

## **DATA CABLING INFRASTRUCTURE STANDARDS**

27/07/2023 Version 11.1

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## ENDORSEMENT

### Version 11.0

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## REFERENCE MATERIAL

DOCUMENT	LINK

## TERMS/ ABBREVIATIONS

TERM / ABBREVIATION	DESCRIPTION
ACMA	Australian Communications and Media Authority; telecommunications regulator
ADSL	Asymmetric Digital Subscriber Line
AP	Access Point. Often used as short for Wireless Access Point.
AS/NZS	Australia Standard/New Zealand Standard
BD	Building Distributor; connects individual Floor Distributors
CA	Communications Alliance; telecommunications association
CD	Campus Distributor; connects individual Building Distributors

TERM / ABBREVIATION	DESCRIPTION
DDA	Disability Discrimination Act
FD	Floor Distributor; typically located on each floor to service local work areas
IEC	International Electrotechnical Commission; international standards body
IS	Information Services
IEEE	Institute of Electrical and Electronics Engineers; engineering association
ISO	International Organization for Standardization; international standards body
PoE	Power over Ethernet (IEEE 802.3af standard) up to 15.4 watts (see <a href="#">What Is Power over Ethernet (PoE)? - Cisco</a> )
PoE+	Power over Ethernet (IEEE 802.3at standard) up to 30 watts
PoE++	Power over Ethernet (IEEE 802.3bt standard) up to 90 watts
TIA	Telecommunications Industry Association; US standards body
TO	Telecommunications Outlet
UTP	Unshielded Twisted Pair

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## 1. INTRODUCTION

### 1.1 Document Purpose

- a) This document defines the technical and functional parameters to be met by the data cabling and network infrastructure to meet the communication requirements of La Trobe University.
- b) This document describes the product type, installation, termination, testing and labelling of cabling and hardware, the network support and associated hardware for voice and data facility installations at La Trobe University sites.
- c) The appointed contractor shall adhere to all requirements of this document and ensure that all their employees assigned to this project are made fully aware of their obligations under this document, except where explicitly varied or excluded in the detailed scope of works for a specific site.

### 1.2 La Trobe Cabling Infrastructure

- a) La Trobe University Information Services has chosen Panduit as the manufacturer of all cabling, racks, cabinets, and associated products to be used within its sites.
- b) The copper cabling product shall be Category 6A Unshielded Twisted Pair (UTP) and when installed shall meet or exceed the requirements of ISO/IEC 61935.1 PL2 as per Section 14.2 Copper & Fibre Cabling Testing Requirements.
- c) Single mode Optical fibre cabling used shall be OS2 single mode, zero water peak, appropriate for the environment in which it is installed and terminated with LC connectors and when installed shall meet or exceed the requirements of AS/NZS 14763.3.

**NOTE:** Always check the specific scope of works for any given site for additions or variations to the above.

### 1.3 Use of documents

- a) This document provides a guideline for the minimum requirements for any data cabling and network infrastructure at any La Trobe University site. These guidelines are relevant for all La Trobe University sites, including administration, lecture theatres, laboratory, heritage, and outdoor environments.
- b) This document alone will not provide a definition of a solution or a scope of works.
- c) All works performed must comply to this document unless written authorisation is obtained from La Trobe Information Services. Refer Appendix B - REQUEST FOR VARIATION .
- d) Any works taken out which do not adhere to the guidelines contained in this document shall be deemed non-compliant and will be rectified by the contractor responsible for the works at the contractor's expense.

## 2. CONFORMITY TO STANDARDS

- a) All Materials and the quality of workmanship shall comply with the standards listed below in Table 1.

- b) Where no Australia Standard exists, use the International Standard as published by the International Standards Organization (ISO) including subsequent amendments.
- c) Should conflict arise between the requirements of a nominated standard and this Specification, direction is to be sought from the University.

Table ID	CODE	Description
A	AS/NZS 3000 (2018 or later)	Electrical installations (known as the Australian/New Zealand Wiring Rules)
B.1	AS/NZS 11801.1	Generic Cabling for Customer Premises, Part 1: General Requirements
B.2	AS 11801.2	Generic Cabling for Customer Premises, Part 2: Office Premises
C	AS/NZS 3084 (2017 or later) Amended in AS/NZS 3084:2017 Amd 1:2023	Telecommunications Installations – Telecommunications pathways and spaces for commercial buildings
D	AS/NZS 3085.1 (2022 or later)	Telecommunications installations — Administration of communications cabling systems, Part 1: Basic requirements
E	IEC 61935.1 (2019 or later)	Specification for the testing of balanced and coaxial information technology cabling — Part 1: Installed balanced cabling as specified in ISO/IEC 11801-1 and related standards
F	IEC 61935.2 (2022 or later)	Specification for the testing of balanced and coaxial information technology cabling — Part 2: Cords as specified in ISO/IEC 11801-1 and related standards
G	AS/NZS 14763.3 2017 or later	Information technology — Implementation and operation of customer premises cabling — Testing of optical fibre cabling (ISO/IEC 14763-3:2014, MOD)
H	IEC 60950-1:2005+AMD1:2009+AMD2:2013 CSV	Information technology equipment — Safety — Part 1: General requirements
I	AS/NZS 61000.6.3 (2021 or later)	Electromagnetic compatibility (EMC), Part 6.3: Generic standards — Emission standard for equipment in residential environments
J	AS/NZS 61000.6.8 (2021 or later)	Electromagnetic compatibility (EMC), Part 6.8: Generic standards — Emission standard for professional equipment in commercial and light-industrial locations
K	AS/NZS 2053 (latest version)	Conduits and fittings for electrical installations
L	AS/CA S008 (2020 or later)	Requirements for customer cabling products



Table ID	CODE	Description
M	AS/CA S009 (2020 or later)	Installation requirements for customer cabling (wiring rules)
N	AS 11801.6	Generic Cabling for Customer Premises, Part 6: Distributed Building Services
O	AS 30129	Telecommunications Bonding Networks for Buildings and Other Structures
P	AS/NZS 2967	Optical Fibre Communications Cabling Systems Safety

## 2.1 Detail design variation to standards

- a) These Standards shall apply for installation activity.
- b) Due to specific circumstances for a site, the approved Scope of Works may be at variance to these Standards. In this instance, this document and the specific scope of works for that site, that has had prior approval from La Trobe University Information Services, shall take precedence.
- c) Smaller projects that do not have a detailed scope of works shall comply with this document unless the Contractor is issued with written variation from Site/Project Manager or an authorised La Trobe University Information Services networks representative.
- d) The applicable standards shall be used in conjunction with the site-specific scope of works for any given site.
- e) The scope of works may include specific schematics for:
  - a. Cable pathways
  - b. Cabinet/Rack Layouts.

## 2.2 Quality Standards

The Contractor shall have a quality system in place that conforms to the requirements of ISO 9001 Quality Management System Standard or shall provide details of progression toward accreditation to this standard.

## 3. OCUPATIONAL HEALTH AND SAFETY

All Contractors that perform any work on a La Trobe University site shall follow the standard La Trobe University induction processes and procedures. Contact La Trobe University Infrastructure and Operations on 03-9479-2017 or [ioservicedesk@latrobe.edu.au](mailto:ioservicedesk@latrobe.edu.au).

## 4. APPLICATION SUPPORT

The structured cabling system shall support the services such as:

### 4.1 Telecommunications

- a) Telephone/Fax
- b) Voice over IP (VoIP)

- c) NBN

## 4.2 IP Delivered Applications

- a) Building Automation Systems
- b) Energy Management
- c) Video Surveillance
- d) Physical Security
- e) Access Control
- f) AV Services

## 4.3 Data Networks

- a) IEEE 802.3
- b) IEEE 802.11 (Wireless LAN)
- c) IEEE 802.af (Power Over Ethernet (POE-15/12.95W))
- d) IEEE 802.at (Power Over Ethernet + (POE-30/25.50W))
- e) IEEE 802.bt (4 Pair Power Over Ethernet (POE-90/73.00W))
- f) 100Base-TX
- g) 100Base-FX
- h) 1000Base-T
- i) 1000Base-SX
- j) 1000Base-LX
- k) 10GBase-T
- l) 10GBase-SR/SW

## 5. PATHWAYS

All copper and optical fibre cabling shall be supported by a standards compliant pathway. Pathways may be comprised of a combination of the following products:

- Cable Tray
- Cable Basket
- Catenary Wire
- Conduit

All pathway routes and construction shall be verified by of an authorised network representative of La Trobe University Information Services before the commencement of any installation.

### 5.1 Cable Tray

The use of cable tray should be limited to the expansion of existing sites, in such cases the following shall apply:

- a) Cable tray where possible shall match that of the existing installation.
- b) All components shall be treated with an anti-corrosive treatment, free of burrs and sharp edges.
- c) All bends and T-joints shall be manufactured, and no components shall be made on site.

- d) All cut edges shall be de-burred and treated with an anti-corrosive paint.
- e) Mounting shall be via Unistrut.
- f) Cable loading shall follow the manufacturer's guidelines.

## 5.2 Cable Basket

For all new sites a cable basket system shall be used.

- a) The cable basket shall be open wire mesh hot-dipped galvanised from Cable Cage Systems.
- b) Basket width available shall include 150, 200, 300, 400, 500 and 600mm, dependent on cable load.
- c) Depth shall be either 50mm or 100mm dependent on cable load.
- d) All mounting hardware, bends, T-offs and cable waterfalls shall be by the same manufacturer.
- e) Installation unless otherwise specified in the specific scope of works shall be to the manufacturer's guidelines.
- f) For under floor pathways, floor height permitting, cable basket shall be mounted on Unistrut; where this is not achievable the cable basket may be secured directly to the floor slab.
- g) Cable loading shall follow the manufacturer's guidelines.

project

## 5.3 Catenary Wire

Catenary wire may be used as a feeder pathway to cable tray or cable basket as follows:

- a) Catenary wire shall be comprised of a minimum of seven strand galvanised steel wire.
- b) The in-ceiling cable support structure shall comprise catenary wire suitably anchored and supported to the ceiling slab and tensioned by way of turnbuckles.
- c) The number of Category 6A cables that can be run on a single catenary is limited to 24; once this number is exceeded either cable tray or cable basket shall be used.

## 5.4 Conduit, Internal

- a) Conduits shall be used where cable is required to run within the floor slab, and in such locations where normal pathways are not practical.
- b) Conduit shall also be used for locations and services that are deemed to have a security risk, e.g. IP security cameras and door access.
- c) Intermediate wiring joints are not permitted in conduit or wiring ducts.
- d) Inspection tees, elbows and bends are permitted but must ensure compliance with Panduit cabling specifications for bend radius.
- e) Where metal conduit is used, ends shall be reamed or filed free of burrs and conduit threads entering junction boxes or fittings shall be at least 10mm long.
- f) Where non-metallic conduit is used, all joints shall be secured with the manufacturer's approved adhesive.
- g) Any conduit cast in-slab should protrude the surface of the slab a minimum 100mm, and located as close as practical to sidewalls, and exit the slab perpendicular to the surface.

- h) A durable draw rope shall be provided in all conduits to assist in subsequent cable installation.
- i) As per standards requirements a minimum of 60% of the conduit capacity must remain after the initial installation is complete, i.e., the maximum fill factor shall be 40%.
- j) Consideration should be given to the upgrade requirements of any given site before selecting the required numbers of conduit. The requirements shall be specified in the Detail Design document.
- k) Pull boxes shall be installed along conduit and ducting routes where there is a change in direction and at distances not exceeding 12 metres between pull boxes.

## 5.5 Sealing Penetrations

- a) The Contractor shall effectively seal all openings (made or provided) in or through building walls, ceilings and floors after cable reticulation.
- b) The Contractor shall effectively fireproof any openings (made or provided) in or through building walls, ceilings and floors with approved fire retardant materials where such sealing is deemed necessary.
- c) The Contractor shall effectively seal all cable duct openings above ground level, and all cable entries into trenches in buildings to prevent the ingress of moisture and the entry of rodents.
- d) The Contractor shall ensure that all spare conduit and cable entries into equipment are effectively plugged and sealed to prevent the ingress of moisture, dust, rodents and insects.
- e) The Contractor shall ensure that all openings through roofs and external walls are made weatherproof including the installation of flashing and/or rain hoods to prevent the ingress of moisture.

## 5.6 Painting and Corrosion Protection

- a) The Contractor shall be responsible for corrosion protection and the painting treatment of all brackets, supports, cable ladders and weather shields being supplied and/or installed by the Contractor.
- b) The Contractor shall also be responsible for the restoration to the supplier's finish or approved matching equivalent on any damaged paintwork to equipment and accessories.
- c) Where no special painting procedure is specified, all metal surfaces shall be wire brushed to remove all traces of rust, scale, grease, and prime coated with one coat of an approved rust inhibiting paint.
- d) The finishing coats, including colour and type of paint, shall be approved by the LTU Project Manager.

## 5.7 Earthing Requirements

- a) All Metallic components, cabinets, racks, cable trays cable basket, and catenary wires shall be connected to the building protective earth as specified for each case in the latest revisions of AS/NZS 3000, AS/CA S009 and AS 30129.
- b) Sizing of Earthing conductors shall be as per latest revisions of AS/NZS 3000 and AS/CA S009.

## 6. ENVIRONMENTAL DEFINITIONS

The following section defines the characteristics of different environments typical within La Trobe University.

### 6.1 Staff Office Spaces

- a) The staff office space environment is to be considered a relatively clean, dust free, moisture free environment.
- b) There are no foreseen potential hazards.
- c) The cabling requirements for these locations unless otherwise specified in the site-specific scope of works is at least one Category 6A Telecommunications Outlet (TO) per workstation.
- d) Check the site-specific scope of works and floor plans for the quantities and location of TOs.

### 6.2 Teaching and Learning Spaces

- a) If the teaching and learning space environment is considered to be not dust free, TOs may be installed with a shuttered faceplate. In some locations the requirement shall be for water-resistant faceplates or Surface Mount Boxes (SMBs).
- b) As teaching and learning space layout will vary from location to location, always check the site-specific scope of works and floor plans for the quantities and location of TOs.

### 6.3 Wet and Dry Laboratories

- a) The wet and dry laboratory environment is essentially a teaching and hands-on learning area.
- b) This environment may be cabled as per the teaching and learning environment.
- c) Work may be required in areas where potentially hazardous chemicals are handled.
- d) This environment may be subject to moisture and gas.
- e) Due to this, TOs shall be installed in water-resistant faceplates or SMBs.
- f) Check the site-specific scope of works and floor plans for the quantities and location of TOs.

### 6.4 Heritage Buildings

Refer to La Trobe University Infrastructure and Operations for guidelines regarding heritage buildings.

## 7. HORIZONTAL CABLING

For all new sites and full refurbishments, La Trobe University requires the installation of ISO/IEC Class E<sub>A</sub> / Category 6A 4pair UTP copper cabling.

- Refer to Appendix A for the Panduit Category 6A-4 pair- UTP White cable part number.
- All four-pair cabling shall be installed as per the manufacturer's guidelines, taking note of the required bend radius.

For existing sites, moves, additions and changes, La Trobe University requires the installation of ISO/IEC Class E<sub>A</sub> / Category 6A 4pair UTP copper cabling.

- Refer to Appendix A for the Panduit Category 6A-4 pair- UTP.

- All four-pair cabling shall be installed as per the manufacturer’s guidelines, taking note of the required bend radius.
- For works where Panduit Category 6A White cable installation may not be possible or feasible (e.g., architecturally, or aesthetically), consultation with an authorised network representative of La Trobe University Information Services will be required. Refer Appendix B - REQUEST FOR VARIATION .

## 8. TELECOMMUNICATIONS OUTLETS

- a) For all new sites and full refurbishments, La Trobe University require the installation of ISO/IEC Class EA /Category 6A -8 pin RJ45 Telecommunications Outlets (TOs)
- b) Refer to Appendix A for the Panduit Category 6A UTP mini-com off white TO part number.

### 8.1 Wall Mounted Outlets

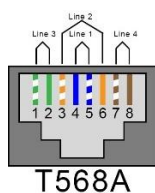
- a) Refer to Appendix A for the part numbers of Panduit two or four Off White RJ45 TOs and the Panduit sloped dual wall plates in which they are mounted and labelled.
- b) Faceplate requirements and TO numbers may vary from site to site; check the specific scope of works for each site.
- c) Where there are unused TO mounting locations, a blanking insert shall be used to fill the vacant slot(s).
- d) Where flush mounted faceplates cannot be used, a type and site approved surface mount box (SMB) may be substituted.
- e) Generally, TOs shall be mounted at the following standard locations or heights with specific requirements outlined in the site-specific document:
  - In or on skirting duct, dependant on whether a flush mount plate or SMB has been used.
  - For standard wall mounting with no obstructions, 300 mm above floor level
  - To meet DDA requirements.

### 8.2 Workstation Outlets

- a) Use appropriate modular furniture faceplate determined by the furniture brand.
- b) The faceplates shall be mounted in the appropriate knockouts in the furniture channel.
- c) Refer to Appendix A for the approved Panduit part numbers.

### 8.3 Telecommunications Outlet Wiring

All Telecommunications Outlets shall be wired to the T568A wiring scheme without exception.



**FIGURE 1-T568A WIRING STANDARD**

## 9. PATCH AND FLY LEADS

Patch and Fly leads shall be supplied by La Trobe University.

### 9.1 Network cable colours

All network cables will be colour coded as per the following:

- a) Yellow for copper uplinks
- b) White for Access Points
- c) Red for Security and critical building maintenance systems (i.e., fire panels)
- d) Blue for all other patching
- e) Purple is reserved for AV equipment cables (AV network cables will follow the same colour coding as above)

## 10. TERMINATION HARDWARE

For all new sites and full refurbishments, La Trobe University require the installation of Panduit ISO/IEC Class E<sub>A</sub> / Category 6<sub>A</sub> unshielded mini-com off white TOs installed in a Panduit 48-port high density vertically numbered patch panels. Refer to Appendix A for the approved Panduit part numbers.

### 10.1 Additional Hardware Requirements

Additional Building and Floor Distribution termination hardware may include 24 port Category 5<sub>e</sub> patch panels for telephony use only; check scope of works and detailed BD/FD schematics for actual requirements.

Refer to Appendix A for approved part numbers.

## 11. RACK LAYOUTS

La Trobe University has 3x common Rack Layouts

- Building Distribution (BD)
- Floor Distribution (FD)
- Wall Cabinet (Used commonly in PC Lab environments)

Please consult the Appendices for LTU Approved Rack Layouts

## 12. BACKBONE CABLING

### 12.1 Copper Backbone (External)

- a) Cable used outdoors shall be Outside Plant rated they shall be laid in conduit within a trench.
- b) All cables used within the outdoor environment shall be Gel filled to prevent water ingress.
- c) Where cables have metallic armouring or metallic barrier foiled sheath all metallic components shall be connected to the building protective earth to ensure equipotential bonding as per AS/NZS 3000 and AS/CA S009.

- d) Cables run in the Outside Plant environment shall have the applicable sheath ratings preventing deterioration from external elements, i.e. cables exposed to direct sunlight shall have a suitable UV resistant sheath.
- e) Refer to Appendix A for approved cable part numbers.

NOTE: Cable category and type shall be dependent on application support and distance. Check the scope of works for exact site detail.

## 12.2 Optical Fibre Backbone

- a) Optical Fibre Cabling shall be OS2 9/125µm single mode.
- b) The Optical Fibre Backbone has two distinctive components:
- c) Internal Riser Rated Cable used within a building.
- d) External Outside Plant Rated Cable used between buildings on a campus.
- e) This combination of optical fibre type will vary from site to site, check the scope of works for a given site to determine the actual requirements.

### 12.2.1 Internal Optical Fibre Backbone Single mode

- a) Internal fibre backbone shall be tight buffered OS2-9/125µm single mode.
- b) Refer to Appendix A for approved Panduit 12 Core Indoor/Outdoor Distribution Cable.
- c) The OS2 cable sheath shall carry a print string identifying the manufacturer the date of manufacture, fibre count, fibre type and sheath composition.
- d) Both ends of the OS2 cable shall be identified with a permanent label, this label shall identify the source and destination of the cable.
- e) Each core of the OS2 backbone cable shall be terminated at both ends with an LC single mode connector.
- f) OS2 fibre shall be terminated using fusion spliced tight buffered factory manufactured pigtails.
- g) The exception to this is when factory terminated cable is specified in the scope of works.

### 12.2.2 External Optical Fibre Backbone

- a) OSP fibre backbone shall be loose tube or central tube OS2-9/125µm single mode cable.
- b) Refer to Appendix A for approved Panduit 24 Core Indoor/Outdoor OS2 Single mode Fibre Outside Plant Cable.
- c) Both ends of the OSP cable shall be identified with a permanent label, this label shall identify the source and destination of the cable.
- d) Each core of the OSP cable shall be terminated at both ends with an LC connector matching the fibre type.
- e) OSP cable fibres shall be terminated using fusion spliced tight buffered factory manufactured pigtails. The pigtail fibre shall match the fibre it is being spliced to.
- f) The OSP cable sheath shall have a permanent print string identifying the manufacturer the date of manufacture, cable type and construction, sheath composition, fibre count, fibre type.
- g) Optical fibre cable used outdoors shall be Outside Plant rated (OSP) they shall be laid in conduit within a trench.



- h) Where cables have metallic armouring or metallic barrier foiled sheath all metallic components shall be connected to the building protective earth to ensure equipotential bonding as per AS/NZS 3000 and AS/CA S009.
- i) Cables run in the Outside Plant environment shall have the applicable sheath ratings preventing deterioration from external elements, i.e. cables exposed to direct sunlight shall have a suitable UV resistant sheath.

### 12.2.3 Enclosures for Optical Fibre Equipment

- a) Cabinet mounted termination enclosures specifically designed to house optical fibre cable terminations shall be provided at each fibre termination point.
- b) Such termination enclosures shall unless otherwise specified, be mounted adjacent to the distribution frame, at the top of the active equipment cabinet.
- c) Each termination enclosure shall be arranged to accommodate at least forty-eight (48) "LC" connections.
- d) A schematic diagram showing each fibre terminated and the service to which it is connected shall be prepared and secured in a transparent protective cover to an appropriate location adjacent to the respective termination enclosure to facilitate easy location of circuits.
- e) A warning notice detailing the hazards associated with optical devices shall be affixed to each termination enclosure in a prominent position.
- f) Each unused fibre panel location not fitted with an LC connector shall have a blanking panel installed.
- g) Each LC connector that is unused shall be fitted with a plastic dust cap at the completion of the optical fibre termination.

## 13. OUTSIDE PLANT (OSP)

### 13.1 Cable Installation (Outdoors)

- a) Cables under roadways shall be laid in roadway ducting within approved conduit. These ducts shall project at least 300 mm beyond the kerb lines and unless specified otherwise, shall be supplied and installed by the contractor.
- b) The conduits shall be heavy duty, rigid UPVC in accordance with AS 2053, or heavy-duty, fibrous cement conduit in accordance with AS2053.
- c) All conduits shall be laid at a minimum cover depth of 500 mm, in a bed of clean sand, with a minimum cover of 75 mm above the top of the conduit.
- d) The trench shall be backfilled and consolidated to finished ground level.
- e) Protection slabs making up the roadway ducting lids shall be pre-cast concrete having a thickness of not less than 40 mm, and a classification of not less than Grade 15 to AS 1480 shall be used unless otherwise specified in the project specification.
- f) A white marker tape complying with AS 2648, part 1 shall be laid continuously along the route of the cable approximately 300 mm above protection slabs.
- g) All underground cable will be contained within 100-mm diameter conduits. The installation of the conduit and pit system is defined in this document and must comply with ACMA requirements.
- h) The minimum requirement is for two 100-mm diameter conduits.
- i) All conduits should be sealed so rodents cannot seek refuge in them.

- j) All conduits should be installed so that a slope exists to assist drainage. A slope of no less than 10 mm per metre is recommended.
- k) A conductive trace wire shall be installed continuously along the route of in ground conduits (either in or on the top of the conduit) for future services location requirements.

## 13.2 Communications Pits

- a) For trenched runs, a Communications Pit labelled "COMMUNICATIONS" shall be located every 50 m or at every change in direction of minimum size 800 mm deep and 600 mm X 600 mm square.
- b) The pits shall be of sufficient size to contain cabling loops without exceeding cabling minimum bend radius requirements. This does not apply to any bored runs.
- c) Each pit shall be provided with a seepage hole cast into the bottom surface to allow the disbursement of any accumulated water. The pit should be located on a minimum of 100 mm of sand.
- d) Bell-mouths shall be installed on conduits terminating in communications pits.
- e) Pits will be provided with appropriate strength lids depending on the placement of the pits.
- f) These pits will be used in the installation of the cable and to store spare cable looped to aid in disaster recovery.
- g) Locked or lockable pit lids may be required for security reasons and to prevent unauthorised entry (refer project specifications). Lids shall be sealed to prevent rodent occupation.
- h) Pits shall have suitable high-density lids such as in P5 or P6 pits capable of bearing heavy loads.

## 13.3 Equipotential Bonding

- a) Cables with metallic sheath components shall be earthed as per the requirements for Equipotential Bonding as specified in AS/NZS 3000 and AS 30129.
- b) This will then be tied to the building protective earth via green/yellow conductor as per AS/NZS 3000 and AS/CA S009 (latest revision).

# 14. INSTALLATION TESTING

## 14.1 General Requirements

- a) The installation shall be thoroughly tested to ensure the as-built performance meets the requirements specified within the Detail Design document and such other specifications referenced either explicitly or implicitly.
- b) The installation shall not be deemed complete until all wiring and equipment has been checked and tested to the satisfaction of an authorised network officer of La Trobe University Information Services and the Site/Project Manager.
- c) The Contractor shall supply all testing equipment.
- d) At least one week's notice of any compliance tests shall be given to the Site/Project Manager, who may witness such tests.
- e) Test reports must be submitted an authorised network officer of La Trobe University Information Services and the Site/Project Manager within two weeks of test completion and shall contain data outlet ID numbers.

- f) La Trobe University Information Services shall not commission network equipment until all test results have been submitted and approved by Senior Manager, Networks and Facilities.
- g) Panduit will from time to time perform site audits to ensure installation has been carried out in accordance with their guidelines.

## 14.2 Copper & Fibre Cabling Testing Requirements

The following shall be the minimum testing requirements for copper cabling:

- a) Copper testing shall be in accordance with ISO/IEC11801 PL2 Class Ea (+ All) and AS/NZS - ISO/IEC 61935.1 for Permanent Link PL2 or PL3 as mandated by design.
- b) Ensure Resistance Unbalance and Resistance Balance between Pairs is tested for PoE purposes, e.g. Typical tester setting: TIA Cat.6A PL (+PoE), Cat.6A U/UTP, T568A (an allowance up to 21ohms in loop resistance for a PL and 25 ohms for Channel will be deemed acceptable)
- c) Optical fibre testing shall be in accordance with ISO/IEC 11801 and AS/NZS - ISO/IEC 14763.3. This shall include the Encircled Flux requirements specified within the standard.
- d) Test parameters and set up testing shall be in accordance with the Panduit Design and Installation Guidelines.
- e) Testing of both copper and optical fibre shall be carried out with either a Fluke® DSX-5000 or DSX-8000 Cable Analyser or an approved equivalent.
- f) Only approved test leads shall be used.
- g) The software version installed on the test equipment shall be the latest recommended for that test instrument.
- h) Test results need to identify the operator performing the test and that the testing device is in calibration.
- i) All multimode optical fibre links shall be tested at both 850nm and 1300nm and in both directions as mandated by ISO/IEC 14763.3.
- j) Any optical fibre cabling lengths exceeding 300m shall include an OTDR trace in a single direction only.
- k) All test results shall be included with the as-built documentation and no optical fibre test result shall exhibit more loss than the calculated loss budget.

## 15. LABELLING CONVENTIONS

- a) A schematic diagram showing the arrangement of circuit groups for the distribution frames shall be provided.
- b) The schematic diagram shall be mounted in the Building or Floor Distributor hardware for future reference.
- c) Patch panels, distribution frames and outlets shall be prominently labelled in accordance with AS/NZS 3085.1.
- d) The unique identifier shall be printed on labels suited to the hardware they are installed on indicating the nature and identity of the terminated cable.
- e) All horizontal cabling that is 'patch frame' to 'workstation outlets' or wall mounted outlets are to be labelled identically at both ends.
- f) All labelling is to be printed in black on white background and be clearly visible.

- g) Hand written labelling is unacceptable in all situations.
- h) The labelling convention across all sites shall be uniform as follows:
  - a. Tie Cables: Source and Destination at both ends
  - b. Cabinet/ Open Frame Rack Layout: Numerical (01-45 from bottom to top)
  - c. Telecommunications Outlet(FD): Patch Panel, Outlet Number, e.g. A01+ (Note: + indicates that it has passed the return resistance test)
  - d. Telecommunications Outlet (Work Area): FD Number, Outlet Number, e.g. A01+ (Note: + indicates that it has passed the return resistance test)
  - e. Telecommunications Outlet plate (Work Area), if fitted: Comms Room ID; otherwise on the device.

## 16. QUALITY OF WORKMANSHIP

This section describes the minimum requirements for the testing, inspection and commissioning of the installation.

### 16.1 Installation Requirements

- a) The contractor and its employees must as a minimum hold an ACMA Open Cabling Registration (OCR), to work on site.
- b) Any individual contractor or employee performing any termination or testing must be a Panduit Certified Installer (PCI) and have fully completed all training without exception. The full name of the tester must be documented on the test results to allow La Trobe to confirm currency of certification.
- c) All cabling works on La Trobe campuses shall comply with the requirements of La Trobe University Infrastructure and Operations.
- d) Any variation to the Information Services Cabling Standards must be approved by La Trobe University Information Services Network Services. Refer Appendix B - REQUEST FOR VARIATION .

### 16.2 Compliance with Standards

- a) In addition to anything specified herein, all works and materials shall comply with all relevant International and local standards.
- b) The Contractor shall provide all regulatory approval documents as part of any works proposal as required.
- c) Without exception, the contractor shall follow all manufacturer's installation guidelines, where a variation is required, the contractor shall mediate with the relevant Infrastructure and Operations Project Manager and an authorised network representative of La Trobe University Information Services.
- d) Any such variation shall be documented with the documentation counter signed by both parties and included in the hand over documentation.

### 16.3 Reservation Inspections

- a) Upon request, the Data cabling contractor shall conduct installation inspections. (For Infrastructure and Operations Capital works – this may be coordinated via the LTU Project Manager)

- b) Any irregularities/anomalies highlighted shall be incorporated into the formal site meeting minutes.
- c) The recorded irregularities/anomalies shall be discussed, and a rectification plan put in place.
- d) If deemed necessary, the matter may be referred to the manufactures engineer for appraisal.
- e) Where possible these irregularities/anomalies shall be rectified before the next site meeting.

## 17. HANDOVER DOCUMENTATION

This section describes the minimum requirements for the documentation to be submitted as part of the completed installation.

### 17.1 Hand-over Documentation Requirements

The Contractor shall maintain on site, a set of drawings including the La Trobe University construction drawings and all others that the Contractor produces for installation, progressively marked up to cover the actual “as-built” installation.

The following as-built documentation shall be provided in hard copy and soft copy format:

Cable routes shall be marked on site drawings defining the exact route.

- a) A0 size Floor plans on Auto CAD, latest format with TO locations specified and cable runs noted.
- b) Structured Cabling System patching records.
- c) Cabinet layout schematics.
- d) Structured Cabling System frame layouts Schematics.
- e) Panduit System Certification certificate.
- f) Panduit Application Assurance Warranty certificate.
- g) Test certificates.
- h) Maintenance schedules and details.
- i) Operation manuals.
- j) Certificate of Compliance to local regulations.
- k) Test reports for copper cable, with results in native form and pdf.

## 18. CONTACT INFORMATION

Clarifications on the contents on this document can be obtained by contacting La Trobe University Information Services Network Services.

A list of Panduit certified installers can also be obtained by contacting La Trobe University Information Services Network Services.

For any works being conducted under La Trobe University Infrastructure and Operations Capital Projects, please consult with the relevant Project Manager or Director also (contact the I&O Service Desk for details)

Name	Role	Email	Telephone

Information Services Network Manager	Network Manager, Information Services, La Trobe University	ictnetworkoperations@latrobe.edu.au	+61 3 9479 1500
Infrastructure and Operations (I&O) Service Desk	Service Desk, Infrastructure and Operations, La Trobe University	ioservicedesk@latrobe.edu.au	+61 3 9479 2017

**19. APPENDIX A – APPROVED PRODUCTS**

MANUFACTURER	PRODUCT DESCRIPTION	PART NUMBER
PANDUIT	45RU 4-POST RACK, THREADED RAIL, 760mm DEEP, NUMBERED UP	R4P
PANDUIT	45RU 150mm WIDE PATCH RUNNER VERTICAL CABLE MAAGER, DUAL SIDED With Doors	PR2VSD06
PANDUIT	1RU HORIZONTAL D-RING CABLE MANAGER, D-RINGS ON FRONT ONLY	CMPHF1
PANDUIT	48 PORT HIGH DENSITY PATCH PANEL WITH VERTICAL NUMBER SEQUENCE	CPP48HDVNSWBL
PANDUIT	CATEGORY 6A, RJ45 10Gb/S MINI-COM JACK MODULE, OFF WHITE	CJ6X88TGIW
PANDUIT	CATEGORY 6A, RJ45 10Gb/S MINI-COM SHUTTERED JACK MODULE, OFF WHITE	CJH6X88TGIW
PANDUIT	SINGLE GANG, 4 OUTLET, VERTICAL, WATER RESISTANT FACEPLATE	CFPWR4CIG
PANDUIT	CATEGORY 6, 24AWG, RJ45-RJ45 PATCH CORD, BLUE 1m	UTPSP1MBU
PANDUIT	CATEGORY 6, 28AWG, RJ45-RJ45 PATCH CORD, BLUE 2m	UTP28SP2MBU
PANDUIT	CAT 6, 28AWG, UTP PATCH CORD, BLUE, 1m	UTP28SP1MBU
PANDUIT	CAT 6, 28AWG, UTP PATCH CORD, WHITE, 0.5m (for Wireless Access Points)	UTP28SP0.5MY
PANDUIT	24 PORT, CATEGORY 5e, PUNCH DOWN PATCH PANEL	DP245E88TGY
PANDUIT	FIBRE TRAY	FMT1
PANDUIT	OS2   12 Core   Tight Buffered   INTERNAL OPTICAL FIBRE	FLKL912

PANDUIT	OS2   6 Core   LT   INDOOR/OUTDOOR FIBRE	FLCR906Y
PANDUIT	OS2   12 Core   LT   INDOOR/OUTDOOR FIBRE	FLCR912Y
PANDUIT	OS2   24 Core   Stranded LT   INDOOR / OUTDOOR FIBRE	FLNR924Y
PANDUIT	OS2   48 Core   Stranded LT   INDOOR / OUTDOOR FIBRE	FLNR948Y
PANDUIT	FLAT FIBRE PANEL PATCH PANEL	CFAPPBL1
PANDUIT	FIBRE ADAPTOR PANEL WITH 6 LC DUPLEX ADAPTORS SINGLEMODE OS1 (BLUE) ZIRCONIA	FAP6WBUDLCZ
PANDUIT	LC-PIGTAIL FIBRE PATCH CORD, SINGLEMODE 9um SIMPLEX BUFFERED-1m	NKFP91BN1NNM001
PANDUIT	FIBRE OPTIC SPLICE MODULE FOR UP TO 24 FUSION SPLICES FOR RACK MOUNT ENCLOSURES	FOSMF
PANDUIT	BLANK FIBRE ADAPTOR PANEL	FAPB
PANDUIT	CATEGORY 6A Vari MatRiX 4-PAIR 23 AWG 6.6mm COPPER CABLE, U/UTP, WHITE, 305m	PUL6AV04WH-CEG



**20. APPENDIX B - REQUEST FOR VARIATION FORM**

**REQUEST FOR VARIATION TO IS DATA CABLING STANDARDS (VERSION 11.0)**

DATE:

FROM:

PROJECT:

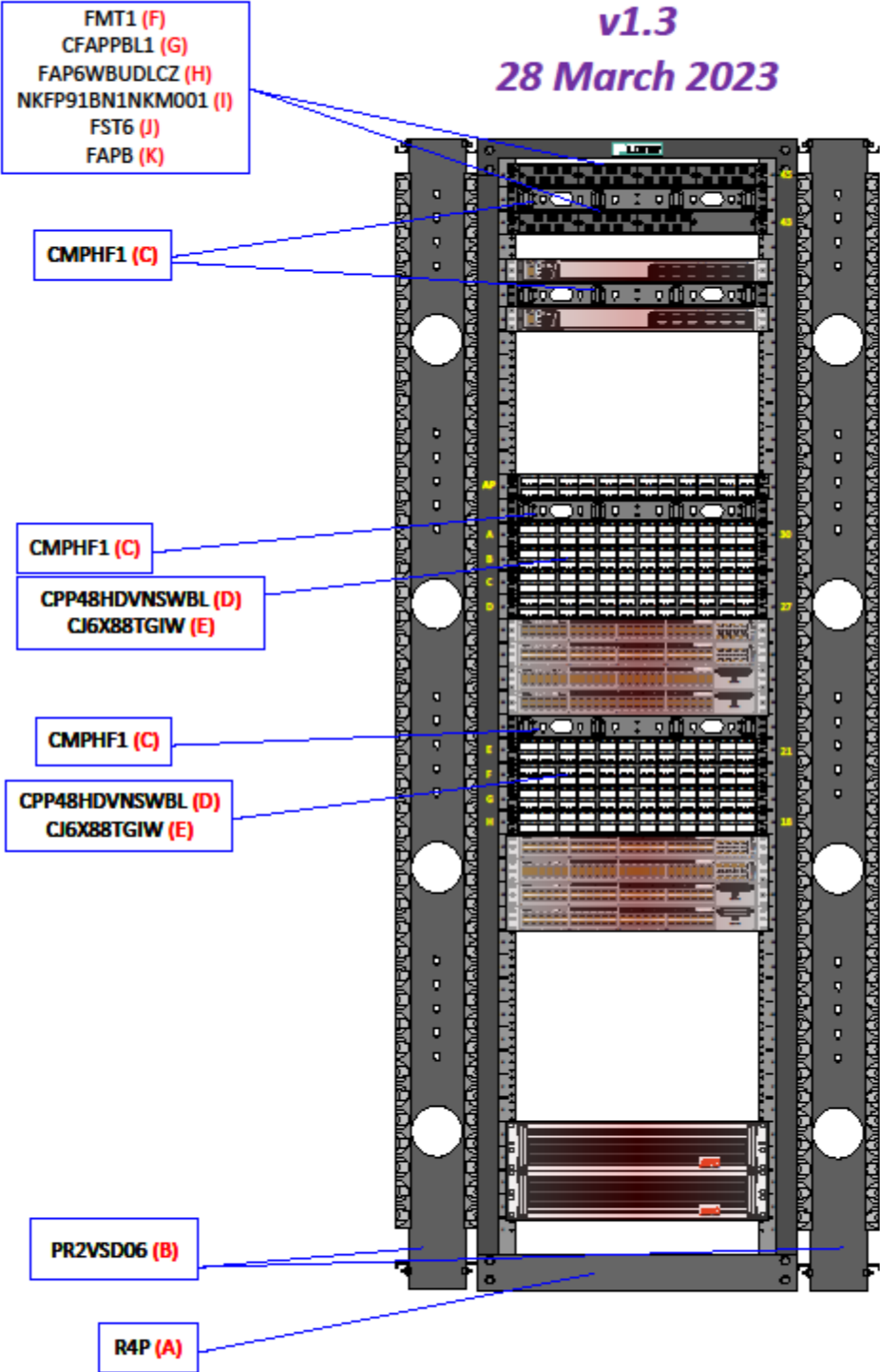
SUBJECT:

<b>Reason for variation to IS Data Cabling Standards</b>
<b>Details of requested variation to IS Data Cabling Standards</b>

<b>LTU IS APPROVAL (Manager Networks or approved delegate):</b>		Date:	
<b>LTU I&amp;O APPROVAL:</b>		Date:	

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21. APPENDIX C – BUILDING DISTRIBUTOR RACK LAYOUT

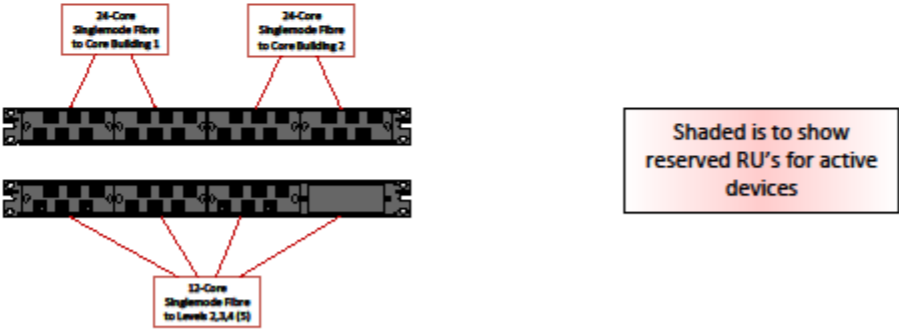


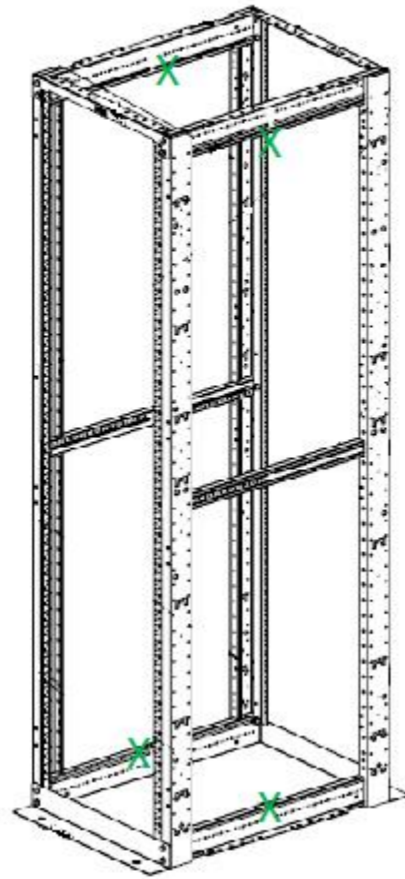
# Building Distributor Comms Room (Typically Level 1) RACK LAYOUT

All data outlets (comms rack and field) are Panduit Unshielded Cat 6A Jacks– WHITE  
 Panduit jacks are to be installed in patch panels A, B, C etc. Use only 48 port patch panels  
 (Vertical Numbering Sequence type)  
 Panduit jacks for Wireless Access Points to be installed in separate panel AP

Item	Brand	Description	Part Number	Qty
A	Panduit	Standard 19" EIA Steel 45RU 4-Post rack, threaded rail, numbered up.	R4P	1
B	Panduit	45RU 6" wide PatchRunner 2™ Vertical Cable Manager, dual sided with door	PRZVSD06	2
C	Panduit	1RU Horizontal D-ring cable manager, D-rings on front only	CMPHF1	3
D	Panduit	48-port high density patch panel with vertical numbering sequence	CPP48HDVNSWBL	1+
E	Panduit	Category 6A, RJ45, 10 Gb/s Mini-Com Jack module, Off White	CJ6X88TGIW	1+
F	Panduit	Fibre tray to house fibre splices and adapter patch panel	FMT1	1+
G	Panduit	Flat fibre patch panel. Holds up to four FAP adapter panels	CFAPPBL1	1+
H	Panduit	FAP with 6 LC Duplex Adapters Singlemode OS1 (Blue) Zirconia	FAP6WBUDLCZ	4+
I	Panduit	NetKey 1-fiber OS2 LC to pigtail with 900µm buffered cable, 1 meter (12-colour pigtail set).	NKFP91BN1NKM001	4+
J	Panduit	Fiber splice tray kit for up to twelve mechanical or fusion splices	FST6	4+
K	Panduit	Blank fiber adapter panel - depends on how many building levels	FAPB	0+
L	Panduit	Cat 6A Advanced MaTriX 4-pair 23 AWG copper cable, U/UTP, White, 305m	PUL6AM04WH-CEG	1+
M	Panduit	Cat 6, 28 AWG UTP patch cord, Blue, 1 metre.	UTP28SP1MBU	1+
N	Panduit	Cat 6, 28 AWG UTP patch cord, Red, 1 metre.	UTP28SP1MRD	1+
O	Panduit	Cat 6, 28 AWG UTP patch cord, White, 1 metre.	UTP28SP1M	1+
P	Panduit	Cat 6A 28 AWG UTP Copper Patch Cord, 0.5 m, White	UTP28X0.5M	1+

Quantities are minimums and will depend on how many data outlets and/or other building levels fed from this main rack. Also it doesn't include quantities for the 24-core links at the other ends





**Other**

Most buildings at La Trobe University number floors as Level 1 (Ground) up.

Field outlets are labelled A01-48, B01-48, C01-48 ... on the faceplate. Outlet number includes a + to signify cat 6A eg A01+

Faceplates also have the comms room number labelled on it eg 158 in picture

Sloped faceplates used for all field outlets. 2 or 4 modules versions available

Cat 6A outlets are WHITE in both rack and field

Cat 6A Slimline UTP 0.5m patch lead WHITE used to connect ceiling mounted WAPs to adjacent cat 6A data outlet faceplate

Cat 6 UTP 28 AWG patch cord, 1 metre used for patching panels A, B, C etc. Other lengths may also be required.

Patch cord colours are –  
**RED** = Critical devices  
**WHITE** = Wireless Access Points  
**BLUE** = Everything else

**Rack Earthing**

Comms rack earthing to be 6mm earth cable with screw lug terminated on Panduit R4P racks top or bottom. Their racks have a peel off sticker on top or bottom rails that expose threaded earthing points either side of rack. ONE location only required



**Rack Power**

Each rack requires 2 x 15 Amp Captive Outlets (Clipsal 56C315 or equivalent, 15 Amp Flat Pin). The outlets will be suspended above the rack or wall mounted in such a way to prevent tripping hazards.

Each Comms room will also have a standard 10 Amp Double GPO

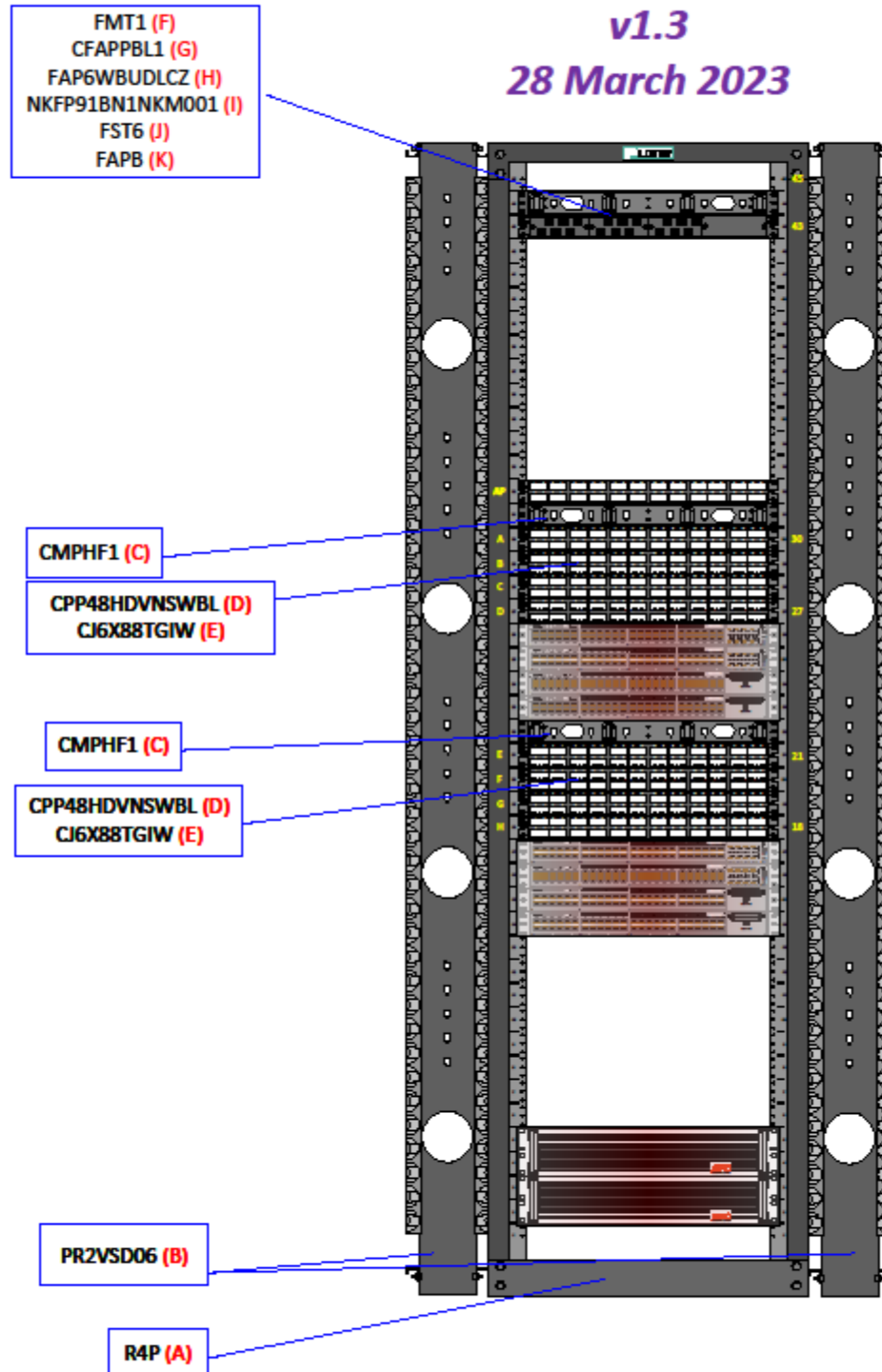
**Parts**



22. APPENDIX D – FLOOR DISTRIBUTOR RACK LAYOUT

## Floor Distributor Comms Room (Typically Levels 2,3,4 ...) RACK LAYOUT

v1.3  
28 March 2023



All data outlets (comms rack and field) are Panduit Unshielded Cat 6A Jacks– WHITE  
Panduit jacks are to be installed in patch panels A, B, C etc. Use only 48 port patch panels  
(Vertical Numbering Sequence type)  
Panduit jacks for Wireless Access Points to be installed in separate panel AP

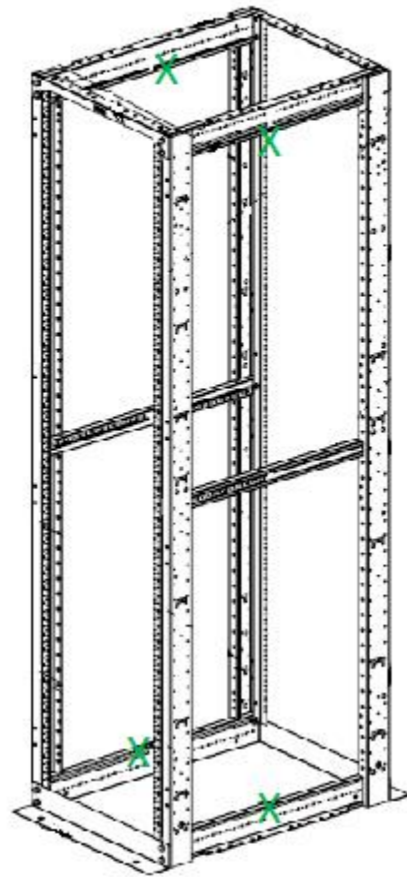
Item	Brand	Description	Part Number	Qty
A	Panduit	Standard 19" EIA Steel 45RU 4-Post rack, threaded rail, numbered up.	R4P	1
B	Panduit	45RU 6" wide PatchRunner 2™ Vertical Cable Manager, dual sided with door	PR2VSD06	2
C	Panduit	1RU Horizontal D-ring cable manager, D-rings on front only	CMPHF1	2
D	Panduit	48-port high density patch panel with vertical numbering sequence.	CPP48HDVNSWBL	1+
E	Panduit	Category 6A, RJ45, 10 Gb/s Mini-Com jack module, Off White	CJ6X88TGIW	1+
F	Panduit	Fibre tray to house fibre splices and adapter patch panel	FMT1	1
G	Panduit	Flat fibre patch panel. Holds up to four FAP adapter panels	CFAPPBL1	1
H	Panduit	FAP with 6 LC Duplex Adapters Singlemode OS1 (Blue) Zirconia	FAP6WBUDLCZ	1
I	Panduit	NetKey 1 fiber OS2 LC to pigtail with 900µm buffered cable, 1 meter (12-colour pigtail set).	NKFP91BN1NKM001	1
J	Panduit	Fiber splice tray kit for up to twelve mechanical or fusion splices	FST6	1
K	Panduit	Blank fiber adapter panel - depends on how many building levels	FAPB	3
L	Panduit	Cat 6A Advanced MaTriX 4-pair 23 AWG copper cable, U/UTP, White, 305m	PUL6AM04WH-CEG	1+
M	Panduit	Cat 6, 28 AWG UTP patch cord, Blue, 1 metre.	UTP28SP1MBU	1+
N	Panduit	Cat 6, 28 AWG UTP patch cord, Red, 1 metre.	UTP28SP1MRD	1+
O	Panduit	Cat 6, 28 AWG UTP patch cord, White, 1 metre.	UTP28SP1M	1+
P	Panduit	Cat 6A 28 AWG UTP Copper Patch Cord, 0.5 m, White	UTP28X0.5M	1+

Quantities are minimums and will depend on how many data outlets are installed.



Shaded is to show reserved RU's for active devices

12-Core Singlemode Fibre to Level 1 (RD)



**Other**

Most buildings at La Trobe University number floors as Level 1 (Ground) up.

Field outlets are labelled A01-48, B01-48, C01-48 ... on the faceplate. Outlet number includes a + to signify cat 6A eg A01+

Faceplates also have the comms room number labelled on it eg 158 in picture

Sloped faceplates used for all field outlets. 2 or 4 modules versions available

Cat 6A outlets are WHITE in both rack and field

Cat 6A Slimline UTP 0.5m patch lead WHITE used to connect ceiling mounted WAPs to adjacent cat 6A data outlet faceplate

Cat 6 UTP 28 AWG patch cord, 1 metre used for patching panels A, B, C etc. Other lengths may also be required.

Patch cord colours are –  
**RED** = Critical devices  
**WHITE** = Wireless Access Points  
**BLUE** = Everything else

**Rack Earthing**

Comms rack earthing to be 6mm earth cable with screw lug terminated on Panduit R4P racks top or bottom. Their racks have a peel off sticker on top or bottom rails that expose threaded earthing points either side of rack. ONE location only required



**Rack Power**

Each rack requires 2 x 15 Amp Captive Outlets (Clipsal 56C315 or equivalent, 15 Amp Flat Pin). The outlets will be suspended above the rack or wall mounted in such a way to prevent tripping hazards.

Each Comms room will also have a standard 10 Amp Double GPO

**Parts**



R4P (A)



PR2VSD06 (B)



CPP48HDVNSWBL (D)



CJ6X88TGIW (E)



CMPHF1 (C)



PUL6AV04WH-EG (L)



FMT1 (F)



CFAPPBL1 (G)



FST6 (J)



FAP6WBUDLCZ (H)



FAPB (K)



NKFP91BN1NKM001 (I)



UTP28SP1MBU (M)



UTP28SP1MRD (N)

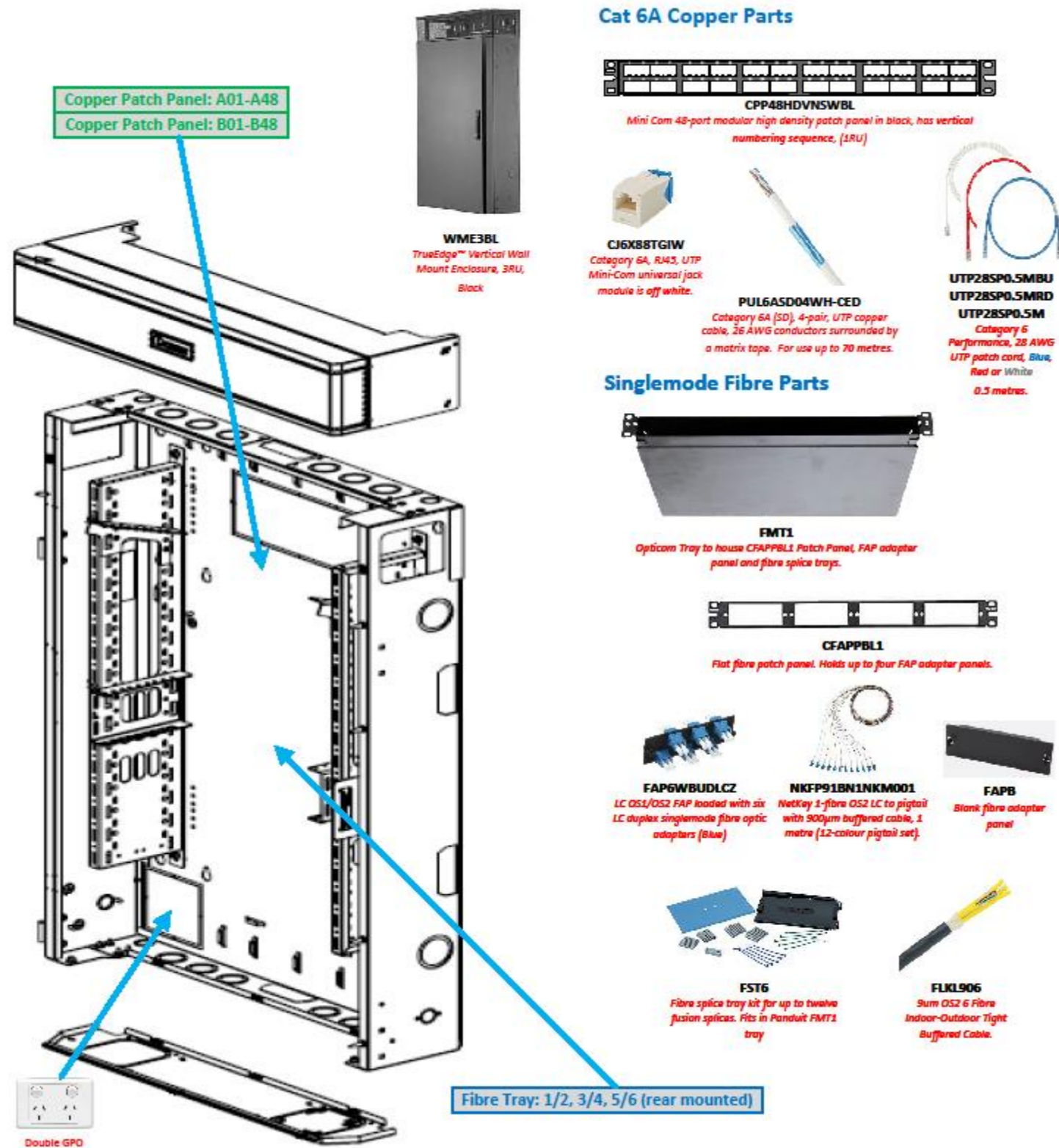


UTP28SP1M (O)



UTP28X0.5M (P)

23. APPENDIX E – TRUEEDGE LAYOUT



# TrueEdge Parts and Layout

V1.0  
28 March 2023

**Notes**

Copper Patch Panels to be labelled with an A/B at each end of panel.

Field outlets to be labelled with A01+ to B48+ plus room number where TrueEdge is installed.

Cat6A slimline cable can be used as most runs are in the same room and easier installation in TrueEdge. NOTE: 70m limit for this cable.

Fibre tray is mounted vertically at rear. Network switches then mount in front of it.

Fibre Panel outlets to be labelled in pairs as 1/2, 3/4, 5/6 staggered from left.

Fibre outlets 7-12 are spare.

Patch cord colours are –  
**RED** = Critical devices  
**WHITE** = Wireless Access Points  
**BLUE** = Everything else

TrueEdge cabinet also available in 6 & 9 RU's

Brand	Part Number	Qty
Panduit	WME3BL	1
Panduit	CPP48HDVNSWBL	1-2
Panduit	CJ6X88TGIW	1-96
Panduit	PUL6ASD04WH-CED	1m+
Panduit	UTP28SP0.5MBU	1-96
Panduit	UTP28SP0.5MRD	1-96
Panduit	UTP28SP0.5M	1-96
Panduit	FMT1	1
Panduit	CFAPPB1	1
Panduit	FAP6WBUDLCZ	1
Panduit	FAPB	3
Panduit	NKFP91BN1NKM001	1
Panduit	FST6	1
Panduit	FLKL906	1m+
Clipsal (other)	2025D (other)	2

**~~~~~ End of Document ~~~~~**