipment installed. Relevant catalogues of all materials, instruments, equipment, and components to be supplied shall be provided to the CDU ITMS Infrastructure representative electronically.

All installed equipment and materials shall be permanently and legibly marked to indicate clearly the name of the manufacturer's registered

trademark and model identification.

Any existing data cabling affected by the relocation of the communication outlets is to be reinstated with new cabling. All redundant cabling is to be totally removed from the wall outlet to the network patch panel terminations in the cabinet and/or communications room.

Where a building is being demolished, the contractor is to remove the old multimode fibre cabling from the pits, conduits and Fibre Optic Break-Out Trays (FOBOT) to free the conduits of any future congestion. The old multimode cabling is not to be used as a future draw cable.

Where a floor or building is being refurbished, the redundant faceplates, copper cabling and associated patch-panels are to be completely removed from the TR. Failure to remove the redundant cabling shall result in non-acceptance by CDU and delay payment until rectification

The contractors are to dispose of the old cabling in a manner that is safe to the environment and is in compliance with the Local, State and Commonwealth laws.

Any cabling infrastructure found by the Cabling Contractor to be non-conforming to CDU's guidelines, the manufacturer's guidelines, Australian Standards and including Internationally recognised Standards, while doing work on the CDU physical infrastructure, shall be reported to the CDU ITMS Infrastructure representative for further investigation. A recommendation for rectification of the non-compliance should be included as part of the report.

2.6 Installation Staff Standards and Accreditation

The Cabling Contractor and nominated personnel must provide the documentation of being current approved installers of the manufacturer and must hold current relevant and necessary cabling Licence(s) / Open Registration with appropriate endorsements. They must present these to the CDU Project Manager for documentation prior to commencement of work.

The successful Contractor shall supply a list of names of installation staff and a copy of their accreditation certificates from the specified manufacturer to the Project Manager and the CDU ITMS representative. This requirement does not apply to apprentices or trainees under the full-time supervision of an authorised installer of the specified manufacturer. A minimum of 50% of the installation staff on site at any time throughout the installation must hold current and valid Manufacturer Certification.

The Contractor shall provide a list of their technical support staff listing their working experience in the relevant field.

The Contractor shall state the nearest location of their principal support

centre.

This centre shall have permanently stationed support staff capable of providing technical support effectively and efficiently when requested by the CDU ITMS Infrastructure representative.

Contractors are required to undertake Charles Darwin University site inductions for each individual site before commencing work on that site.

At the beginning of each working day on-site at any CDU Campus, all contractors must individually sign on at the CDU Property & Facilities Office and individually sign off at the end of the day.

Contractors working on CDU sites must attend CDU Workplace Health & safety induction, including asbestos training.

Contractors must adhere to the Office of Property & Facilities safety plan procedures and forward appropriate documentation as required under this.

Contractors on CDU sites must be uniformed, with company identification, clearly showing who they are and what company they are employed by.

Building and room access is to be provided by Office of Property & Facilities in
coordination with the CDU Security Office.

3 Guidelines

3.1 Types of Use

The Structured Cabling System shall be capable of supporting current and future services as specified by ISO/IEC from 11801.1 through to 11801.6 and must be of type RP3 to comply to residential, commercial and industrial environments.

- These include but are not limited to the following services:
- IEEE 802.3 (Ethernet)
- IEEE 802.11 (Wireless LAN)
- Power over Ethernet 802.3bt Type 4
- Building Security and Access

- IP telephony
- EFTPOS services
- Building Management Systems
- Security Cameras
- Digital video and audio
- 3D Imaging and printing and
- Other IP based services not mentioned above.

3.2 Design Guidelines

The Structured Cabling System is designed to support a high speed, high availability and redundant network that allows for future growth and capacity increase into either major or minor buildings.

- A major building is defined as a building with more than or equal to 72 data outlets and
- A minor building is defined as a building with less than 72 data outlets.

All cabling infrastructure is to be installed by Manufacturer certified Network Design & Installations cabling contractors, to the level as set out by this document.

All cabling infrastructure is to be installed and tested to comply with Manufacturer certification.

The following specifications apply to all CDU campuses, buildings and sites:

- A major building must have two redundant fibre on separate/diverse paths into the building communications rack and
- A minor building can have a single fibre into the communications rack.

3.3 Fibre Cabling Infrastructure

- Major Optical Fibre services must be via two separate building entry points if more than or equal to 72 data ports are required
- All building entry points are to be effectively sealed with a TDUX Duct Seal and once implemented then covered with Denso to effectively seal against weather conditions

- All external pits are to have gaskets installed to mitigate dirt and other materials intruding.
- Lead in Optical Fibre to be terminated within 15 metres of fibre barrier after it enters a building on vendor certified FOBOT
- Lead in Cabling Infrastructure shall be terminated in the Building Distributor (BD)
- Gel filled OS2 fibre must be used between buildings. Gel filled cable must not be used internally due to potential fire hazard
- Only Standard LC/UPC connectors are to be used for all new installations. LC-APC is not allowed unless the vendor is not using the CDU infrastructure such as for example the NBN
- For new deployments a request for more than 48 cores must be submitted in writing to the ITMS representative for review
- A 1RU vertical management must be placed immediately below the FOBOT
- Cabling between communications rooms within a building to the BD will have a minimum of 12 cores OS2 fibre connecting to a new 48 core Fobot within the BD. If more than 12 cores are required between individual floors within a building, a request must be made in writing to the ITMS Infrastructure representative and
- All fibre cores must be terminated in a Fobot. Leaving fibre cores not terminated is unacceptable practice and should result in the contractor being blacklisted for all future work within all CDU sites, buildings and campuses.

3.4 Telecommunications Rooms (TR)

- A minimum number of consolidated TR, the number of which to be governed by 80m recommended cable run length of horizontal cable from the patch panel frame to the wall outlet and including two 5m patch leads
- If one TR can provide the services of a BD, then this will be the BD and TR for that building size of room to conform to Australian Standards AS/NZS 11801 and related standards including the latest amendments
- Within a secured communications room a floor mounted communications racks should be from a reputable manufacturer including vertical management on both sides at the front, side panels and meshed font & back doors
- To install a closed and secured rack within an open space, a

request must be sought in writing from the CDU ITMS Infrastructure representative who will assess the area proposed and assist with providing a solution

- A communication rack within a secured space must have at least 900mm external space at the front, back and sides of racks or rack assembly as per Australian standards
- Where the secured ITMS Communications space pre-exists, the ITMS Infrastructure representative must be engaged to assess the viability of the secured space towards usability and feasibility to redesign the communications rack within the secured space and including meeting Occupational Health & Safety requirements
- Each single communications rack within a secured space must be supplied with two vertical cable management on both sides at the front of the rack
- Each communications rack within a secured communications room must be supplied at minimum with 2 x 15A drop-down pendants for power, each on their own separate dedicated circuit
- Each individual rack shall have a minimum of 8 outlets surge protected vertical or horizontal power rail with integrated circuit breaker – rear mounted in racks 42RU or more.
- Individual communications rack shall be earthed by connecting to the building earthing system
- Each rack must be individually connected to separate circuit breakers and multiple racks within a communications room shall not be connected in series
- Each enclosed cabinet must be fitted with ventilated doors and fan cooling
- Power and air-conditioning infrastructure shall have sufficient capacity to provide adequate power load and maintain requisite temperature control - i.e., 23 degrees, or to Australian Standard AS2834
- All closed racks within an open and shared area are to be lockable and fitted with the standard CDU ITMS communications rack key
- Communications racks must not be placed directly beneath a potential source of water and/or dirt such as an air conditioner, pipes, underneath a kitchen, toilet, etc
- Overall capacity to allow for 30% growth of outlets in the rack /rack assembly

- Environmental such as power and air-conditioning to be sufficient to be fit for purpose
- All Communications Rooms are to be always kept clean of contractors' tools and materials. CDU reserves the right to dispose of any items within the room after two weeks should contractors not remove all their materials and tools from the room upon request. The contractors shall be charged should cleaning services be engaged to remove all materials including the cleaning of the area and
- Communications Rooms must be permanently secured and locked via a swipe mechanism and including keyed as per the standard CDU ITMS communications room keys.

3.5 Cable Risers, Pathways and Internal Catenary Cable Support System

- Cable risers and pathways to be independent from all other services
- Main cable pathways shall be preferably of steel wire basket form to maximise airflow.
- Headroom above cable pathways must not be less than 300mm
- Cable risers and pathways must not be underneath and/or in the vicinity of potential.
- sources of water and dirt
- Shall allow for 50% spare capacity for future growth
- Shall be fire rated where the cabling traverse floors, or fire rated building infrastructure as required by Building Code of Australia
- Cable pathways above solid or feature ceilings to be cable mesh tray with appropriate access panels to be installed for future access
- Where the internal building design and construction cannot facilitate wire mesh cable tray support, catenary cables shall be installed. The maximum bundle size of cables supported by a catenary wire shall be 24. There shall be a maximum of two bundles supported per catenary
- The catenary wires must securely and safely support the potential load of attached cables The catenary wires shall be terminated, sized and supported to support the potential load of attached cables while meeting the maximum sag requirements of AS/NZS 3084
- The cable should be securely fixed to the building structure using

M8 x 25mm Dyna bolts or similar. Secondary support fixings shall use M6 x 25mm Dyna bolts

- Catenary cables shall be 2.5mm PVC coated, multistrand cable fixed to the building infrastructure at a maximum of 3m intervals. Fixings should be at irregular intervals to prevent performance degradation due to in-phase noise build up and

- Cables shall be secured to the catenary support system using Velcro style wrap at a maximum of 300mm centres. All permanent fixing must be completed using Velcro style ties wraps. Plastic ties of any kind shall be considered unacceptable.

3.6 Horizontal Cabling and Data Outlets

- New Horizontal cabling to be a structured cabling system, Category 6a Class Ea U/FTP
- Should there be shortages of U/FTP copper cabling and/or associated RJ45 shielded jacks, the CDU ITMS Infrastructure representative must be sought in writing to authorise the implementation of a comparable type
- The recommended length for Horizontal cabling is 80 metres due to the application of Power over Ethernet and includes two 5 metre patch leads from frame to wall outlet termination. Should the horizontal cable channel exceed 80m it shall be considered as failed
- Patch cables to use are blue 2 metres recommended and not to exceed 5 metres in length under any circumstances
- Wall outlets at workstations are to be capable of three outlets maximum unless otherwise specified
- Recommendation is of two outlets installed on implementation
- Ceiling mounted outlets, in-ceiling data outlets and including external outlets for wireless access points, IP Cameras and other IP capable devices are to be positioned within two metres from the intended position of the device and
- Cabling for wireless, IP Cameras and including any other IP devices mounted to the ceilings and/or externally to the buildings shall have a 3m service loop to allow for extending of position. Unless otherwise specified by the CDU ITMS representative, the outlets shall have their runs terminated with a ceiling mounted, in-ceiling data outlet and including externally mounted wall outlets secured to a permanent structural member.

3.7 Labelling of cabling infrastructure

- Labelling as per as per the section on "Labelling and Numbering".

3.8 Test results and Documentation requirements

- New inter and intra building Fibre being deployed through pits and conduits within any CDU campus and/or site must be submitted in writing to the Space & Planning representative of the Office of Property & Facilities Department for evaluation and written approval before implementation

- Any modifications and variations to the proposed fibre paths will be at the discretion of the Office of Property and Facilities Department of Space & Planning representative
- Copper installations of outlets within the building and associated labelling must be documented on a building floor map and must be provided to both the CDU ITMS Infrastructure representative and the Space & Planning representative of the Office of Property & Facilities Department to allow for the ongoing use and maintenance of the cabling infrastructure
- Test results and as-built drawings for all cabling infrastructure must be provided on completion of works to the CDU ITMS Infrastructure representative in the form set out by this Cabling Specifications document section "Documentation and Labelling" and in accordance with section
- The manufacturer's warranty for the cabling installation will be required
- Failure to provide the required documentation within two weeks may result with a delay in payment until the documentation is provided and
- All required documentation is solely and unequivocally the Intellectual Property of Charles Darwin University.

3.9 Acceptance and handover

- It is a requirement that all works adhere to the above guidelines and to specifics outlined in the cabling specification document for acceptance, handover, and any associated payments for works to take place and
- Acceptance shall include the cleaning of the communications room floor, removal of all non-CDU tools and materials, inside the cabinets and frames and wipe down of cabinets, racks and associated infrastructure, to prevent the ingress of building dust in active network equipment once installed.

4 Telecommunications Rooms (TR)

4.1 General

Telecommunications Room (TR) covers space dedicated to providing telecommunication and networking services inside buildings.

TR rooms shall be designed in compliance with NOHSC 1007. The design and location should provide suitable attenuation within the specified limits between the active equipment within and the listening staff.

The TR is used to terminate the campus cabling, building backbone cabling, horizontal cabling, as well as house network equipment to allow data services to be provided for the work area in a structured cabling system.

The TR may contain telecommunications equipment and other communications equipment such as IPTV, Security, Fire Alarm, Lighting Control, Public Address, AV, etc.

The TR may also contain small UPS equipment, Building Automation Service (BAS) equipment, Building Management Systems and other services such as security systems and similar.

UPS equipment greater than 60 kVA should be located within an adjacent room or facility external to the TR.

The layout of the equipment racks and other equipment & services within the TR shall be approved in writing by a CDU ITMS Infrastructure representative prior to installation. The design and layout of the cabling infrastructure terminated within the equipment racks shall also be approved in writing by a CDU ITMS infrastructure representative prior to installation.

Environment for the TR must be such that it ensures a dust free area that will allow any active equipment to operate within its optimal operating temperature.
Each TR shall be connected to the BD with Single-Mode Fibre connectivity to connect services to the University's network. Each BD shall be connected to the University's Campus Distribution Network. The size, class and quantity of the Fibre cable/s must be approved in writing by a CDU ITMS Infrastructure representative prior to installation and/or be supplied by the tenderer at the time of submission of tender.

As part of the submission of the tender a design of the cable path through the CDU pits, conduits and including building pathways must be submitted for approval to the CDU Office of Property & Facilities Department of Space and Planning representative.

Running fluid pipes and drains through TRs is not allowed.

Building a TR underneath, a kitchen, toilet, bathroom, within a storeroom and other amenities where water can flood, dirt and obstructing materials impacting the TR is not allowed.

Plans for building a communications room must be submitted for review/approval to CDU ITMS Infrastructure representative before installation.

No high voltage electrical services to be present or traversing a TR. The TR shall be able to contain:
- Telecommunications equipment
- Horizontal and vertical cable terminations and
- Associated cross-connect cables.

For a large building a TR must be provided on each building level requiring data services.

Where the building is considered small and the horizontal cabling channel does not exceed the mandatory length of 80 metres and less than 72 data ports, a single TR can be implemented.
- Additional rooms should be provided when the area to be served exceeds 2000m2.
- An additional TR will also be required when the horizontal channel distance to any work area exceeds 80m
- The TR shall be located as close as practicable to the centre of the area served
- - this will minimise the length of cable runs and help ensure that cable runs are kept within specified length
- Horizontal pathways should terminate in the TR located on the same floor as the area being served
- Concrete walls shall be treated to minimise dust and finishes shall be light in colour to enhance room lighting
- In multilevel buildings the risers must be vertically aligned

- ▄ Appropriate sleeves or slots to be provided between each riser in a multilevel building with the minimum requirement being 2 x 100 mm conduit and
- ▄ Where the sleeves or slots penetrate, they shall be constructed to protrude at least 75mm to act as a bund. They shall not be left open except during cable installation and shall be properly fire-stopped as per Australian Standards.

4.2 Data Services

All fibre optic cables to be terminated on a 1RU FOBOT capable of presenting up to 48 Single-Mode fibre cores.

Where more than 48 single-mode fibre cores are required, the ITMS Infrastructure representative must be engaged for assessment and assistance.
All Horizontal Cable must be terminated on a 1RU Patch Panel.

Each shielded patch panel must be individually earthed to the designated earth point or bar on the frame.

Daisy-chain earthing of patch panels is prohibited.

All field outlets to be fitted with a Shuttered bezel to fit the wall plate.
Patch leads shall be provided by the Contractor when patching of data circuits is required at the cross connections to facilitate MACs and maintain the vendor's System Warranty.

Data patch leads are to be Cat 6a S/FTP 23AWG or 22AWG shall be minimum 500mm to 2mtrs. Cabling color blue 2mtr in length for racks larger than and/or equal to 42RU, and color blue 50cm to 1mtr in length for smaller communications racks.

Patch lead length shall be maximum 3m Blue at the wall plate outlet end. Patch cord length should be discussed with the CDU ITMS Infrastructure representative.
Enough quantities of patch leads will be supplied by the contractor to allow patching of 70% of installed patch panel ports with at least one outlet on each wall plate to be patched. This means each outlet requires at least two cables to be supplied – a TR patch end and a TO wall plate

end.

4.3 Voice Service

The University has deprecated and migrated from the older Category 3 copper voice service to modern IP (including cloud) services.

Under no circumstances shall any analogue voice service be implemented and all requests to extend and/or maintain the remaining analogue services must be requested in writing to the CDU ITMS Infrastructure representative.

4.4 Room Size

The size, location and provisioning of services and facilities in the TR shall be in accordance with the latest and most current AS/NZS 3084 specifications. The location and number of TRs per building must be approved by the CDU ITMS Infrastructure representative in writing. The TR must be of a size to allow the appropriate number of standard sized racks (see "racks" section of this document for size) with 900mm working area around all sides.

- Rooms should have a minimum standard ceiling height of 2700mm
- Each telecommunication room shall have a minimum total door opening width of 1600 mm, a depth of no less than 2700 mm, and width of no less than 2600 mm and
- In smaller buildings where space may not be available consideration may be given to a smaller room however this must be approved in writing by the ITSM representative.

4.5 Access

Access to the TR shall be secured to prevent access by unauthorised personnel.
Doors shall be keyed to the standard CDU ITMS door key for existing installations.

New installations must have controlled swipe access as the primary means of access and including doors that are keyed to the ITMS Infrastructure key.

Shared access to a TR must have prior written approval from the CDU ITMS Infrastructure representative.

- For security reasons TRs shall only be used for CDU ITMS Infrastructure approved services
- The floor level in the enclosure should be the same as the outer access area, so that equipment racks and equipment can be easily installed and maintained
- There must be ease of access to the ceiling space above the enclosure(s) and this access will remain uncluttered by other installations, including air conditioning and electrical installations
- Ceiling space to allow for future access and installation
- The ceiling can be an exposed grid suspended ceiling with removable 600 x 600mm tiles. In some circumstances the ceiling grid can be removed to provide the required minimum height of 2700mm to the ceiling however suitable arrangements must be implemented so that the performance of building air conditioning is not impaired
- The proposed TR must be fully accessible from common areas and internal to the building.
- The TR shall be fully secured by two full height doors and allow racks to pass through without dismantling, i.e., must have minimum clearance of 900 mm and
- Doorway to TR must be in accordance with the latest and current AS/NZS 3084 and
- TR Door should swing outwards.

4.6 Lighting

Intensity on the front and back of installed terminations should be 500lux at 1m above the floor to meet AS/NZS 3084 requirements. The lights should be situated to minimise shadows on the patching and termination areas.

4.7 Air conditioning

A stand-alone air conditioning (A/C) system is to be provided in the TR to ensure a suitable operating environment of 23 degrees Celsius for equipment in the room.

This system shall be fit for purpose and provide 24 hours, seven days a

week operation. The A/C units are to be Refrigerated Air Cooled type design operation.

Due to leaks and other moisture, the stand-alone air conditioning shall not be placed directly above the communications rack, trays and/or other component of the communication system within the TR room.

A ventilated door and cabinet fans may be required to facilitate ventilation in the case of air conditioning failure.

4.8 Racks

Full Height Closed and Secured 19" Racks shall be used for Open and/or Shared Spaces. All communications rack within these spaces must be securely locked on all sides and keyed to the ITMS Infrastructure standard key.

All racks must be compliant to the EIA-310-D standard.

The minimum for a secured closed rack within an Open and/or Shared space shall be 42RU external dimension of 800mm x 900mm and must include internal cabling vertical management each with a minimum of 200mm on both sides of the rack placed at the front.

The placement of the proposed rack in the Open & Shared areas must be requested in writing to the ITMS Infrastructure representative for assessment and assistance.

Where a 42RU closed and secured rack is not practical due to building construction and/or practicality, a request for a smaller secured rack must be sought in writing for assistance and approval from the CDU ITMS Infrastructure representative.

Wall mount equipment racks are not the University's preferred option for mounting infrastructure equipment. The use of secured wall mount cabinets within the University shall only be used with prior written approval by the CDU ITMS Infrastructure representative.

Open four posts Racks shall be used within Secured Communications Rooms. The minimum specification for a Rack shall be 45RU 600mm x 900mm with two vertical management of minimum 200mm each on both sides of the rack at the front.

Where there is a requirement for a rack within a secured TR to be totally enclosed and secured with panels and lockable doors, a request must

be made in writing to the CDU ITMS Infrastructure representative for assistance with clarification included.

The internal layout of the Equipment racks and rack layout must be provided showing the location of the equipment racks and the equipment contained in them. Examples of standard rack layouts can be found in Appendix A of this document.

The equipment racks supplied shall have 30% spare capacity after the installation of all equipment to allow for future growth unless approved in writing by the CDU ITMS Infrastructure representative prior to installation or specified by the Contractor at the time of submission of tender.

All new installations within a secured communications room shall use a good quality product.

The minimum specifications for a single free-standing equipment rack within a secured space are:
- 19-inch mounting rails
- 600mm wide, 900mm Deep, 45RU in Height
- 45RU 4-Post Open Frame Rack, , Black
- Vertical cable management installed on the sides of the front of the rack.
- 45U copper earth Bar for grounding of all equipment
- A cable tray supplied above one side of the equipment rack. The width of the tray must support 200% of the installed horizontal and backbone cabling.
- Allow for 30% of spare capacity after the installation and
-
- 2 x 10-way 15 Amp vertical power rails with integrated circuit breaker – rear mounted.

The minimum specifications for a dual free-standing equipment rack configuration within a secured space are:
- 19-inch mounting rails
- 600mm wide, 900mm Deep, 45RU in Height
- Two 45RU 4-Post Open Frame Rack, Black
- Two 45U copper earth Bar. For grounding of all equipment in both racks
- Cable tray supplied above one side of the equipment rack which

supports the copper patch-panels. The width of the tray must support 200% of the installed horizontal and backbone cabling.
- Allow for 30% of spare capacity after the installation and
- 2 x 10-way 15 Amp vertical power rails with integrated circuit breaker for each rack – rear mounted.

The minimum specifications for a closed and secured minimum 42RU rack within an open and shared space are:
- 19-inch mounting rails
- 800mm wide, 900mm Deep, 42RU in Height
- Minimum 42RU 4-Post Open Frame Rack, Black
- Vertical cable management installed on the sides of the front of the rack.
- Mesh lockable Front and Back doors locks changed to the standard ITMS Infrastructure key.
- Two Side Panels (cladding) ventilated for each side of the rack,
- One top cover ventilated,
- Chimney for allowing cabling to enter from the ceiling into the rack.
- Vertical cable management installed internally on the sides of the front of the rack.
- 42U copper earth Bar. Grounding of all equipment
- Cable tray supplied above one side of the equipment rack. The width of the tray must support 200% of the installed horizontal and backbone cabling.
- Allow for 30% of spare capacity after the installation and
- 1 x 10-way 15 Amp vertical power rails with integrated circuit breaker – rear mounted.

All free-standing Open Racks must be secured to the ground in the TR by a method approved in writing by the CDU ITMS Infrastructure representative prior to installation or supplied by the Contractor at the time of submission of tender.

Mobile cabinets and mobile racks are not acceptable for cabling System Warranty.

Contractors and Project Managers must ensure specifications for all

racks and communications cabinets are submitted and approved in writing by the CDU ITMS Infrastructure representative prior to installation or supplied by the tenderer at the time of submission of tender.

4.9 Earthing and Bonding

All equipment racks shall be effectively earthed to a Communications Earthing Terminal (CET) as per AS/CA S009 standard. For each individual TR and BD location the tenderer shall supply a Communications Earthing Terminal System for connection to the building Protective Earthing System.

All shielded horizontal cables shall be earthed at one end only and this shall be the patch panel end. Shielded tie cables shall be earthed at one end only unless both ends are connected to the same CET in the room.

4.10 Power

- Each individual open rack within a secured communications room is to be supplied at minimum with 2 x 15A drop-down pendants for power, each shall be on separate dedicated circuit and
- Each secured rack within an open and shared space is to be supplied at minimum with 1 x 15A pendant for power and shall be on its own separate dedicated circuit.

4.11 Patch Panels

New patch panels installed in the racks shall be a 24 port patch panel.

Each installed patch panel shall include rear cable management that is attached to the back of the patch panel.

4.13 Cable Management

1RU Horizontal cable management in frames within all racks are to be provided.

Vertical cable management in frames is to be as specified in Section 4.8 Racks.

Fibre optic cable management is to be placed directly underneath each individual FOBOT.

Vertical and horizontal cable management shall be provided to manage the quantity of patch leads being used within the communications rack. The style and layout of all cable management provided in the equipment racks shall be approved in writing by the CDU ITMS infrastructure representative.

Examples of standard rack layouts used by Charles Darwin University can be found in Appendix A.

4.14 Cable Trays

Cable trays in TRs should be appropriate for the number of cables terminating in the communications room and allow for at least 50% growth.

Mesh Cable trays shall be used as they are open to dissipate as much heat as physically possible which is due to the application of Power Over Ethernet (PoE) through the cabling.

Where cables exit off cable tray or enter wall cavities the cables shall be protected with an approved ridge support (E.g., Corrugated Conduit) maintaining the cable's minimum bending radius for drops greater than 45°.

4.15 Building Distributor Telecommunications Room (BD)

The Building Distributor is a specialised TR and is used for terminating lead in paths for fibre and copper cabling. This room is normally on the ground floor and fed externally from underground conduits which would ideally rise in this room.

The size, location and provisioning of services and facilities in the BD shall be in accordance with the latest and current AS/NZS 3084.

The BD may contain telecommunications equipment and other communications equipment such as and used as a TR.

4.16 Data Centres

(Under Review)

4.17 Labelling

BD and TRs should be labelled as per the section on "Labelling and Numbering".
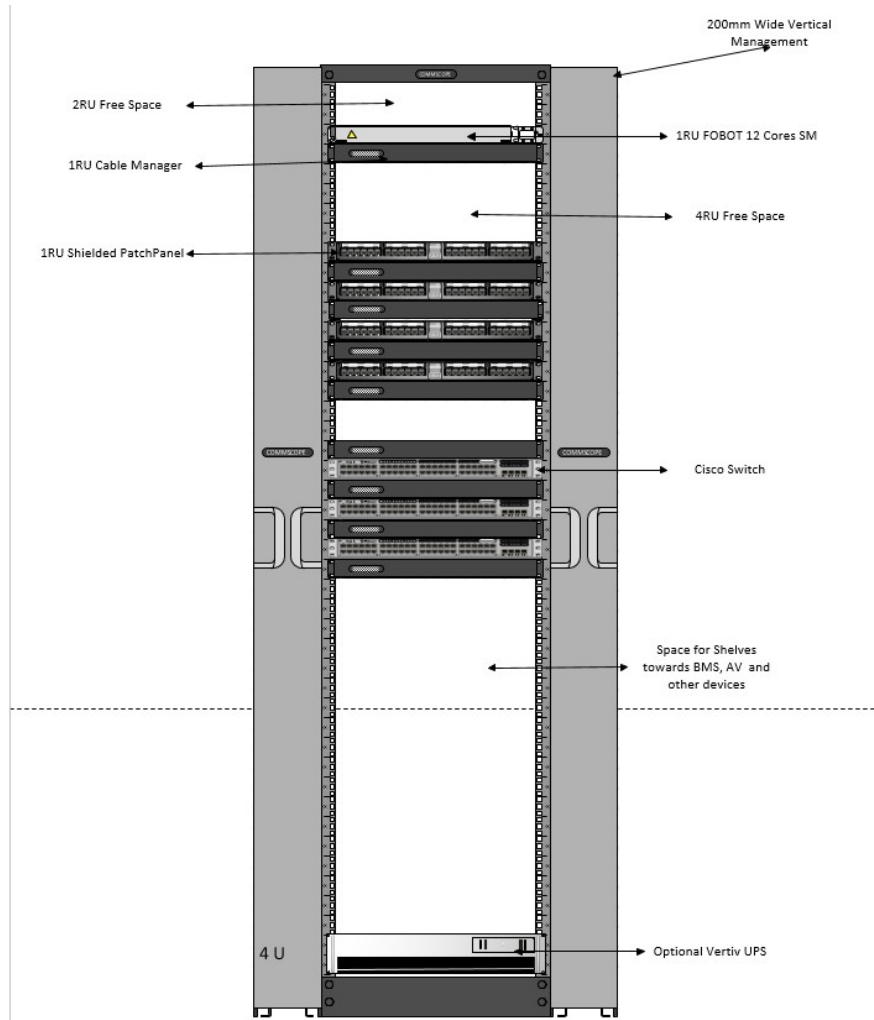
4.18 Compliance Testing

BD and TR compliance testing as per the section on "Compliance Testing".

4.19 Documentation

TR documentation as per the section on "Documentation".

Secured TR room example Single Rack:

Patch panel example front cable management:

Patch panel example rear cable management:

Example of Failure to remove the redundant copper cabling and jacks:
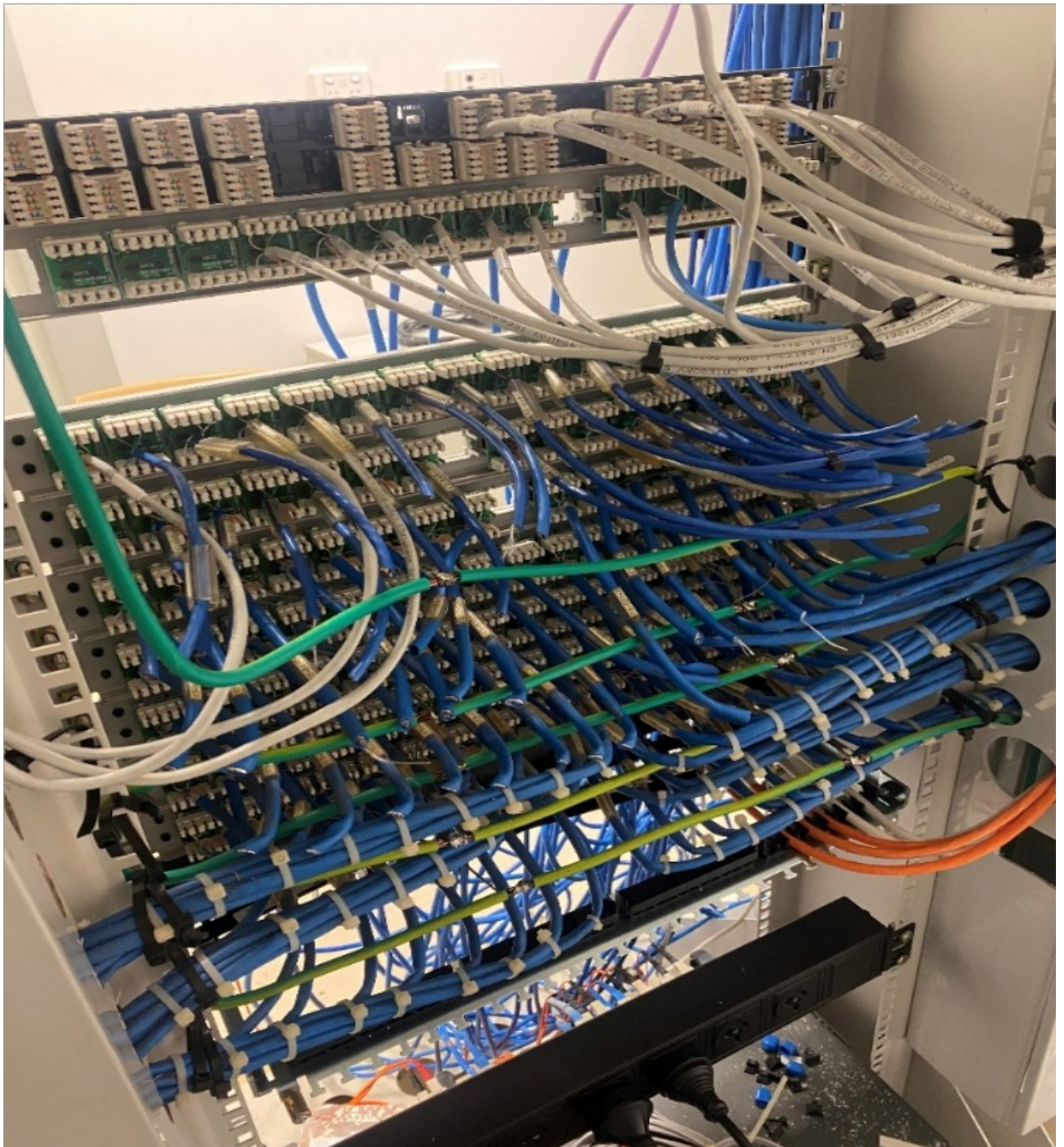
5 Campus Backbone Cabling System

5.1 General

The campus backbone cabling system refers to cabling used to join BDs and including other services that are external to buildings. This encompasses connectivity between buildings, as well as between TRs in the same building.

Approved fibre products and solutions shall be used in all Charles

Darwin University campuses to maintain the vendor's System Warranty.

Backbone cabling shall be considered as any cabling that interconnects buildings, sites, campuses and including services that are located externally to a building.

Copper cabling of any type, class and/or category is not allowed under any circumstances to be used externally and including within external conduits and pits.

Backbone connections to the BD from the Datacentres and Campus fibre distributors/aggregators shall be run in star topology and specifications including capacity, shall be approved by the CDU ITMS Infrastructure representative.

The current CDU standard for the campus backbone cabling infrastructure is to provide underground loose tube gel-filled tubes Optical Fibre services via diverse paths and building entry points. All outdoor conduits above ground shall be self- draining so that the indoor/outdoor Optical Fibre cable does not lie in trapped or pooled water/fluid.

- All Optical Fibre backbone cabling shall be comprised of gel filled Single Mode Optic Fibre. All internal building fibre shall not be gel filled due to the potential fire hazard

- Specifications for the build, design and implementation of all communications pits must be requested in writing from the Office of Property and Facilities Department of Space & Planning representative

- Communication pits should be established at locations no greater than 70 meters apart and at any point or where there is a change in direction

- Wherever possible communications pits must be aligned so that they are easily located.

- Communication pits should be located such that they remain permanently unobstructed (by landscaping, flowerbeds etc.)

- Specifications for the build, design and implementation of backbone pathways must be requested in writing from the Office of Property and Facilities

- All backbone pathways shall be connected by at least 2 x 100mm diameter conduits and

- Once the pits and backbone pathways are completed and As Built must be provided to the Office of Property and Facilities Department Space & Planning representative of for documentation and future purposes.

5.2 Underground Installations

Use Triple Jacket with external Sacrificial Jacket Underground Mini Stranded Anti Termite Loose Tube Gel Filled tubes for all underground applications. Moisture blocked Outdoor/Underground OF cable must pass the "Water Penetration Test" as referenced in the latest and current AS/CA S008.

5.3 Outdoor Above Ground Installations

All outdoor above ground cabling must be mechanically protected. Use Outdoor Tight Buffered OF cable for all outdoors above ground applications. This cable has an UV- resistant sheath that can accept exposure to sunlight; however, this cable must be installed in weatherproof, 100mm UV-resistant conduit for protection against accidental mechanical damage.

CDU ITMS does not prefer this method. See "Pathways".

5.4 Cabling Pathways – add As-Builts from contractors.

Standard pathways for outdoor cabling between buildings shall be via the University pits and conduits system. All pits and conduits located on Charles Darwin University properties and grounds are considered available for the University to make use of.

Any civil works associated with pits, conduits or pathways in general and performed on any CDU buildings, sites and campuses shall have prior approval in writing from the Office of Property & Facilities Department of Space & Planning representative before the commencement of works.

- On completion of works, the grounds shall be reinstated to the Office of Property & Facilities requirements.

- All new cable installs within conduit system shall have a draw rope installed, regardless of whether one is currently in place.

- For all new conduits installed, conduit identification tape is to be installed 100mm above conduit. Copper Tracer wire or equivalent must also be installed and may be included as part of the identification tape.

- All pits shall be installed to Australian standards and shall be installed in such a way as to allow positive drainage.

- All pits shall be large enough to accommodate a minimum of 2 x 100mm conduits (entering and exiting); however, the ITMS Infrastructure representative in consultation with the Office of Property & Facilities shall have final say on the size of the pit to be installed.

- All new pit installs shall have an internal pit cover installed to prevent rodents, insects and dirt ingress.

- Every effort is to be made to ensure all pit joints are secured in such a way as to be kept off the bottom to avoid water immersion or

moisture ingress, hung in an upright position.

5.5 Optical Fibre

Care must be taken to not damage any existing Multi-Mode (MM) fibre still servicing the University buildings, sites and campuses. In such circumstances when the MM fibre is damaged, the ITMS Infrastructure representative shall be engaged for assessment and the facilitation of a viable solution.

Multi-core optical fibre cable shall consist of Category OS2 optical fibre (also
known as ITU specification G.652c or G.652d) single mode optical fibre and shall be colour coded for identification.

"Multi-mode", including OM1, OM2, OM3, OM4 and OM5 shall not be implemented on any CDU Campus, sites and buildings for all inter and intra buildings connectivity.
Optical fibre is specified as per current Australian and vendor standards for transmission and budget loss. Where splicing is required, joints are to be fusion spliced. CDU does not accept puck and polish or mechanical splices.

Where new SMOF cables are installed which replicate any existing MM optical fibre cable, the old MM optical fibre cable must be removed entirely after cutover.
The redundant Multimode optical fibre shall not be left in the conduits to be used as potential future draw cables.

5.6 Optical Fibre Terminations

Each TR may also house the rack mounted fibre termination trays for termination of fibre optic cables. The FOBOT shall provide cross-connect, interconnect or splicing capabilities.

The FOBOT shall consist of a frame mountable housing for terminating and or splicing fibre optic cables and allow for organisation of the fibre optic interconnects. The assembly shall have rear openings for cable

entry, with posts to accept strain relief terminations and with fibre storage guide facilities for maintaining bend radius.

The FOBOT shall be up to 48 ports for one rack unit and shall be a slide tray for ease of access.

- 1RU FOBOT for 12, 24 or 48 ports.

The adaptor plates shall be suitable for only LC duplex couplings. Other couplings including MTRJ, SC, ST and other style couplings shall not be used within any Campus, sites and buildings.

The polarity of the fibre permanent link installed shall be in a crossover or flipped design to enable a standard fibre patch lead to be used to connect active devices. Failure to provide this solution is unacceptable and rectification will be required prior to hand over of any installation.

5.7 Voice Grade Cabling

The old copper Cat3 cabling has been deprecated and is not to be installed under any circumstances.

Voice services were migrated to IP protocol services and the Office of ITMS must be engaged should there be a requirement for a specialised service.

5.8 External Campus Cabling

Charles Darwin University does not support the use of indoor cabling for external use or inter-building cabling. Indoor cabling used for outside the building situations shall not be used under any circumstances.

5.9 Labelling

Campus backbone cabling should be labelled as per the section on "Labelling and Numbering".

5.10 Compliance Testing

Campus backbone compliance testing as per the section on "Compliance Testing".

5.11 Documentation

Campus backbone cabling documentation as per the section on "Documentation".

6. Building Backbone Cabling System

6.1 General

Within a building all the backbone cables shall be run in a star topology, terminated in the BD at one end, and in a Telecommunications Room TR at the other end.

Approved products and solutions by the ITMS Infrastructure representative shall be used for backbone cabling solutions in all Charles Darwin University's campuses, sites and buildings.

Fibre optic cable for all internal Horizontal, Vertical and Riser application shall be non-gel filled OS2 cable.

There may be a special requirement of Category 6a S/FTP cables for links between TRs and BDs. In such case, written authorisation with a business case must be requested from the ITMS Infrastructure representative.

Tie cables between FD and TRs may be required for connection of additional service.
The multi-core optical fibre cable shall consist of single mode fibre, colour coded for identification.

All optical fibre types, class, size and quantity used in all University building backbone cabling installations shall be approved in writing by the CDU ITMS Infrastructure representative prior to installation and/or be supplied by the contractor at the time of submission of tender.

Specification of optical fibre as per current Australian and Manufacturer standards for transmission and budget loss

All through connectors on FOBOTS shall use LC duplex with LC connectors.

Seek the guidance and approval from the CDU ITMS Infrastructure representative for the layout of the backbone infrastructure required. Full details of the type of cables to be used including the type of termination, identification method, method of installation and limitations (if any) shall be provided in writing to the CDU ITMS infrastructure representative.

6.2 Voice Grade Cabling

Deprecated.

6.3 Overvoltage

Deprecated

6.4 Cabling Pathways

Building backbone cabling system and associated pathways must have adequate segregation from electrical and hazardous services, ensuring system integrity and performance, ensuring that it does not present problems of maintenance or access, and ensuring there is no conflict with the operation and maintenance of other systems.

All indoor conduits shall be installed is such a way that the indoor/outdoor OF cable does not lie in trapped or pooled water/fluid.
All newly installed Metallic pathways shall be earthed in compliance with AS/NZ S2009

6.5 Labelling

Building backbone cabling should be labelled as per the section on "Labelling and Numbering".

6.6 Compliance Testing

Building backbone compliance testing as per the section on "Compliance Testing".

6.7 Documentation

Building backbone cabling documentation as per the section on

"Documentation".

7. Horizontal Cabling

7.1 General

Approved products and solutions by the ITMS Infrastructure representative shall be used for horizontal cabling solutions in all Charles Darwin University's campuses.

All horizontal cabling bundles through the infrastructure must not exceed the maximum bundle size of 24 cables. When deployed via a mesh tray, each bundle must be efficiently spaced for adequate airflow to pass between the individual bundles as per Manufacturer guidelines.

The horizontal cable installed must be of the T568A standard and shall be a minimum of a Category 6a U/FTP 4 pair solid-conductor cable used to connect each telecommunication outlet (TO) to the TR.

The 4-pair U/FTP cable must meet AS/NZS 11801 Category 6a U/FTP requirements. It must be tested to minimum Class EA to ensure performance for any application up to and including 10,000 Mbps (10GBE) from the TR to the TO at the work area.

The 4-pair U/FTP cable shall be run using a star topology from the TR to every individual telecommunication outlet. For information on the approved materials that can be used for the cable pathways please refer to AS3084.

All cables shall be run and installed in a professional manner in accordance with AS/CA S009 Wiring Rules for safety and network integrity, and AS/NZS 11801 for performance and to comply with sites designated manufactures warranty.
The use of the following materials on the cabling is not permitted due to the chemical interaction with the cabling and will void warranty from the Manufacturer: - Paint, abrasives, corrosive residues, paint remover, plaster, spf insulation and other contaminants.

All parts shall comply with Australian standards, communications

manual module 1 Australian regulatory arrangements and meet the Manufacturer's product certification.

Each cable from the cross-connect at the TR to the telecommunication outlet (TO) shall be continuous without any joints or splices. Multiuser Telecommunication Outlets (MUTO) are not to be used on any CDU Campus, sites and Buildings.

The horizontal cabling length from the TR to the TO shall not exceed the channel length of 80m and including two 5m patch leads due to the new constraints for delivering 802.3bt Type 4 PoE over the cabling infrastructure.

The new cabling installation shall be designed to support up to 100W remote powering on all cables in accordance with RP3 specification ISO/IEC 14763-2 and fit for purpose in accordance with AS/CA S009:2020

The cabling system shall be planned and designed to ensure adequate segregation from electrical and hazardous services, ensuring system integrity and performance, ensuring that it does not present problems of current and future maintenance or access, and ensuring there is no conflict with the operation and maintenance of other systems.

Full details of the type of cables to be used including the type of termination, identification method, method of installation and limitations (if any) shall be provided in writing to the CDU ITMS Infrastructure representative.

Termination of cables in the TR shall be on racks or assemblies to suit the selected modules and or patch panels.

To comply with the identification requirements of AS/CA S009, cable shall not be painted.
Copper installs and infrastructure shall meet the sites designated manufacturer's warranty.

Cat 6a U/FTP cabling for wireless and including IP cameras are to have a 3m service loop to allow for extending of position.

Cables that penetrate fire barriers, inter-floor, building entries shall have the penetrations suitably fire-stopped by qualified operators as required by local building code regulations/laws and Charles Darwin University Office of Property and Facilities requirements.

7.2 Cabling Pathways

All cable pathway designs shall follow the most economically feasible route from the TR to the TO.

All cable pathway designs for refurbishments and new buildings shall be approved by the CDU ITMS Infrastructure representative before installation.

All cable pathway designs for refurbishments and new buildings shall incorporate ease of access for the laying of future cables.

Cable pathways for horizontal cabling shall be primarily within meshed trays for main cable routes. Catenary solutions may be proposed where the building construction is small and/or difficult, see page 14.

All metal pathways shall be earthed in compliance with AS/NZ S2009.

All new cable infrastructure solutions shall be submitted to the CDU ITMS Infrastructure representative prior to installation to verify appropriate type is being used for.

Cable pathways above fixed, feature or hard ceilings shall be meshed cable trays, with access hatches in ceiling every 3 metres and at each change of direction for future maintenance and access to the cable path.

Adding cables to existing catenaries should not exceed the maximum number of 24 as cables recommended by the vendor.

If by adding cables to existing and/or new catenaries the total number of cables in that catenary exceeds 80% of the maximum number of 24 cables as recommended by the vendor, a meshed cable tray should then be implemented.

The installer shall seal all openings, either external or internal, made or provided through building walls, floors, ceilings or other fixtures after the cable has been reticulated to ensure the integrity of the barrier that has been penetrated. This includes but is not limited to the ingress of moisture, entry of rodents, other vermin and fire where applicable.

Where cables exit off cable tray or enter wall cavities, they shall be protected with a ridge barrier and the bend radius to be within vendor's specification.

7.3 Cable terminations - Cross-Connect System

The cross-connection system for all horizontal cabling within the University's TRs shall be a standard modular patch panel design.

Rear cable management approved by the Manufacturer for certification purposes shall be supplied on all patch panels. This rear cable management will be affixed to the back of the patch panel using the manufacturer's certified solution. Plastic "Zip-ties" and other ad-hoc items are *not* to be used. Velcro ties are the preferred solution for tying up and consolidating cabling.

7.4 Work Area

Contractors shall supply and install the wiring or interconnections that connect active terminal devices to the telecommunication outlets. This includes patch leads, telecommunication outlets (TO), connectors, faceplates, as well as the work area patch leads (terminal patch leads) needed to make connections.

For outdoor use, all equipment must be rated to the appropriate weatherproof rating and submitted in writing to the CDU Infrastructure representative for review.

7.5 Telecommunication Outlets (TO)

All copper telecommunication outlets and modules supplied by the contractor shall be modular 8-position / 8-contact outlets, accepting standard modular RJ45 plugs, and meet vendor specification to enable

vendor certification. Outlets shall not be earthed at the work area end and must be within two meters from the workers area.

7.5.1 Faceplates

The faceplates offered shall have the following:
- Standard of 3 outlets faceplate where two will be used, the unused shall be capped to protect against ingress dirt and other objects
- Options for vertical style or horizontal mounting style
- A clear fixed label for application of circuit identification
- Newly installed faceplates are preferred e.g., Clipsal C2033HI-WE. Should the space already have the older Clipsal C2034HI-WE installed, new installations shall be of the preferred Clipsal faceplate
- Must match the existing faceplates for Moves, Adds and Changes
- Newly installed faceplates for staff or student workspaces are to be mounted above desk height. This includes, but is not limited to printers, PCs and desk phones
- Connections for specialist equipment and specialist purposes may be mounted in other orientations/locations e.g., building management systems, security cameras, and floor boxes in meeting rooms and
- Where network outlets are fixed to furniture or partitions, all aspects of this document still apply, specifically end to end testing, labelling and cable management. It is not acceptable to have wall mounted faceplates and run a network patch lead to integrated outlets at the workspace.

7.6 Horizontal Patch leads

All patch leads shall be Cat 6a S/FTP – either 23AWG or 22AWG.
For OH&S reasons it is critical to ensure that appropriate cable management is in place at the TO for all S/FTP patch leads running from faceplates to workspaces.

All Cat 6A S/FTP patch leads must be factory terminated 4-pair S/FTP. The Cat 6A S/FTP work area patch leads shall be factory terminated, by the same manufacturer type as the installed horizontal cabling and must

follow the colour coding below.

Cat 6A S/FTP cord length shall be 2m for racks larger than or equal to 42RU and 1m for 18RU and/or smaller at the TR. Cat 6A S/FTP cord length shall be 3m at the TO wall plate outlet end.

Table for cable colour.

Communication Room	Work Area
Crossover = Red	Crossover = Red
Audio/Video = Black	Audio/Video = Black
Staff and Clients = Blue	Staff and Clients = Blue
Wireless AP = Purple	Wireless AP = Purple
IP Camera = Orange	IP Camera = Orange

7.7 Fibre Patch leads

The Fibre Patch leads shall:

- Consist of Category OS2 optical fibre (also known as ITU specification G.652c or G.652d) to suit the installed OS2 fibre optic cabling
- Be 2m in length
- Be used for optical fibre cross-connects and interconnects
- Have the fibre cladding covered by Kevlar fibres and a protective outer jacket
- Be factory terminated with LC duplex ceramic connectors at each end and
- Meet the vendor specification

7.8 Labelling

Horizontal cabling should be labelled as per the section on "Labelling and Numbering".

7.9 Compliance Testing

Horizontal cabling compliance testing as per the section on "Compliance Testing".

7.10 Documentation

Horizontal cabling documentation as per the section on "**Documentation**

8. Numbering and Labelling

8.1 General

Each piece of equipment, patch panel and outgoing cable from the patch panels shall be labelled. Corresponding labelling and numbering shall also be provided on the telecommunication outlets.

All labels or labelling systems used are to be clearly visible, legible, not handwritten and white with black text. All labelling shall comply with AS 3085.1 latest edition.

To comply with the identification requirements of AS/CA S009, cable shall not be painted.

8.2 Backbone Cabling Labelling

All fibre optic cables shall be labelled in every telecommunications riser, pit entry, exit of any conduit and shall be labelled within 1m of entry to the FOBOT.

All labelling exposed to the environment shall be of self-laminating adhesive or better and durable enough to withstand water, UV and the NT harsh weather.

Any exposed or above ground conduits that have telecommunications cabling within must have a firmly affixed label on the outside of the conduit at 3 metre intervals to enable University staff to easily identify the type of cables within. The label on the conduit must match the cable that is within the conduit, reflecting the standard labelling method outlined in this document.

All pits shall have brass labels installed on the outside to identify the pit number and extra labels shall be installed to indicate the direction of

the conduits exiting and entering the pit.

All cabling installed with the communications pits shall have at least two ID labels on them, identifying:

- The cable belongs to CDU.
- The "a" end, and the "b" end (i.e., both termination points of the fibre)
- Date of installation (for any fibre optics type and core count are to included)

Examples of ID labels include:

- "CDU / cpl11c1 / crd8c6 / SM-24"
- "CDU / cbl2dc / cor12c4 / SM-48"
- "CDU / pac1 / pcc1 / SM-48"

The following label "CDU / cpl11c1 / crd8c6 / SM-24" refers to Charles Darwin University / Casuarina Campus Purple 11 Communications Room 1 / Casuarina Campus Red 8 Communications Room 6 / Single Mode 24 core.

Strict adherence to this format is required for the installation to be deemed compliant and accepted.

8.3 Equipment Racks

Racks and cabinets shall be labelled with the communications room and the sequential rack number. Examples include:

- "Comms2 Rack1"
- "Comms3 Rack2"
- "Comms1 Rack3"

8.4 In-Rack Labelling

Labels shall be laser printed and be of at least 11pt font.
Patch Panels and FOBOTs shall be labelled horizontally and sequentially from left to right, working down the rack.

FOBOTs shall have the cable ID as specified in "Backbone Cabling Labelling".

Handwritten and "permanent ink" markers are **not** permanent and shall not be permitted even in the interim.

8.4 Horizontal cabling labelling

All cable labels should be of clear wrap around self-adhesive type fixed onto each cable. Each copper cable is to be labelled at each end 100 - 150mm from the termination point. Lettering on the label is to be machine typed.

Horizontal cabling shall be labelled at both ends of the cable with self-laminating adhesive labels identifying communications outlet.

Handwritten and "permanent ink" markers are **not** permanent and shall not be permitted even in the interim.

8.5 Telecommunications Outlet Labelling

Telecommunication face plates are to be labelled with a label following the ITMS standards and a non-peeling adhesive where engraving is not an option.

The labels on the communications outlets and patch panels shall be laser printed and be of at least a 16pt font width of label on outlet.

Where it is a new building with no existing labelling, each new faceplate shall have a unique reference number. All ports on that faceplate shall be labelled sequentially, starting at C1-001 where C1 is the communications room designation. These form the unique identifier for each outlet.

For example, the leftmost outlet below is referenced as "c2-001". The next immediate outlet on the right is "c2-002" and last outlet is blanked for future use.

Where the existing building currently have the older labelling style & faceplate installed (see picture further below) and a new addition is

required, the new labelling format will take effect from the last numbered outlet in the rack. For example, should the last two numbered outlets be labelled c3-050-p1 and c3-050-p2, the new outlet will begin as c3-051, the next following new outlet c3-052 and increase sequentially.

Where the room(s) is being refurbished and no new additions are made, the old labelling format shall be retained.

Outlets labels installed in ceiling spaces, typically for wireless access point installations, shall be labelled on the ceiling with a non peeling label, to identify the existing outlet within the ceiling for wireless.

Wireless APs shall also be labelled with a non-peeling label for AP Identification.
Strict adherence to this format is required for the installation to be deemed compliant and accepted.

Wall plate example of the preferred faceplate Clipsal C2033HI-WE
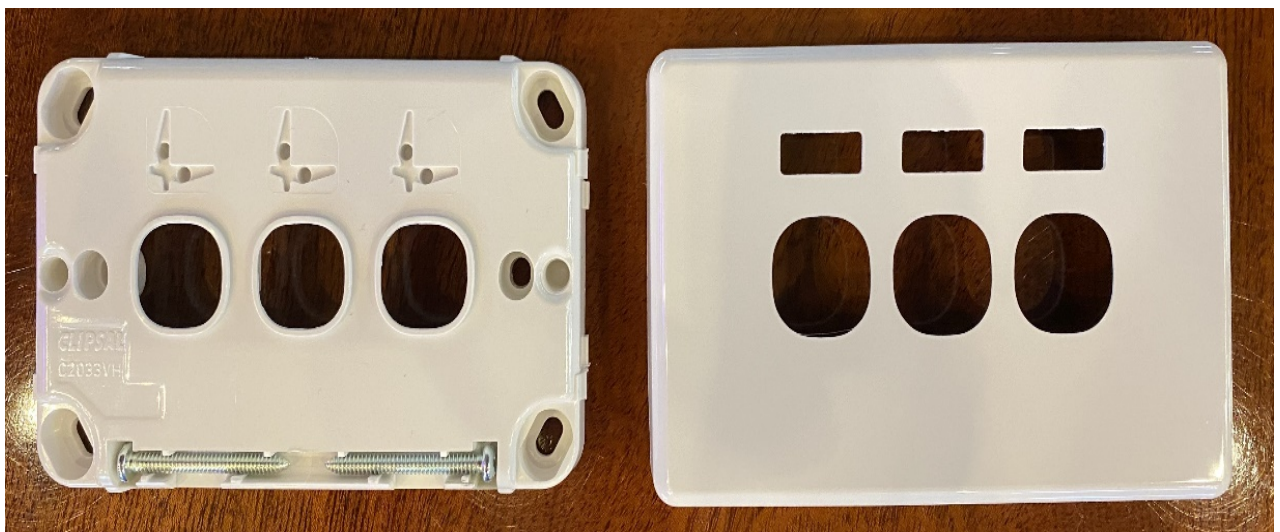
Wall plate example of an older Clipsal C2034HI with the old

labelling format:

Wireless AP example, note outlet label on the ceiling next to

the WAP:

In ceiling AP wall plate example:

Rack Horizontal cabling example:

Fibre optic cabling labelling example:

FOBOT labelling example:

9. Compliance Testing

9.1 General

All cables will be tested prior to acceptance. Testing equipment used must be calibrated and operated according to manufacturer instructions.

9.2 Optical Fibre Link Testing

Testing of fibre optic cabling shall be Bi-directional testing showing loss budget, length, fibre type, using Light Source and Power Meter as required by the Manufacturer.

9.3 Test Requirements

All optical fibre links must be tested for:
- Continuity and maintenance of polarity
- Length
- Propagation delay and
- Optical attenuation of link, 2 x wavelengths, 2 x direction.

Conduct the tests in accordance with ISO/IEC 14763-3:2017/AMD1:2018, using LSPM (OLTS) equipment and as directed by the manufacturer.

The tester should also refer to the relevant manufacturer's Structured Connectivity Solutions Field Testing Guidelines for Fiber-Optic Cabling Systems.

Where LSPM results exceed the Power Loss Budget, the link shall be investigated with an OTDR to determine the location of the faulty component.

9.4 Compliance Criteria

The compliance criteria shall be a PASS for all the tests listed under Test Requirements. The optical attenuation of the link shall not exceed the Power Loss Budget calculated in accordance with the losses set out in AS/NZS 11801 and ISO/IEC 14763-3 for the optical fibre components that make up the link. For a System Warranty, the optical fibre installation must pass the requirements and test methods set out in the document

"Performance Testing of Optical Fibre Links Using ISO/IEC 14763-3 for Compliance to ISO/IEC 11801".

9.5 Reference Setting (Zeroing) Methods for LSPM Testers on Optical Fibre

The 1- Reference Cord Method of Reference Setting as per Cl 9.1.2 of ISO/IEC 14763- 3 Ed2 is the preferred method as it produces the least unacceptable Gain results.

Modern up to date testers allow for the input adaptor knobs to be switched to suit the different fibre connectors under test (e.g., SC or LC).

The "3-Reference Cord Method of Reference Setting" as per Cl 9.1.1 of ISO/IEC 14763-3 Ed2 may be used where the connectors on the older LSPM tester are different from the connectors on the Link to be tested (e.g., SC on Tester and LC on Link). However, this method will produce some unacceptable Gain results that may be expensive to fix.

The 2-Jumper method of reference setting is not accepted in ISO/IEC 14763-3 and SHALL NOT be used.

9.6 Use of Mandrels (for 1 & 3-Test Cord Methods)

For testing the existing old MMOF, the LSPM Tester should meet the Encircled Flux requirement in the launch cord. This was achieved by using a correctly sized and securely held Mandrel Wrap on the Launch Cord for mode stripping during Reference Setting and Testing. An Encircled Flux launch cord will also meet the Encircled Flux requirement for MMOF.

9.7 Reference Cords & Field Calibration Cords (3 & 1-Test Cord Methods)

Launch and Tail Reference Cords for MMOF & SMOF LSPM testing shall be 1m to 5m each and have a Reference Connector at one end.

Field Calibration Cord shall not exceed 2m in length and have Reference Connectors at both ends. Reference Connectors shall be the same type of connectors as the cabling to be tested.

Reference Connectors have the following loss values when 2 reference

connectors are connected in a reference adaptor.

Fibre	Attenuation
MMF	≤0.10 dB
SMF	≤ 0.20 dB

9.8 Test Cord Qualification

For both MMF and SMF test cords, after the Reference Setting has been done, the test cord connectors shall be tested to ensure the loss is less than the values in 9.2.5.

This shall be done 3 or 4 times per day and the results saved as REF 1, Ref 2 etc. and presented with the cable test results with the warranty application.

9.9 U/FTP Class EA Performance Testing on Category 6a Installations

Permanent link performance is the preferred acceptance criteria for all U/FTP installations.

Horizontal cabling testing should be done once the cable is in its final installed position. It should not be done, for example, before the faceplate is mounted on the wall or before the patch panel is mounted in the rack.

The installer must individually test 100% of the cables after installation of the cables to determine compliance to certified manufacturer performance requirements.

All test results shall upload to the manufacturer's website for the generation of the 20 to 25 Year Certificate of Installation Manufacturer Warranty. These must be supplied to the CDU ITMS Infrastructure representative for future reference.
Charles Darwin University only accept PASS. Charles Darwin University does not accept cable runs with test results indicating a FAIL. Any failed cable results shall be rectified prior to sign off by the CDU ITMS Infrastructure representative.

A certain percentage of the outlets may be chosen at random for the final acceptance testing by a representative of CDU or, in their absence, by the cable manufacturer.

The design data and the full results of all compliance tests performed by the installer are to be fully documented and submitted to a CDU ITMS infrastructure representative to hold for the period of the warranty. Permanent Links shall meet the appropriate minimum requirements of ISO 11801 for Class EA.

The Structured Cabling System shall be tested by the installer for compliance to the requirements specified by the certified manufacturers Class F performance standard using Level 3 testers or higher in accordance with AS/NZS IEC 61935.1 – Testing, using a Fluke tester in accordance with AS/NZ IEC 61935.1.

The results must include 100% of total installation and provide full electronic data files in tester format for each cable run indicating the name of the person doing the testing, date, building, cable identification, and to certified manufacturers testing class F requirements. PDF test results are not acceptable for warranty analysis.

9.10 Voice Cable Testing

Deprecated
Documentation - see section on "Documentation" for documentation of test results.

10. Documentation

10.1 TR Documentation

Documentation must meet CDU, Australian and Vendor standards. Record books shall be provided by the Contractor/Installer.

Laminated floor layout of as-built TR shall be provided in each communications room presented on a framed A3 plan clearly identifying all pathways and outlet locations.
TR record books should include information showing inter-floor fibre and communications building backbone cabling.

10.2 Backbone cabling documentation

All external work shall have as-built documentation supplied electronically and inspected by the both the ITMS Infrastructure representative and the Office of Property & Facilities representative before signing off the job as complete.

10.3 Work Area

Documentation of work area outlet position and numbering is to be provided "as built".

This should be provided electronically to the ITMS Infrastructure representative.

10.4 Test Result Documentation

All required information and including each individual test results required by the Manufacturer to generate the 20 to 25 Year Warranty Certificate for CDU shall be provided by the contractor to the Manufacturer without exception.

Separate to the information uploaded by the contractor to the Manufacturer towards the Certification/Warranty generation, a copy of the full "Plot Data Enabled" test results for each copper cable run and each core of each optical fibre cable run shall be supplied to CDU ITMS in an electronic format. Results should be in a recognised test vendor's application format, such as from Fluke LinkWare.

11. Customer Acceptance

11.1 General

Customer acceptance includes, but is not limited to:
- Provision of the manufacturer's Certificate of Installation after the cabling contractor has uploaded all the required data to the manufacturer's website.
- Cabling infrastructure installed to Manufacturer specifications for the System Warranty
- Cabling infrastructure tested to, and pass Manufacturer

certification as set out in "compliance testing" section of this document.

- Test results provided to CDU as set out in "compliance testing" and "documentation" sections of this document.
- As-built diagrams provided as set out in the "documentation" section of this document and
- All defects corrected to the satisfaction of the Manufacturer, Stakeholder and the CDU ITMS infrastructure representative.

At the conclusion of the installation, the CDU ITMS Infrastructure representative will require two weeks' notice for a preliminary walk-through with the installation contractor to perform checks for installation quality, accurate performance of the work, and to verify engineering diagrams. Any required modifications to the documentation or installation shall be accomplished within a two-week period.

A minimum of two inspections are to be organised with the installation contractor and CDU ITMS infrastructure representative. The first after the completion of roughing in the cabling infrastructure (prior to ceiling tiles or plasterboard being installed), the second after the termination of the patch panels and TOs).

"Customer Acceptance" shall consist of a final walk-through with the installation contractor. The walk through shall be scheduled within three weeks of the completion of the installation in order to turn the project and documentation over to the end- user.

"Customer Acceptance" does not release the installation contractor from repairing any cabling errors or improperly labelled circuits caused by the installation contractors that may be discovered later.

"Customer Acceptance" of TR to include the cleaning of the communications room floor and wipe down of cabinets, racks and associated infrastructure, so as to prevent the ingress of building dust in active network equipment once installed.

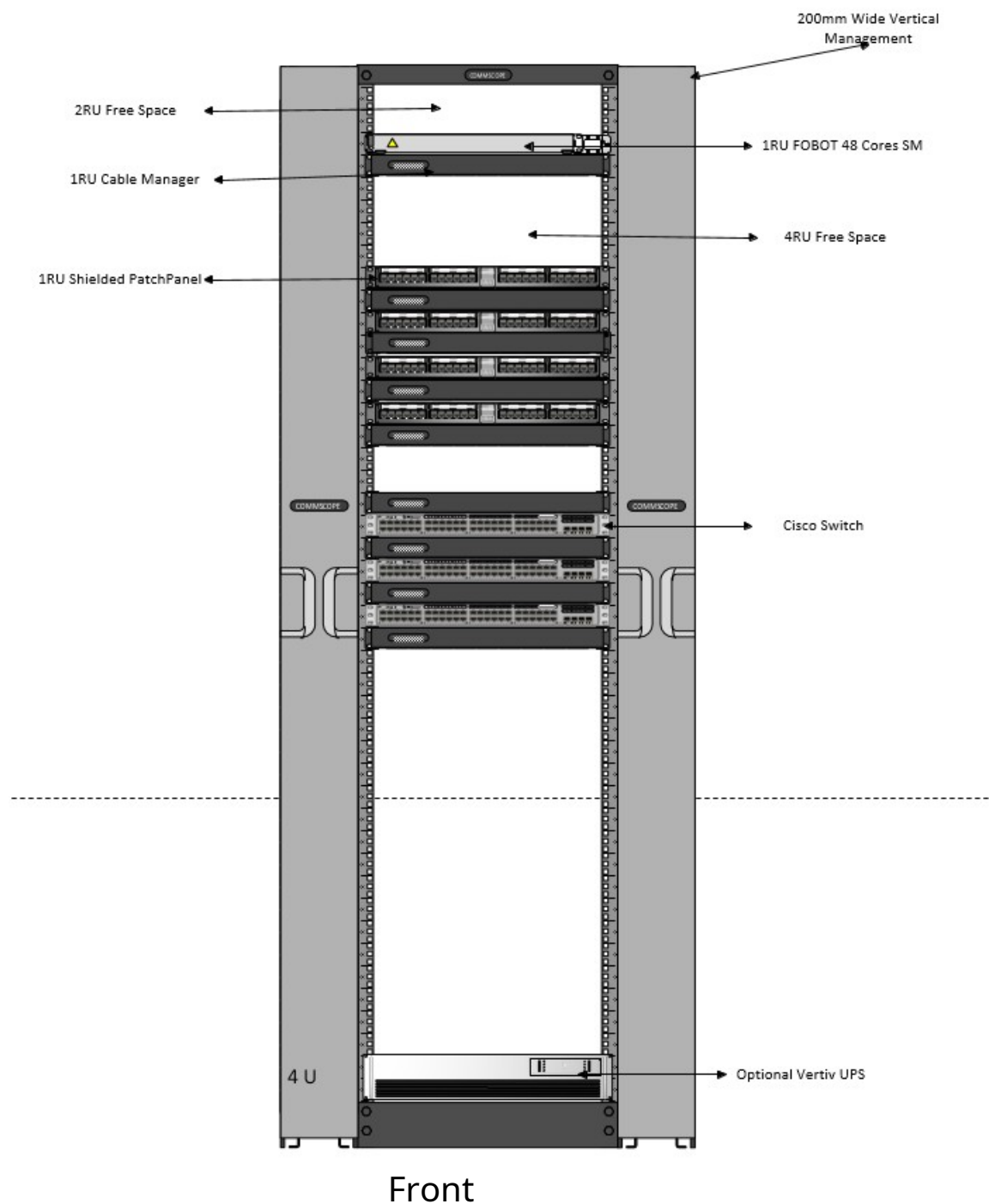Failure to meet customer acceptance may result in delay or withhold of

payment of works.

12. Appendix

APPENDIX A. Example Comms Rack Layouts
Standard Building Distribution/Telecommunications Room

Front

A Building Distribution/Telecommunications Room Rack within a secured space will normally be 45 RU, 600x900 with two vertical management included and may contain:

- FOBOTs for lead in fibre and inter-floor fibre at the top of the rack
- 1RU Vertical management immediately below the FOBOT
- Copper cabling panel below FOBOTs with a reasonable gap of minimum 2RU
- Regular horizontal cable management for fibre and S/FTP patch leads
- 2 x 200mm wide vertical cable management on each side of the rack at the front
- Network switch(es) underneath all patch panels, with a reasonable gap
- Optional, a 1.5 - 3kVA UPS at the bottom of the rack and
- 2 x 10-way 15A vertical PDU's mounted to back, upright, facing backwards and connected to rack UPS.

Large Building Distribution/Telecommunications Room

Front

A Building Distribution/Telecommunications Room Rack will normally be two 45 RU side by side, 600x900 each with three vertical management included and may contain:

Rack 1:

- C FOBOTs for lead in fibre and inter-floor fibre at the top of the rack
- Network switch(es) below FOBOTs with a reasonable gap
- Regular horizontal cable management for fibre and patch leads
- Vertical cable management joining Rack1 to Rack2 of 200mm wide.
- Vertical management to the front left of the rack of 100mm wide
- Optional, a 3-6kVA UPS at the bottom of the rack and
- 2 x 10-way 15A vertical PDUs mounted to back uprights facing backwards and connected to rack UPS.

Rack 2:

- Copper cabling at the top of the rack
- Regular horizontal cable management/UTP patch leads
- Vertical cable management joining Rack2 to Rack1 of 200mm wide.
- Vertical management to the front right of the rack of 100mm wide and
- 2 x 10-way 15A vertical PDUs mounted to back uprights facing backwards and connected to rack UPS.

APPENDIX B. Example Telecommunications Rooms Layouts
"Single 800x900 Rack" Layout

Single Equipment Rack

Communications Room

900mm

Back rack door

900mm

800mm 800mm

900mm

2700mm

Front rack door

Minimum Room Size

door

900mm 2.6m x 2.7m

2600mm

"Dual" 800x900 Rack Layout

Double Equipment Rack

Back rack door

Back rack door

900mm

2700mm

900m

800m

900mm

800m

900mm

900m

Front rack door

Front rack door

900mm

door

Minimum Room Size

3400m
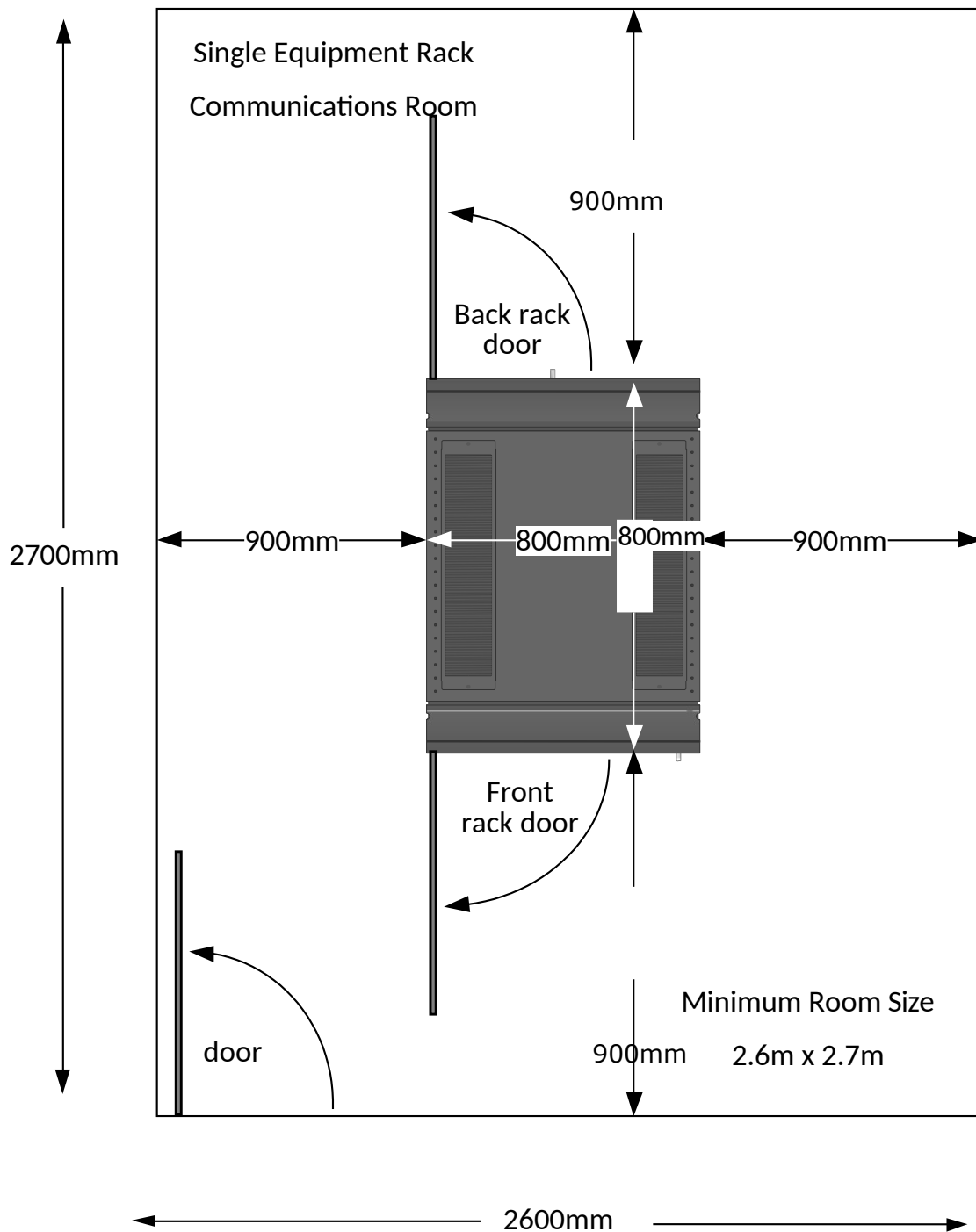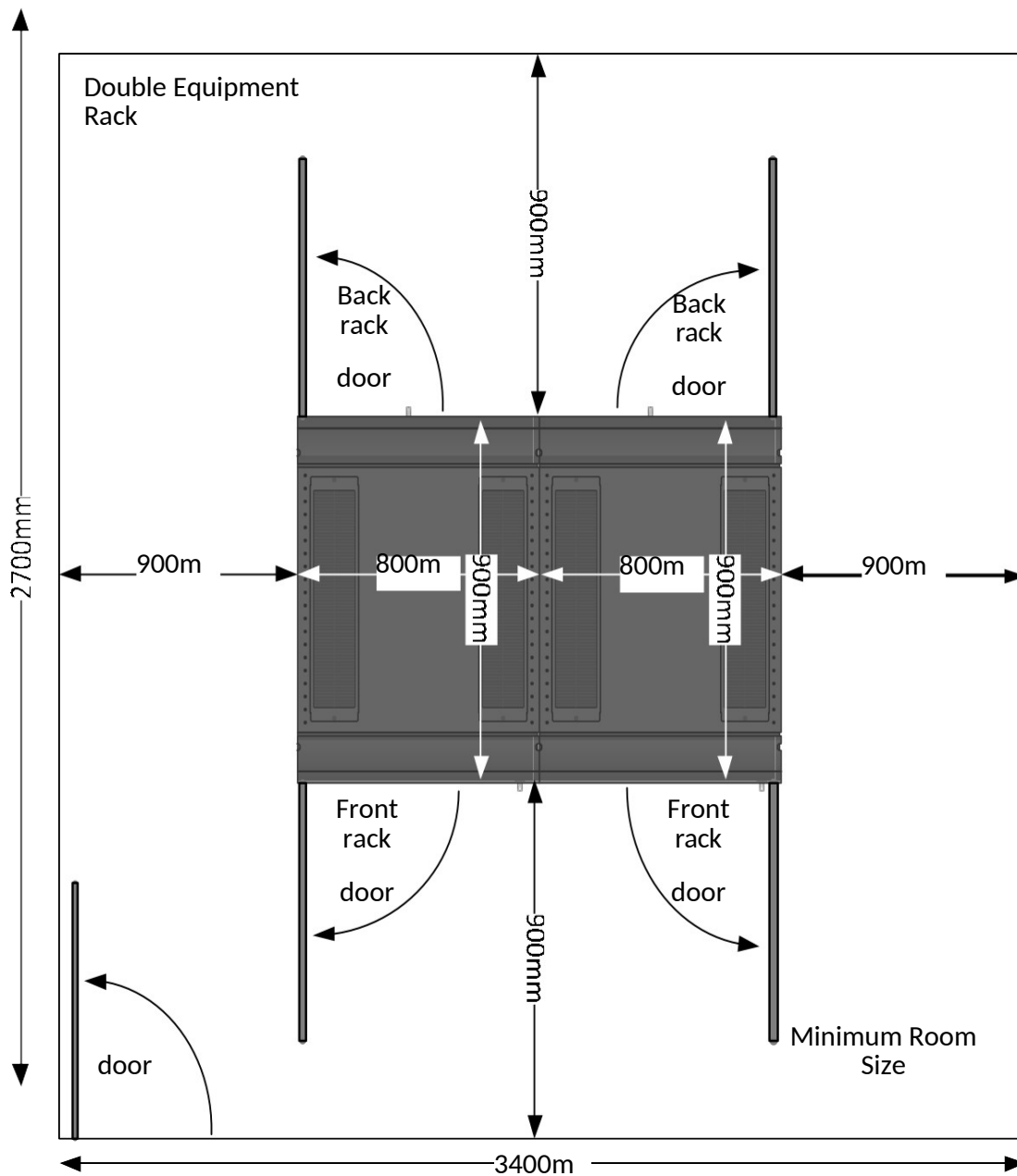
Appendix C - Approved Manufacturers and Parts

This list shall be updated yearly and/or as required. Please contact CDU ITMS Infrastructure for testing and acceptance of new products

Anderson Corporate

Part Number	Description
10S1-O2L2	2M LC-LC SM patch lead
10S1-O2L3; SM10-02L3	3M LC-LC SM patch lead
10S1-02L5	5M LC-LC SM patch lead
10S1-02L8	8M LC-LC SM patch lead
10S1-O2L10	10M LC-LC SM patch lead

Commscope Australia

Part Number	Description
NPC6ASZDB	Cat 6A S/FTP RJ45 Patch Cord variants available in colour and lengths
884069604	Category 6A Copper Cable, 4 pair, U/FTP, LSFRZH
4-2153449-2	AMP-TWIST SLX Series Modular Jack, category 6A, shielded
64671116-07SH	Adapter BEZEL with shutter for mounting SL Jacks into CLIPSAL/HPM Plates in field outlets
760237046	Discrete Distribution Module Panel, SL, STP, 1U, 24 port
760072942	1U patchcord management - Horizontal Trough Kit, 1 RU, 19 in, single sided
760038240	1U Patchcord Management
760252625	External Fiber cable, Triple Jacket, Anti Termite, All-Dielectric, 24 fiber, Gel Filled, Mini Stranded Loose Tube
760252626	External Fiber cable, Triple Jacket, Anti Termite, All-Dielectric, 48 fiber, Gel Filled, Mini Stranded Loose Tube
760004267	Indoor Fiber cable, 12 fiber single-unit, Singlemode G.652.D and G.657.A1, Dca flame rating
760019075	Indoor Fiber cable, 24 fiber single-unit, Singlemode G.652.D and G.657.A1, Dca flame rating
760249998	FOBOT 1U sliding panel, splice modules, adapter packs up to 48 cores
760241378	Fiber Optic Splice Tray Kit, stackable, 48-fiber capacity
760216762	Distribution Adapter Pack, Singlemode, 24 LC/UPC with internal shutters
760109462	360G2 Mod Panel Blank Adapter Pack to protect FOBOT from ingress dirt

AFL Global Fibre Products

Part Number	Description
LMH61DPA048BK	External Application - 48F SM L/TUBE NYLON DC SACRIFICIAL SHEATH BLACK
LMH61DPA024BK	External Application - 24F SM L/TUBE NYLON DC SACRIFICIAL SHEATH BLACK
TVBQ1FAA024YW	Internal Application Only - 24F SM I/O 900UM TB PREMISE LSZH YELLOW
TVBQ1FAA012YW	Internal Application Only - 12F SM I/O 900UM TB PREMISE LSZH YELLOW
RB-1EM1EP-BB-4GG-A	1RU 48F LC SM SLIDING SPLICE ENCLOSURE, ACC: CABLE TRAY **KIT INCLUDES:** 1 x 1RU 2 MODULAR PANEL SLIDING ENCLOSURE 1 x SC/LCD 12P PANEL 1/12HP ANGLED LEFT 12 x LC DUPLEX ADAPTER REDUCED FLANGE BLUE 1 x SC/LCD 12P PANEL 1/12HP ANGLED RIGHT 12 x LC DUPLEX ADAPTER REDUCED FLANGE BLUE 4 x LC 900UM PIGTAIL TB G657.A1 2M LSZH 12F COL 1 x SPLICE CASSETTE KIT WITH HD COMB FOR 24/48 SPLICES 1 x 1RU FRONT MOUNT CABLE TRAY WITH I.D STRIPS
RB-1EH1EK-BA-2GG-A	1RU 24F LC SM SLIDING SPLICE ENCLOSURE, ACC: CABLE TRAY **KIT INCLUDES:** 1 x 1RU 2 MODULAR PANEL SLIDING ENCLOSURE 1 x SC/LCD 6P PANEL 1/6HP ANGLED LEFT 6 x LC DUPLEX ADAPTER REDUCED FLANGE BLUE 1 x SC/LCD 6P PANEL 1/6HP ANGLED RIGHT 6 x LC DUPLEX ADAPTER REDUCED FLANGE BLUE 2 x LC 900UM PIGTAIL TB G657.A1 2M LSZH 12F COL 1 x SPLICE CASSETTE KIT WITH HD COMB FOR 12/24 SPLICES 1 x 1RU FRONT MOUNT CABLE TRAY WITH I.D STRIPS
FRE-1RU-PCMNDR	1RU PATCHCORD MINDER PANEL WITH 4 CLIPS

Racks and Associated Items

Open Racks Secured TR

Manufacturer B&R	
Part Number	**Description**
AF45U609	Open Server Rack Frame, 600 mm W x 900 mm D x 2135 mm H, 19" Rail, 45RU
ARVCMS45U20	45U Vertical Cable Management System U-Channel system with cable fingers, connection brackets and cover flaps 200mm
ARVCMF45U	45U Vertical Cable Management Fingers Cable fingers and connection bracket
ARPEB45U	45U copper earth Bar
ARC45U30	45U Cabinet Cable Tray 300mm wide
AC45U209	45U cable zone kit 200Wx900D
ARVCMF45U200	45U Cable zone required
AC45U09	45U cable zone kit 100Wx900D
ARVCMS45U10	45U Vertical Cable Management System U-Channel system with cable fingers, connection brackets and cover flaps 100mm

Secured Closed Racks Open Areas	
Manufacturer B&R	
Part Number	**Description**
AF42U809	42U 800w x 900d 4Post Frame
ARVCMF40U	Vertical Cable Management Fingers
ARP42U09	Side Panels (cladding) ventilated for side of the rack – two required
ARDD42U08	Mesh lockable Front and Back doors, locks changed to the standard ITMS Infrastructure key
ARTR809	Top cover ventilated
ARCH	Chimney for allowing cabling to enter from the ceiling into the rack
ARVCMS40U20	U-Channel system with cable fingers, connection brackets and cover flaps
ARPEB42U	42U copper earth Bar
ARC42U30	Cable tray

Rack PDUs	
Manufacturer Thor Technologies	
Part Number	**Description**
RF11iQP	1U Surge protected with remote management
RF11	1U Surge protected no remote management

Rack UPS	
Manufacturer Vertiv	
Part Number	**Description**
Liebert GTX5 with IP/SNMP card	Optional depending on business case
EBM	Optional depending on business case

15 Glossary

The following is a Glossary of terms and acronyms utilised in this document:

Application: A system, with its associated transmission method which is supported by telecommunications cabling.

Balanced cable: A cable consisting of one or more metallic symmetrical cable elements (twisted pairs or quads).

Building backbone cable: A cable that connects the building distributor to a floor distributor. Building backbone cables may also connect floor distributors in the same building.

Building Distributor (BD): A distributor in which the building backbone cable(s)
terminate(s) and at where connections to the campus backbone cable(s) may be made.

Building Entrance Facility: A facility that provides all necessary mechanical and electrical services, which complies with all relevant regulations, for the entry of telecommunications cable into a building.

Cable: An assembly of one or more cable units of the same type and category in an overall sheath. It may include an overall shield.

Cable element: The smallest construction unit (for example pair, quad, or single fibre) in a cable. A cable element may have a shield.

Cable Tray: A ladder, trough, spline, solid bottom or channel raceway system intended for the support of telecommunications cable and other cables that are permitted to exist in that pathway.

Cable unit: A single assembly of one or more cable elements of the same type of category. The cable unit may have a shield. NOTE - A binder group is an example of a cable unit.

Cabling: A system of telecommunications cables, cords, and connecting hardware that can support the connection of information technology equipment.

Campus backbone cable: A cable that connects the campus distributor to the building distributor(s). Campus backbone cables may also connect building distributors directly.

Campus distributor (CD): The distributor from which the campus backbone cabling emanates.

Catenary wire: A catenary is a length of wire suspended between two points, such as eyebolts, on which cables or looms are attached at suitable intervals. Typically, there is an eyebolt at either end with the catenary wire attached directly to one end and a turnbuckle to the other end. This system shall also be supported for its entire length at intervals no longer than three (3) metres.

Channel: The end-to-end transmission path connecting any two pieces of application specific equipment. Equipment and work area cables are included in the channel.

CommScope: CommScope Holding Co Inc including TE Connectivity, KRONE and AMP brands.

Consolidation point: A location for interconnection between horizontal cables that extend from building pathways and horizontal cables that extends into work area pathways. No consolidation points shall be installed without consultation with ITMS.

Cross-connect: A facility enabling the termination of cable elements and their connection, primarily by means of patch leads or jumpers.

Distributor: The term used for the functions of a collection of components (such as patch panels or patch leads) used to connect cables.

Equipment cable: Cable connecting equipment to a distributor (FD or CD).

Equipment room: A room dedicated to housing distributors and application specific equipment.

Floor distributor (FD): The distributor is used to connect between the horizontal cable and other cabling subsystems or equipment. (See telecommunications room).
The FD also connects to the BD/CD.

FOBOT: Fibre Optic Break Out Tray. A tray used to contain and distribute the terminated fibres.

Fusion Splice: The means by which Optical Fibre Cable shall be joined and terminated to Optical Fibre Pig-Tails.

Horizontal cable: A cable connecting the floor distributor to the telecommunications outlet (s).

Interconnect: A location at which equipment cables are terminated and connected to the cabling subsystems without using a patch lead or jumper.

Interface: A point at which connections are made to the generic cabling.

Jumper: A cable unit or cable element without connectors, used to make a connection on a cross-connect.

Krone HighBand 25: A cross-connect designed to accommodate the use of patch leads or jumper wire. It facilitates administration for moves and changes.

LC Connector: An optical fibre modular plug / socket suitable for patching by licensed personnel. The shape of this connector has a rectangular shroud.

Optical fibre cable (or optical cable): A cable comprising one or more optical fibre cable elements.

Optical fibre duplex coupler: A mechanical device designed to align and join two duplex connectors.

Optical fibre duplex connectors: A mechanical termination device designed to transfer optical power between two pairs of optical fibres.

Optical Fibre Pig-Tails: The termination device at the end of each optical fibre cable. This is a factory terminated connector and shall be fusion spliced onto the installed optical fibre cable.

Patch By Exception: This is ADC Krone's HighBand 25 solution, consisting of HighBand25 disconnection modules, leads, mounting and management hardware.

Patch lead: Flexible cable unit or element with connector(s), used to establish connections on a patch panel.

Patch panel: A cross-connect designed to accommodate the use of patch leads. It facilitates administration for moves and changes.

PDU: Power Distribution Unit for supplying power to all network rack mounted equipment normally connected to Rack UPS.

Riser: A common space allocated between floors of multi-level buildings for the reticulation of services. In this manual it is for the reticulation of communications cabling.

Riser Cable: see 'Building Backbone Cable'.

RJ-45: An 8-pin modular plug /socket for copper cables suitable for patching by non-licensed personnel.

S/FTP Foil over shielded twisted pair cable: An electrically conducting cable comprising one or more pairs of STP with a foil shield over all pairs.

SPF: Spray Polyurethane Foam, made by mixing chemicals to create foam.

Site: A premises containing one or more buildings

Splice: Joining of conductors and fibres, generally from separate sheaths.

Structured Cabling: A cable system connecting the campus distributor through to the telecommunications outlet(s).

Telecommunications Room (TR): An enclosed space for housing telecommunications equipment, cable terminations, and cross-connect cabling. The telecommunications room is a recognised cross-connect point between the backbone and horizontal cabling subsystems.

Telecommunications Outlet (TO): A fixed connecting device where the horizontal cable terminates. The telecommunications outlet provides the interface to the work area cabling.

Telecommunications Reference Conductor (TRC): A telecommunications earth bonded to the main building earth at one point only.

Twisted pair: A cable element that consists of two insulated conductors twisted together in a regular fashion to form a balanced transmission line.

UTP Unshielded twisted pair cable: An electrically conducting cable comprising one or more pairs none of which are shielded and no overall shield.

CDU ITMS (Infrastructure Operations): Section within the University that is responsible for the design, deployment and maintenance of the communications network for the Charles Darwin University.

Work area cable: A cable connecting the telecommunications outlet to the terminal equipment, for example a typical office.

--- END OF DOCUMENT ---