



THE UNIVERSITY
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DESIGN STANDARD

E. Communication Services

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Revision log

Current issue

E. Communication Services - UoA Design Standards. FINAL Version 5. January 2023

Previous issues

Version	Authors	Description	Revision	Date
1.0	Peter Hughes, UoA Technology Services,UoA	E. Communication Services - UoA Design Standards	DRAFT Version 1	December 2017
2.0	Peter Hughes, UoA Technology Services,UoA/ GHD	E. Communication Services - UoA Design Standards	DRAFT Version 2	December 2017
3.0	GHD	E. Communication Services - UoA Design Standards	DRAFT Version 3	March 2018
3.0	Vicki Jacobs, Capital Project Delivery, UoA/ GHD	E. Communication Services - UoA Design Standards	FINAL Version 4	August 2018
4.0	Infrastructure, UoA	E. Communication Services - UoA Design Standards	FINAL Version 4	October 2021
5.0	Michael Katsikitis, UoA ITDS	E. Communication Services - UoA Design Standards	FINAL Version 5	January 2023

List of revised items

Version	Authors	Revised items	Date
4.0	Infrastructure, UoA	Abbreviations, 1.Introduction, 2.General Requirements removed and reference in Vol.A Project Process Checklist	October 2021
5.0	Infrastructure, UoA	Abbreviations, 3. Technical requirements - Updates for Patch lead lengths, Trays, Panduit inclusion, Racks, Single Outlet inclusion, Equipment Room Specifications Abbreviations, 4. Specifications - Updates for Commscope/Panduit, Underground Pathways, Trays, Catenaries, Cabinets. Removed – Cable Containment, Specific Space Requirements	January 2023

Revision management

It is envisaged that revisions to this document will be undertaken at intervals of not more than two (2) years.

Endorsement body

Director of Infrastructure

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Authors and acknowledgements

The standards have been developed by Capital Projects with the assistance of UoA staff, external consultants, contractors, and colleagues from other education institutions. The University conveys its thanks.

Abbreviations

(refer –Standard Volume A. Project Process Checklist)

1. Introduction

(refer –Standard Volume A. Project Process Checklist)

2. General requirements

(refer –Standard Volume A. Project Process Checklist)

3. Technical requirements

This section outlines the specific technical requirements for E. Communication Services Design Standards.

3.1 Structured cabling

The design considerations are intended to facilitate the provision of functional spaces which are safe, comfortable and aesthetically pleasing.

The communications Structured Cabling System (SCS) plays a critical role in telecommunications systems, providing the physical link between sources and destinations of information. Data, voice, video and control signals are transmitted over this infrastructure linking devices across an office, throughout a building or across several buildings.

The cabling system may be quite small and simple, linking just a few nodes, or it may be extensive, linking several buildings with hundreds of nodes. The SCS shall provide a uniform design regardless of the size of the installation.

To facilitate the day-to-day operations of a normal office environment, the SCS shall readily enable additions, moves and changes, wherever and whenever necessary. Furthermore, the structured cabling system must also be flexible and provide the capability to carry a wide variety of applications - from high-speed local area network (LAN) applications to voice and low speed data.

UoA cabling systems are generally intended to serve for a long period of time. Whilst it is likely that transmission system requirements will change during the life of the cabling system, the system shall be provided to accommodate the likely needs over the life of the installation. For this reason it is important to plan the SCS to provide flexibility and to accommodate increased bandwidth requirements as far as possible. This is particularly important where cabling is installed underground or in other locations where upgrades to plant can be expensive and disruptive.

3.1.1 Cable utilisation

The optimum cable arrangement will depend on the circumstances of the particular installation. Factors that need to be considered in determining the composition of the SCS include:

- Distances between distributors and edge devices
- Compatibility with existing cabling and equipment
- The equipment that will use the structured cabling system and constraints that such equipment may introduce with regard to supported interface modules
- Environmental factors such as salt atmosphere and prevalence of lightning
- Functional requirements of Voice and Data service delivery
- Compatibility and interface with building services functions such as: BMCS, Security, Lighting Control.

3.1.2 System description

The cabling, connecting hardware, termination and interconnecting cords comprising the SCS shall be a single matched solution from a vendor approved by UoA. The three main advantages with this approach are:

- Manufacturer's Warranty - Cabling equipment suppliers offer an automatic channel warranty of 25 years if the installation is a "Single Brand Solution" that is installed by a certified or accredited contractor, rather than the 1 to 5 years available for a cabling system constructed from mixed brand products.
- Performance Improvements - Independent testing has revealed that mixing cabling products from a number of manufacturers can have significant impact upon the performance of the structured cabling system thereby limiting the useful life of the installation.
- Consistency - Single matched installation maintains consistency across the environment, this allows for easier management and operation of the structured cabling system.

System architecture

The conceptual arrangement of a generic cabling system (from AS/NZS 3080) is illustrated in the figure below.

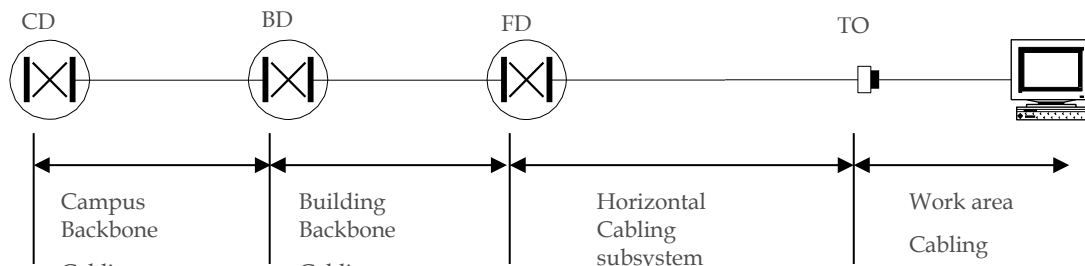


Figure 1. Generic cabling system

The distributors provide the means to construct different structured cabling system topologies such as bus, star, ring, and mesh or a combination of these. Furthermore, the distributor functions may be combined. The Structured Cabling System within UoA facilities will often combine the Building Distributor (BD) and Floor Distributor (FD) functions.

In general terms, use of Consolidation Points (CP) is discouraged and should be used only when planning for the project identifies that there is a need for localised architectural layout changes (for example, to wall or desk layouts) that would necessitate re-wiring of TOs from the FD with extensive ongoing costs to facilitate such changes.

3.1.3 Backbone cabling

Backbone cabling includes both campus and building backbone cabling subsystems. Campus backbone cabling runs between buildings and Building backbone cabling runs within buildings to provide the interconnection between the floor distributors and building distributors. The backbone cabling generally provides interconnection between active network equipment that may be within the same building or in separate buildings.

Campus backbone communications cabling shall be single mode optical fibre.

3.1.4 Horizontal cabling

The horizontal cabling subsystem extends from the telecommunications outlet (TO) to the associated distributor. It includes consolidation points (CP) that may be in the path (where applicable), but does not include work area cords between the terminal equipment and the TO. All horizontal cabling must not exceed 90m. All user area field TO's must be installed within 2m of the work station. All concealed space TOs must be installed within 2m of the customer equipment ie (Wireless Access Point).

TOs shall be cabled to the same level comms room as the TO is located unless otherwise specified.

The horizontal cabling shall be a star topology connecting each workplace telecommunications outlet to a patch point at a distributor as shown.

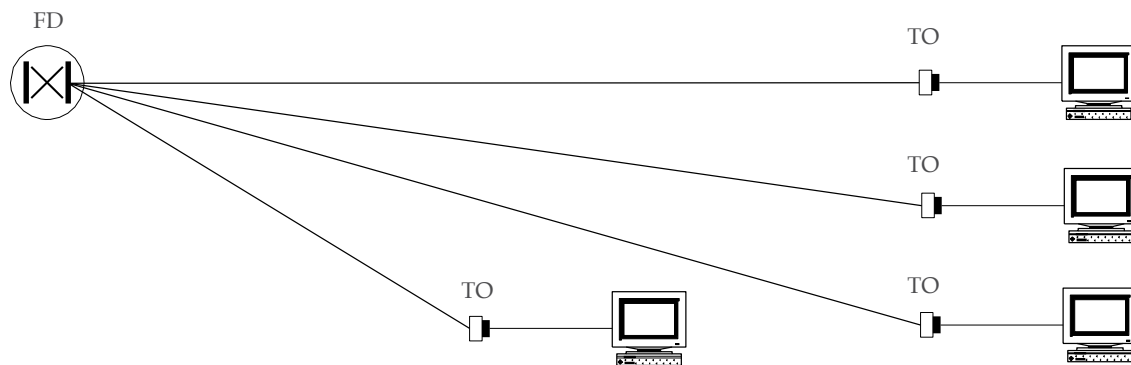


Figure 2. Horizontal cabling

3.2 Balanced cabling

This section applies to Category 6 and above cabling in horizontal and backbone applications.

Balanced cabling shall meet the requirements of AS/CA S008 and shall meet or exceed the performance requirement of AS/NZS 3080 for the relevant performance Class.

Cable of the same manufacturer type shall be used throughout the entire installation.

Certification that the balanced cabling system meets the specified Class performance levels shall be provided by the installer.

3.2.1 Patch and work area cords

Patch cords must have RJ45 connectors at both ends complying with AS/NZ 3080.

Patch cords and work area cords shall be from the same manufacturer as the horizontal cable and matched to the AS/NZS 3080 performance Class of the cabling system in which they are used.

Pin assignments and colour codes shall conform to the "T568A" arrangement in accordance with AS 3080 Z.B.2, and are 8-Position 8-Contact modular plugs.

All patch cords and work area cords shall be factory assembled, terminated and certified and fitted with male modular plug.

Quantities of each length shall equal to the number of outlets and to be confirmed with IT depending on areas requirements.

Work area cable lengths shall be 1m & 2m in length and Patch Panel leads shall be 0.2m.

3.3 Optical fibre

Optical fibre cable for UoA cabling systems for campus use shall be constructed using OS2 SMOF.

The only exception is for Data Centres where the use of MMOF OM4/OM5 can be used for inter server rack connectivity.

3.3.1 Optical fibre patch cords

Optical fibre patch cords shall be minimum 9/125µm OS2 according to the application.

Except in some instances of extension to an existing installation, patch cords supplied shall be from the same manufacturer as the backbone cable and matched to the AS/NZS 3080 optical fibre cable type of the cabling system in which they are used. In an existing installation extension, preference is for patch cords to match the existing, unless prohibitively expensive.

Patch cords shall be provided in standard pre-manufactured lengths (e.g. 1m, 2m, etc.) sufficient to interconnect the optical fibre termination unit and switch/router hardware while minimising the need to manage excess cable.

3.4 Cable pathways and containment

3.4.1 General

Cable pathways shall be selected and designed to:

- Maintain minimum segregation from other services as mandated by AS/CA S009 and AS 3000 in accordance with AS/NZS 3080 ZA.3.1.
- Minimise interference in accordance with AS/NZS 3080 ZA3.2.
- All other Services shall have their own supporting infrastructure. Exemptions must be signed off by Associate Director Technology Operations.

Pits and external plant shall be placed as unobtrusively as practicable so as not to attract attention, avoid trip hazards and minimise interference to other services.

All cable pathways and containment systems shall be fully coordinated with all other building services and in accordance with the respective clauses of the UoA Design and Construction Standards.

All Cable pathways shall be accessible at all times and not have access restricted by permanent fixtures, eg solid ceilings.

Solid ceilings must have access hatches located where the tray changes direction and where cabling passes through walls. Tray access hatches shall be no further than 2m apart to provide adequate access/service to the Communications Pathways.

3.4.2 Carrier service entry

The lead-in cable providing the interface to carrier services shall be determined, in consultation with UofA, as appropriate to each building/project.

The service entrance for carrier services will generally be located within the building that is closest to the carrier infrastructure.

Carrier service entry facilities shall be planned in consultation with the carrier. The facility shall be easily accessible to the carrier.

3.4.3 Intra-building

No fixed horizontal cabling shall be visible within the workplace unless for architectural featuring. Cabling shall be coordinated with all other wiring systems within the building and installed in conduits, on cable trays or through under floor cavities.

It is preferred that cabling be concealed in roof, floor or wall spaces, however, cabling may be surface mounted within ducting in the following circumstances:

- Where such location is considered inordinately expensive, disruptive or impracticable. In which case suitable neat ducting may be used.
- Clipsal TAL Plus Trunking (PL50150)
- Must be three division option with internal barriers the full length of the ducting

Cables shall be installed parallel to walls, floors and ceilings as far as is practicable.

Where cable is run through a fixed, open or suspended ceiling it shall be supported by means of suspension from fixed non-movable structural features, purpose installed cable trays or by one or more catenary wires.

3.4.4 Communication risers

Where there is more than one floor, risers shall be located vertically one above the other and shall be vertically interconnected by conduits or wiring access tray with the equivalent space of not less than four 100mm conduits. Communication risers shall only be used for communication cabling, all risers must be locked using a Technology Services lock and signage installed on the door.

3.4.5 Inter-building pathways

Inter-building pathways shall be constructed to accommodate the cabling between buildings.

Underground pathways shall be provided unless this is proven to be impractical.

The specific requirements for the incoming services for a new facility shall be determined in conjunction with UoA on a project-by-project basis. All new buildings and capital works shall have a defined means of ingress for voice and data cables created, with reserved ducted access for the entire distance to the Building Distributor room.

The crawl space under elevated buildings shall be considered an external environment and proper consideration shall be given to the choice of components used in this space i.e., external grade type cabling shall be used. Factors to be considered shall include dampness, flooding, UV radiation, vermin, and future access.

3.4.6 Cable tray

Cable trays shall be installed in accordance with AS/NZS 3084

All trays shall be mounted in accessible locations and be signed off by ITDS

Inverted tray only acceptable in short lengths due to space constraints. This type of solution will need to be proposed and signed off by ITDS.

3.4.7 Ducting and trunking

Surface mounted ducting shall be installed where an alternative method for concealment of cables is not possible.

Ducting shall be screw fixed to walls using suitable fixings (e.g., cavity fasteners for cavity walls and masonry anchors for concrete slabs, columns and the like). Fixings shall be of a type that does not cause undue distortion to the ducting when tightened.

Ducting shall be run in an inconspicuous manner. Excess cabling shall not be stored in the duct.

3.4.8 Fasteners/fixings/ties

Generally fixings shall be of a type suitable to the situation in which they will be used.

Where fixings are to be used externally or exposed to the weather stainless steel or brass is preferred. Plain steel will not be accepted. Where fixings are used internally, cadmium plated may be used.

All fixings, fastenings and supports shall be of adequate strength and size and arranged to ensure the installation against mechanical failure under normal conditions of use and wear and tear.

All surface mounted conduits, duct, cable trays and support branches on masonry shall be fixed in position using plugs, masonry anchors or other approved means.

Cadmium plated "loxins", "ramset" or "terrier" masonry anchors shall be used for fixings in concrete, clay or concrete brickwork.

Where "ezydrive" or "nail in" type concrete fasteners are used these shall be the removable screw exit type, so as to avoid damage to wall and surrounds when removed.

Bolts or machine screws with nuts, washers and anti-vibration devices shall be used where necessary for fixings to masonry construction including plastered expanded metals. Such plugs shall be used only for minor shear loadings.

Cable bundling shall be tightened by hand without using tools and shall be tightened just sufficiently to hold cables together and to fix cables to supports. Care shall be taken to avoid tight twisting of the cable, tearing of the outer jacket, cutting or wearing through due to abrasion of the cable.

Only hook and loop cable ties e.g., Velcro style, shall be used.

3.4.9 Underground pathways

Refer to J. External Works for further details regarding in-ground services.

Underground pathways shall be designed and constructed in accordance with AS/NZS 3084.

Copper and fibre backbone cables shall follow the same routes and can share the same conduits where there is less than x2 conduits for a pathway.

Underground pathways are preferred for external cable routes, however above ground routes may be used provided that:

- The pathway is fully covered and the cabling is installed within protective conduit or ducting for the entire external section of the cable route.

3.4.10 Trenches

Trenches for communication cabling shall be constructed to provide the depth of cover and segregation specified in clause 5.5.3 of AS/CA 5009. Depth of cover in this case means the distance between the natural ground surface and the top surface of the communications conduit.

3.4.11 Conduits

The existing underground conduit system shall be utilised where possible and practical, without degrading the performance of the installation.

Sweeping bends shall be used to allow for cable bending radii and shall also be white communications type PVC.

All conduits shall be installed with a 3mm nylon draw cord.

Any section of conduit that may be exposed to direct sunlight shall be UV stabilised.

Size shall be a minimum of 100mm in diameter.

3.4.12 Pits

Pits shall be installed at suitable locations to facilitate installation and maintenance of cabling including:

- Building entrances
- At distances not exceeding 50m along underground cable pathways
- Where a significant change of direction to the route occurs
- At road crossings or culverts

The minimum pit dimensions shall be 900mm x 900mm x 900mm deep x 100mm thick.

Pits shall be provided with all required accessories including:

- Trafficable covers and support bars for covers as required (minimum AS 3996 Class D)
- Covers to be permanently and appropriately labelled with "Communications" and indicate conduit directions
- Cable support bars
- Bellmouth for conduit entry
- Gaskets and seals
- Split Gatic lid for easier opening
- Maximum lid size shall be 900x450mm with a minimum of 2 lids per pit

Shared service pits with other services (e.g., gas, electrical, water) shall not be used.

Pits shall include a drain point at the bottom to allow for any water drainage.

3.4.13 Penetrations

Fire rated elements and structural members are not to be penetrated without prior approval from the Architect, relevant Fire Consultant and Maintenance Services.

Where ladders or trays pass through ceilings, walls and floors, provide neat, close fitting apertures. At openings through fire rated elements, terminate the ladders or trays on either side of the opening and provide fire stopped holes for the cables only. Firestopping shall comply with the National Construction Code (NCC).

3.5 Equipment rooms

3.5.1 General

Equipment rooms shall be developed in conjunction with the briefing from UoA ITDS and require the coordinated input of the Architect and other building services consultants. Rooms shall be designed with due consideration of the following:

- Relevant Australian Standards
- Room for organic growth
- HVAC requirements – Network Services prefer commercial grade wall mount split systems.
- Fire protection systems
- Access and security requirements
- Comms room door to be labelled 'Communications room ****'
- Protection against water ingress
- Safety – equipment layout shall not restrict escape routes
- Acoustic/ noise requirements
- Suitable access to equipment for installation and maintenance
- Permanently clear and unhindered access, for both personnel and equipment, to equipment rooms/ spaces from an accessible corridor or unoccupied space
- Access to/from the equipment room to external parking for the transport of equipment
- Exclude all other building penetrating services other than the room requirements.
- Floors for Commscope C6/C6a applications:
 - a. Raised floors to have a minimum under floor height of 180mm to the underside of the tiles.
 - b. Raised floor tiles to be Tasman C38, wood core, grey star laminate tiles or similar
 - c. Raised floor support to be 'stringer support' system
- Panduit C6a floors to be covered in Comms grade Anti-static vinyl flooring up to the bottom of the walls

3.6 Campus core rooms

The campus core equipment room shall be used to accommodate the major items of communications equipment such as routers, switches and servers and shall be the central point of the cabling system. These rooms are considered critical IT locations for the University, and thus should be appropriately equipped.

For Campus Core locations, a full load test needs to be completed and measured against the specification of the cooling system.

3.6.1 General

Communication racks are used to house and restrict access to hubs, cabling, all active LAN components and other communications hardware.

Racks will generally be free standing or where specifically required and approved by UoA, wall mounted.

Racks shall be designed for 19" equipment mounting.

The rack(s) within the core equipment room containing core switching equipment shall provide minimum 45 rack units (45 RU) equipment mounting space, otherwise a smaller rack may be approved due to space constraints.

All equipment rooms at a site shall be fitted with building access control and coordinated with the security requirements.

Racks shall be fitted with an appropriate lock.

Racks shall provide facilities for ventilation in the form of vented panels or the like. Metal surfaces of the rack and accessories shall be powder coated, painted or otherwise protected against corrosion.

Black finish is preferred for racks.

All racks and open frame racks shall be bonded to the protective earth system or communications earth system (CES).

3.6.2 Racks

Racks shall typically be provided as 45 RU and shall be installed on 100mm plinth.

For Campus Core locations rack shall be a minimum of 1200mm deep.

Racks for Communications rooms:

- 1000mm deep - 0-288 horizontal cables
- 1200mm deep - 289 horizontal cables and higher

3.6.3 Wall mount cabinets (RU and Type 1)

Where wall mounting cabinets are approved for use by ITDS, they shall be swing frame design to facilitate rear access, and mounted on adequate structural support.

Wall mounting cabinets shall be provided as 12 RU and minimum internal depth of 600mm , excluding door.

Where a Type 1/ Type 2 cabinet is used it shall have a minimum of two doors that are vented and be sized to suit the application.

3.6.4 Rack installation

Communication racks shall be located to achieve maximum operator convenience. No wet services, i.e., piping for Fire Sprinklers, shall be installed above the communications racks.

The cabling Contractor shall ensure that racks are arranged to permit installation of other equipment and racks with adequate access spaces for inspection, wire termination and patch field alterations.

Racks shall be provided with sufficient clearance for installation and maintenance activity. Typical minimum clearances for racks are indicated in the sketches below.

If communication room has a door that opens inward into the room, minimum distances shall be maintained, this includes hand rails and steps.

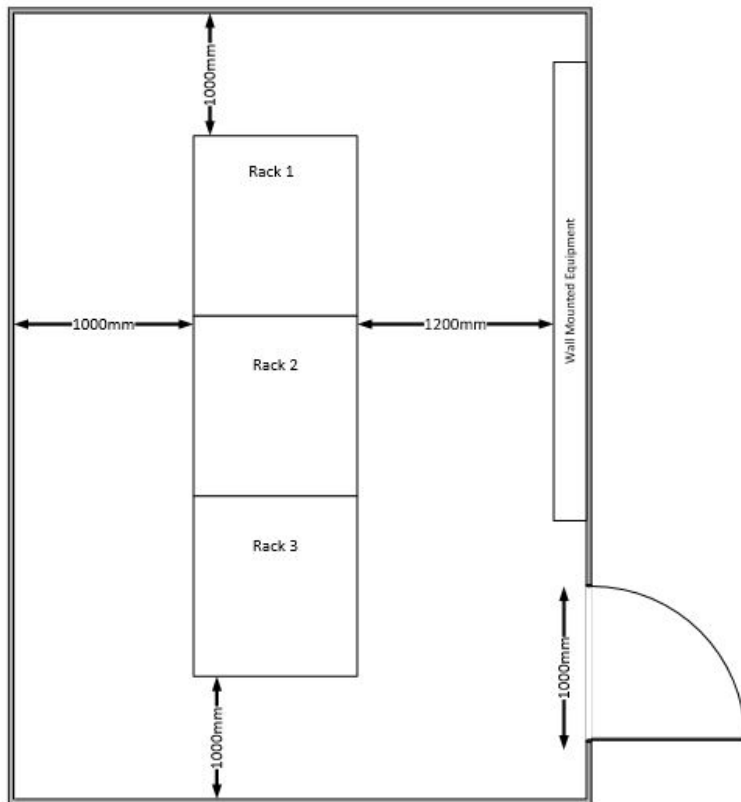


Figure 2. Typical Communications Room Arrangement Detail

3.6.5 Rack minimum clearance

The vertical footprint for wall mount cabinets shall not extend beyond 1.8m m nor lower than 0.5m AFFL. Minimum clearance above the racks shall be adequate for cable access including provisions for future expansion. Wall mount locations shall be selected such that there is no risk of injury through striking arising from walking past or rising from beneath the rack.

Racks shall be installed plumb and square without twists in the frames or variations in level between adjacent racks.

Racks shall be bonded to the protective earth system.

3.6.6 Rack layout

Each rack shall be provided with sufficient spare space and cable management for future installations and maintenance activity. The rack layout to be defined by ITDS.

3.7 Rack power

3.7.1 Campus core

Power supply for equipment within Campus Core Communications rooms shall be provided by means of a separate distribution switchboard.

A minimum 2 x dedicated 20 amp circuits for each rack. 20 amp Clipsal 56C320-EO round pin plug bases. Details of power supply requirements shall be coordinated with the Electrical services designers to ensure that the requirements for Essential Power (backed up by standby generator), UPS, diversity of supply and safe working are all adequately addressed in the design.

Power distribution within equipment racks shall be provided as an integral part of the rack in the form of (x2) power rails attached securely to the rack. Outlet type, rating and quantity should accommodate the equipment to be installed in the rack, ensuring there is adequate capacity to fully fill the rack in all available spaces. Rails shall be a minimum of 12 way per rail and a minimum 10A rating.

3.7.2 Building/ floor distributor

A minimum 2 x dedicated 20 amp circuits for each rack. 20 amp Clipsal 56C320-E0 round pin plug bases. Details of power supply requirements shall be coordinated with the Electrical services designers to ensure that the requirements for Essential Power (backed up by standby generator), UPS, diversity of supply and safe working are all adequately addressed in the design.

Power distribution within equipment racks shall be provided as an integral part of the rack in the form of power rails attached securely to the rack. Outlet type, rating and quantity should accommodate the equipment to be installed in the rack, ensuring there is adequate capacity to fully fill the rack in all available spaces.

Electrical Switchboards

All dedicated Switchboards providing power for the Communications room are to be located within the communications room.

3.7.3 Cable management

Racks shall be supplied with cable management panels to facilitate the support and organising of patch cords between patch panels. Vertical cable containment shall be provided to both sides of each equipment rack. Horizontal cable management (Lacing Bars) are to be provided below each switch where switch stacks are installed for a Commscope C6/C6a solution. Panduit Solutions to have horizontal cable management bars at the top of rack for the Voice tie and FOBOT.

A rear cable support system shall be utilised to offer strain relief for cables entering the rear of the rack.

For installations with more than two adjacent racks/racks, cable shall be installed across the rack tops and vertical cable management installed between them.

3.8 Terminations

3.8.1 General cable terminations

The general method for termination of copper cabling shall be modular 8-pin sockets (commonly known as RJ45) and plugs using the T568A standard.

Interface connectors at the FD (Patch Panels) and TO shall be modular 8-pin sockets (RJ45). Horizontal balanced cables shall be terminated with corresponding modular 8-pin jacks.

Insulation Displacement Connection (IDC) punch-down blocks fitted to 19" rack mount frames and PDS may be used for termination of outdoor (external) and multi-pair copper cables.

3.8.2 Outlets

- Outlets to be either Single, Dual, Triple or Quad configuration to suit the needs of the application
- Wall plates shall be the ID Window model type allowing for a machine printed outlet identification
- All other plates/rails are to be labelled with Treffolyte labels and be white with black text
- Fibre to desktop to be engraved yellow with black text labels affixed to Window ID faceplates
- Outlets mounted on cable basket/tray shall be enclosed as to prevent mechanical damage from the rear and suitably mounted (Not vertical).
- Desktop mounted outlets shall be enclosed to prevent mechanical damage and in a Harmony or equivalent style rail secured to the desk.

- Soft Wiring shall be cabled with a patch cord that shall be factory assembled, terminated and certified and fitted with male modular plug at one end. The desktop end shall be terminated with a black RJ45 socket that is the same standard as the horizontal cabling from the Communications Room.

3.9 Wireless

3.9.1 Wireless LAN Interfaces

Outlets used to interface with WLAN access points will be determined in conjunction with UoA IT operational and functional requirements, with full consideration of the physical nature of the space.

The following guidelines are for contractors to follow

- All Access points are to be installed as below (Where this is not possible contact is to be made with the University to approve a subsequent location):
 - Within 2000mm of the location indicated on the map;
 - under the ceiling visible to users;
 - not within 500mm of a light or aircon duct;
 - Within 2m of data outlet in ceiling space;
 - Fixed ceilings will require access panels.
- Timing of Installs (users are usually using the wireless service while work is being completed, all reasonable effort to reduce impact on users should be taken)
 - Where possible replacement should be done prior to 8am;
 - where possible all installations should be completed prior to do replacements
 - where replacing/relocating access points reasonable effort should be made to reduce the time the access point is down.
- Any change in AP locations must be documented on the floor plans and returned to the University
- The included patching/install records are to be completed and returned to the University
- At the completion of any building contact the University
- External Antenna installs
 - Arrange a time for completion of install with University staff;
 - University staff will test at the time of install;
 - may be required to make changes to antenna direction during this time.

3.10 Security

It shall be necessary to pass at least two points of restriction to access equipment from outside the building. This shall generally be achieved using locked or access controlled doors at the equipment room or other equipment racks.

Core equipment rooms shall be on UoA's access control system. Refer H. Security Services Design Standards.

3.11 Audio visual cabling

Any network cabling that does not terminate in the local communications room is to be coloured either green or orange and not utilise the communications pathways. Must have its own pathway created (eg. separate catenary runs).

3.12 Acoustic noise

For the purpose of design tasks associated with attenuation of noise, it shall be assumed that noise levels originating from a telecommunications room shall be maintained within the limits specified by the National Standard for Occupational Noise - NOHSC:1007(2000).

Equipment rack locations shall be selected such that noise levels in work areas arising from active equipment, when combined with other sources of work area noise, shall be maintained within the limits specified by AS/NZS 2107.

In general this shall be achieved by installing the equipment rack within a room that is segregated from work areas and that provides suitable attenuation of the noise transmission path between the equipment and the listeners.

Fire alarms and Emergency Warning Information Systems shall be audible at the equipment racks. Refer G. Fire Services Design Standards.

3.13 Environmental factors

3.13.1 Lightning protection

Special consideration shall be given to earthing practices in areas prone to lightning activity.

3.13.2 Salt

Particular care shall be taken for installations in coastal regions or near to salt pans / lakes to minimise exposure of equipment to salt.

Equipment racks and distribution equipment shall not be installed in open areas. Equipment room vents shall be fitted with filters to minimise salt ingress.

3.13.3 Chemical corrosion

Equipment rooms and distributors shall not be located near corrosive atmospheric or environmental conditions.

Storage areas for cleaning solvents and other chemical products shall not be used to house cabling equipment and shall not be adjacent to equipment rooms or equipment room vents.

3.13.4 Heat

Equipment room design, including HVAC and venting, shall be adequate to accommodate the heat load of active equipment likely to be fitted in the room and to maintain a comfortable working temperature in accordance with AS/NZS 3084 ZB2.3.4.8.1.

Racks shall be equipped with vented panels to facilitate air flow for cooling of active equipment. Where necessary, ventilation trays or racks shall be installed in the rack.

If further increased air flow is required, door vents and / or ceiling extraction fans shall be used.

The duty cycle of any venting or HVAC provided shall be 24 hours/7 days.

Side panels and doors shall not be removed to improve ventilation.

3.14 Earthing

All equipment racks, cable tray systems and the like shall be earthed in accordance with AS 3000 to the building protective earth system.

Earthing practices shall comply with the requirements of AS/CA S009.

Catenary wires used for cabling support shall not be bonded to the TRC (where provided) but may be bonded to building protective earth system.

3.15 Transient protection

Transient protection equipment shall be provided for protection of equipment connected to balanced copper outdoor cables where such equipment can be provided without compromising transmission performance.

Transient protection for cabling shall be compatible with the earthing system provided at the facility. Particular care needs to be taken where separate buildings earths may not be bonded.

3.16 Labelling

3.16.1 General

All telecommunication outlets, patch panels, racks, cables and conduits shall be systematically and permanently labelled.

Cable and TO numbering shall be the same and as per below;

- Levels with multiple communications rooms feeding the same level – “COMMS ROOM-NUMBER” CC424-251 / CC424-252
- Levels with a single communications room – “NUMBER” 251 / 252

Labels may be computer generated using a proprietary labelling system. Use of Dymo label, felt tipped pen and the like will not be accepted.

Telecommunications outlets shall be labelled with a machine printed label to suit the window faceplate or Treffolyte. Shall not be labelled using Dymo labels.

The method of designation shall be in general accordance with AS/NZS 3085.

3.16.2 Voice

Backbone voice cable shall be clearly marked in all exposed areas. Exposed areas would be at a point the cable terminates on the CD/BD/FD frames and in cable pits.

The backbone cable shall be terminated on IDC modules specific to the cabling solution selected for the areas. The termination shall conform to all ACMA regulations and the manufacturer's recommendations.

Marking shall consist of an optical fibre warning tag and is to include cable pair range identification and the words “UNIVERSITY OF ADELAIDE.”

Backbone voice cables terminating in Commscope rooms:

- Ports shall be sequentially numbered, left to right, bottom to top, using the letter V and three digits. Sequences shall start at 001 for each rack.
- The frame shall be labelled with the identifier of the CD/BD/FD that the backbone voice cable originates from and the corresponding vertical and pair range.

Backbone voice cables terminating in Panduit rooms:

- Cables to be presented at top of rack 2RU below top and be terminated on Commscope 25 way 1RU Voice Patch Panel

Labelling conventions for voice backbone cabling shall follow the general format:

- Source CD (eg building number “M458”, etc)
- Vertical
- Pair Range

3.16.3 Fibre

Each fibre termination through connector location in the termination unit shall be sequentially numbered from bottom to top and left to right with the appropriate engraved Treffolyte labels. Each end of each fibre core must be labelled with an attached number tag. Cores must be sequentially numbered within the cable.

Each end of each cable jacket must be clearly identified by cable sequence number for the route. Cable sequence numbers shall be determined in consultation with UoA Network Services

Fibre optic cable must be clearly marked in all exposed areas. Exposed areas would be at a point the cable leaves ducting or cable trays, in cable pits and fibre termination points.

Labelling of the cables shall be stainless steel labels affixed with stainless steel ties.

Marking is to consist of an optical fibre warning tag and is to include cable sequence number and the words “UNIVERSITY OF ADELAIDE.”

3.16.4 Outlets

The outlet labelling shall be equivalent to the designation of the horizontal cabling designation by which it is connected to the floor distributor.

3.17 Testing, commissioning and certification

3.17.1 General – current tester standards

The cabling system Contractor shall supply all labour, materials and equipment required for fully commissioning and testing the installation.

Testing shall be performed at the channel level wherever practicable.

Testing shall only be performed using calibrated test and simulation equipment. Vendors recommended tester shall be used.

The test results, for all cables, connectors and outlets shall be fully documented and tabulated, identifying each cable and each outlet or interface port by its label. All test results shall be included in the handover documentation.

Test results shall meet the requirements of AS 3085.1 Section 9.

3.17.2 Balanced cabling and connecting hardware

Test personnel and the test methodology shall comply with the requirements of AS/NZS IEC 61935.1:2006.

The acceptance testing and certification report section for balanced cabling shall include the test results for each outlet. The report shall include as a minimum the following details and tests results for each outlet:

- Cable and outlet/port identification
- Test equipment and test configuration details
- Wire map testing
- Cable length
- Cabling performance parameters as specified in AS/NZS 3080

- Date and time of testing
- Name and signature of testing engineer

The cable system shall be tested and certified to its Class channel performance in accordance with clause 6 of AS/NZS 3080:2013.

The equipment supplier shall provide certification in writing indicating full compliance of the balanced cabling connecting hardware (telecommunication outlets and patch panels) with the relevant performance Class of the cabling system. Certification shall include test results as recorded by the appropriate test laboratory.

The cabling system installer shall certify the performance of each channel (horizontal and backbone) to its Class for all pairs as detailed.

3.17.3 Outdoor and indoor voice backbone cabling

The insulation resistance and capacitance shall be tested on a minimum of two randomly picked pairs in every 100 pairs.

The loop resistance of each pair is to be tested with the lowest and highest readings recorded. The difference between the lowest and highest readings shall not exceed 10%.

3.17.4 Optical fibre backbone cabling

The acceptance testing and certification report for optical fibre cables shall include as a minimum:

- Cable identification
- Test equipment and test configuration details including equipment settings
- Length of fibre segment in metres
- Loss over fibre segment in dB
- Date and time of testing
- Name and signature of testing engineer

Optical loss testing shall be conducted on each core of all installed optical fibre cable runs by way of a Light Power Meter. Actual throughput loss, in decibels (dB), of the fibre link at the wavelength of system operation shall be tabulated from both ends of each fibre link.

Testing for OS2 optical fibres shall be carried out at the optical wavelengths of:

- 1,310nm
- 1,550nm

Testing shall be carried out using a suitable launch cable and clearly show loss at all splices and connectors.

3.18 Documentation

3.18.1 Handover documentation

The following documentation shall be supplied at the completion of the project:

- As-constructed scale site and building/floor location plans showing the location and size of pathways and the cables installed therein, cable routes, pit locations and rack/distributor locations. Scale drawings shall be to a reasonable accuracy in the event that CAD drawings of the site are not available. (Refer Figure C1 of AS/NZS 3085.1)
- As-constructed schematic diagrams detailing the quantity and types of cables linking distributors. (Refer to Figure C2 of AS/NZS 3085.1)
- As-constructed equipment room layouts, including associated services equipment
- As-constructed physical rack layouts. (Refer Figure C3 and C4 of AS/NZS 3085.1)
- As-constructed physical layout drawings detailing outlet positions and identification numbers
- Cabling infrastructure patching records (Refer Appendix D and Appendix E of AS/NZS 3085). Records shall be generated and recorded in accordance with the data storage requirements of UoA.
- Equipment lists detailing (type/make/model for) the installed equipment including racks, outlets
- Test reports detailing procedures, equipment configuration and test results for balanced copper cable
- Test reports detailing procedures, equipment configuration and test results for optical fibre cable
- 25 Year Warranty documentation
- Contractor details.
- TCA1

Refer to K. Documentation Design Standard for documentation requirements.

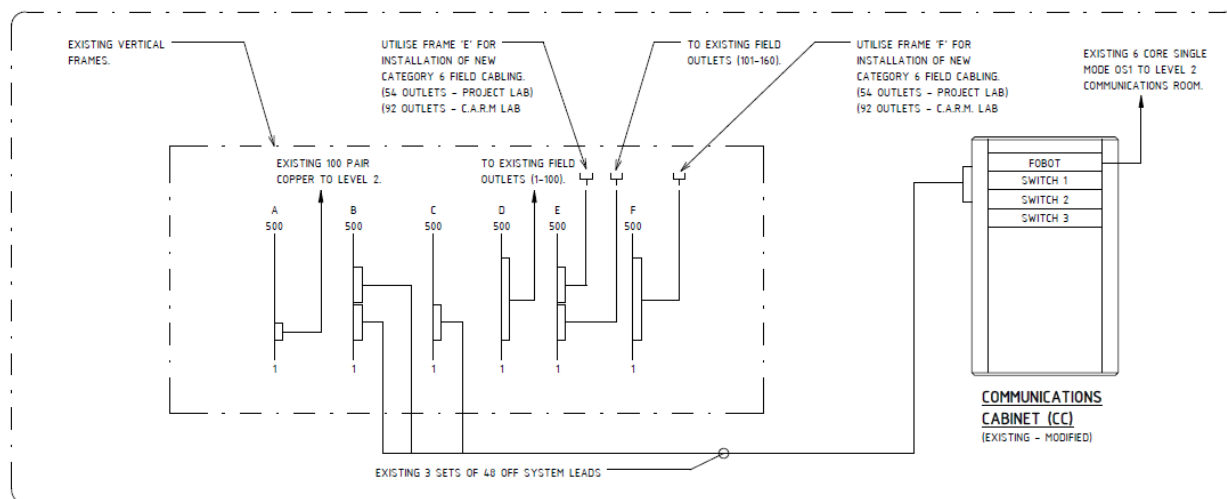


Figure 3. Typical Commscope Frame Layout Detail

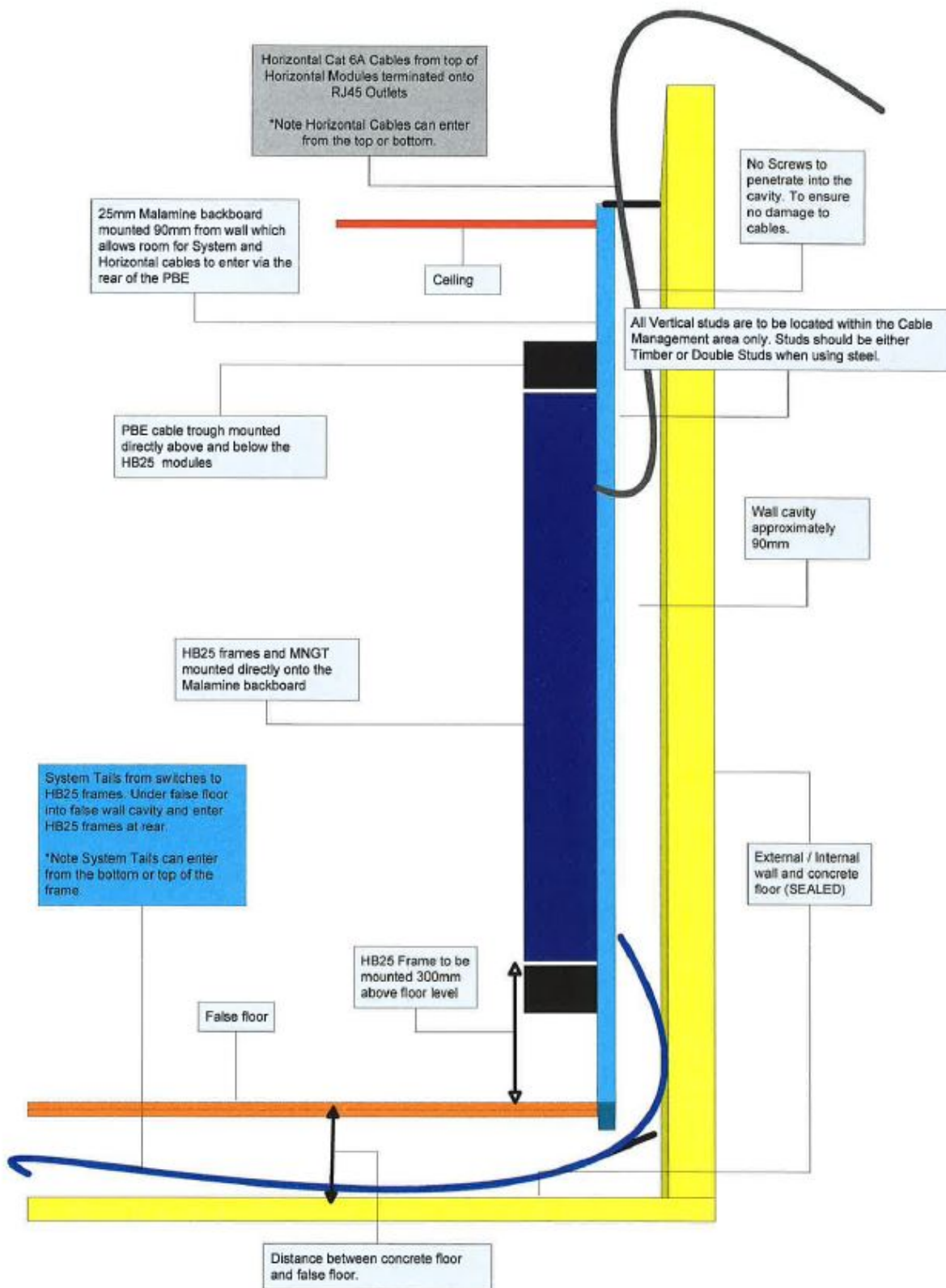


Figure 4. Typical False Wall layout example (Commscope Cat 6A)



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SCHEDULES

E. Communication

4. Specifications

4.1.1 Preferred manufacturers

ITEM	PREFERRED MANUFACTURER
Racks	Panduit or equivalent
Structured Cabling System	
Copper (Internal)	Panduit or Commscope
Copper (External)	Panduit or Commscope
Fibre (Internal)	Panduit or Commscope
Fibre (External)	Panduit or Commscope
Cabling Support	
Cable Ladder Tray	Unistrut
Power Distributor Unit	Rack manufacturer or equivalent

4.2 Cabling

Campus backbone cabling (external inter-building)

OS2 12-core single-mode optical fibre minimum.

Building backbone cabling (internal intra-building)

OS2 12-core single-mode optical fibre minimum

Inter-building copper backbone cabling

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

The inter-building copper cables shall be of Outdoor Cable construction as in AS/CA S008.

Cables shall not be direct buried.

Intra-building copper backbone cabling

The backbone cable shall be ACMA approved voice grade. The minimum wire diameter shall be 0.40mm and 50/100 pair cables should be used.

Backbone cabling shall be used to connect the CD / BD to all FDs where installed.

Structured Cabling

- Outlets running in a room to a local Communications Cabinet within the same room shall have blue sockets & bezels

Category 6 - Commscope

Insulation Displacement Connection (IDC) Highband Ultim8 Disconnection modules to be utilised where a 55 way frame solution has been utilised for Category 6 cabling.

The cable colour shall be grey and the socket shall be black

Category 6a - Commscope

Highband 25' Cross Connection Solution to be utilised where Category 6a cabling has been utilised

The cable colour shall be grey and the socket shall be black

Category 6a – Panduit

- Standard Jacks - CJ6X88TGBL
- Outlets installed in Harmony rails - CJRCAPBU – 90 Degree caps
- Outlets installed in Moduline and enclosed mounting blocks where space is an issue - CJLR6X88TGBL – 45 degree Left/Right –
- Outlets installed on Cavity walls - CJUD6X88TGBL – 45 degree Up/Down

Patch Panels

- 24 Port – CPPL24WBL Y
- 48 Port – CPPL48WBL Y
- Jacks for patch panels - CJ6X88TGBL-C
- Labelling to be printed labels inserted in the window areas the same as the field faceplates, but spacing is to be correct to suit the 4 modules sections.

Fibre Enclosures

- FCE1U – 1RU Fibre Enclosure – Slide Out Version

Leads

- UTP28X0.2MBU – 200mm C6a Blue thin patch panel leads
- UTP28X1MBU – 1M C6a Blue thin field fly lead
- UTP28X2MBU – 2M C6a Blue thin field fly lead
- UTP28X3MBU – 3M C6a Blue thin field fly lead

Cable:

Copper

- PUL6AV04BU-EG – Cat6a Blue UTP –

Fibre

- FLKL924Y – Indoor rated 24C OS2 SMOF
- FLNR924Y – Outdoor rated 24C OS2 SMOF

Optical fibre cabling

Optical fibre cabling shall meet the requirements of AS/CA S008 and shall meet or exceed the performance requirement of AS/NZS 3080 clause 9.4 for the relevant performance class.

Cable jackets shall incorporate clearly legible identification marking distance intervals not exceeding one metre to indicate cable manufacturer, date of manufacture, batch number, cable type and capacity and length marker.

- External – (Cable Jacket – Blue or Black)
- Internal – (Cable Jacket - Yellow)

Optical fibre cables shall terminate at the fibre break out trays (FOBOTS) located at distributors. Each cable shall be continuous from one Comms room to the destination Comms room without intermediate joins or connections. The cable strength member shall be securely fastened at the termination rack.

Optical fibre cable shall be terminated with LC fibre connectors. Racks shall be filled from left to right.

Optical Fibre Enclosures

Panduit 1 RU Fobot's shall be the slide out version – FCE1U, and be labelled with engraved Treffolyte labels on the adjacent blank panel and below or above the enclosure with the origin of cable

Copper work area cords

Quantities of each length shall equal to the number of outlets and to be confirmed with IT depending on areas requirements.

Work area cable lengths shall be 1m & 2m in length.

- Commscope Category 6 leads shall be white
- Commscope Category 6a leads shall be yellow
- Panduit Category 6a leads shall be 28 AWG (skinny style) blue

Optical fibre patch cords

Optical fibre patch cords shall be provided as standard manufactured items of standard length and shall be as short as is practicable to minimise excess cable management requirements. Longer patch cords will be required where network equipment is not installed in the same rack as the optical fibre termination / distribution panel.

Optical fibre patch cords will not necessarily be provided at the time of installing the optical fibre, as the client may not know what the exact active equipment type will be.

Optical Fibre patch cords shall be coloured yellow for Single Mode and Aqua for Multimode

4.3 Capital works programs

Horizontal cabling systems shall be a minimum of Category 6a (Class A) balanced cabling.

All main cable trays and core holes shall have 30% spare capacity after project completion to allow for organic growth.

4.4 Expansion and upgrade to existing facilities

Upgrade or expansion works are to maintain uniformity with this standard (i.e. Cat 6/6a or OS2)

4.5 Cable pathways

Underground pathways

The minimum conduit count and size for lead-in cables to any permanent building is one 100mm conduits.

Minor campus pathways shall consist of a minimum 2 off 100mm conduits. Major campus pathways shall consist of a minimum 4 off 100mm conduits.

Trenches

In general the depth of cover required shall be;

- 450mm under public footway or roadway
- 300mm in other areas except where soil conditions preclude a trench depth to provide 300mm cover in which case the depth of cover shall be in accordance with AS/CA S009 (18.6)

Cable Trays

- All trays shall be mounted in accessible locations
- All tray in Comms rooms to be powder-coated black as well as supporting Unistrut
- Removed tray runner edges above rack in Comms to have push on black edge trim around the cut-outs.

4.6 Internal catenary

Catenary wires used for support of internal cablings shall be installed within ceiling spaces. Catenary wires shall have an insulating sheath.

The maximum bundle size of cables supported by a catenary wire shall be 20 4-pair cables for Category 6/6A Commscope, and 24 4-pair cables for Panduit C6a.

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 7.4.3.1.

4.7 Cabinets

Freestanding racks shall be fitted with:

- Front and rear 19" mounting rails
- Horizontal and vertical cable tidy panels
- Vertical cable tray or cable management troughs fitted to both sides of the rack
- Power rails with adequate quantity of outlets to be accommodated in the rack with not less than 10 outlets and typically 20 outlets with Clipsal 56CSC320 round pin plug tops
- Removable side panels
- Keyed, lockable, perforated steel front door or split front door depending on clearance
- Keyed, lockable, perforated steel split rear door
- Levelling adjustment
- Earth bar as part of Communications Earth System