



The University of Newcastle

Telecommunication and Data Cabling

**Technical Specification 2009 (Revised
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TELECOMMUNICATIONS

1. Introduction

1.1 A structured cabling system consists of a flexible cabling infrastructure that can support computer, telephone, and video systems independent of their manufacturer. In a structured cabling system, each information outlet is varied to a central point using a star topology, facilitating system interconnection and administration.

1.2 The standards for a structured cabling system, described in this document apply to all new cabling installations at the University of Newcastle unless otherwise specified in the text or in writing by an Information Technology Services (ITS) representative.

2. Ownership

2.1 All permanently installed data and voice cabling inside buildings, between buildings and active equipment forms part of the University communications infrastructure and as such are the responsibility of ITS. Any proposed alteration of the cable must be reported to an ITS representative for approval prior to commencement.

23.3.2 ITS will maintain and configure active equipment on the campus network.

3. Definitions

The structured cabling system shall consist of any or all of the following sub-systems:

- Work area subsystem - The connection between the information outlet and the equipment in the work area is provided by the work area subsystem. It consists of fly leads, adapters and other transmission electronics.
- Horizontal subsystem - The horizontal subsystem connects the telecommunications equipment room to the information outlets (IO's) in the work areas. It consists of the transmission media, the associated hardware terminating this media and IO's in the work area.
- Riser subsystem - The main cable route between floors within a building and between telecommunications equipment rooms within a building is called the riser subsystem. It consists of the transmission media and the associated terminating hardware.
- Access to the user subsystem is via telecommunications closets on each floor. The riser subsystem is only used for the through passage of cables. No cables shall be terminated in telecommunications risers.
- Administration subsystem - The administration subsystem links all of the subsystems together. It consists of labelling hardware for circuit identification and patch leads or jumper wire for creating circuit connections.
- Equipment subsystem - The equipment subsystem consists of electronic communications equipment in the telecommunications equipment room and the transmission media required to terminate this equipment on distribution hardware.
- Campus subsystem - The campus subsystem provides the links between multiple buildings. This subsystem includes the entrance facilities into the building, transmission media, associated terminating hardware and electrical protection devices to mitigate harmful voltages when the media is exposed to lightning and/or power surges.

4. Standards Conformance

All cabling work shall be implemented and completed in strict compliance with the latest regulations and standards issued or endorsed by the Standards Association of Australia and AUSTRALIAN COMMUNICATIONS AUTHORITY (ACA) outlined in sections 5, 6 and 7.

5. Applicable Australian Standards

5.1. The cabling materials and practices shall comply with the latest edition at the time of all relevant Australian Cabling Standards including but not limited to the following:

- AS 3000 SAA Wiring Rules.
- ACATS008:1997 Requirements for Authorised Cabling Products
- AS/ACIFS008:2001 Requirements for Authorised Cabling Products
- AS/ACIFS009:2001 Installation Requirements for Customer Cabling (Wiring Rules)
- AS/NZS 3085.1:1995 Telecommunications Installations-Administration of Communications

5.2. Cabling systems shall comply with the following:

- AS/NZS 3087:2000 Specification for the Testing of Balanced Communications Cabling • AS/NZS 3080:2000 Integrated communications cabling systems for commercial premises.
- AS 3084:1993 Telecommunications installations - Telecommunications pathways and spaces for commercial buildings.
- AS 3123 Approval and Test Specification - Plugs, socket outlets and couplers for general industrial application.
- AS 3260 Approval and Test Specification - safety of information technology equipment including electrical business equipment.
- AS 3548 Electrical Interference - Limits and methods of measurements of radio disturbance characteristics of information technology equipment.

6. EIA/TIA Standards

The cabling materials and practices shall comply with the latest edition at the time of all other relevant standards including but not limited to:

- TSB-67 Transmission performance specification for field testing of UTP cabling systems.
- IEC 801 Pt 3 & 4 Immunity to radiated electromagnetic fields and electrical transients.
- UL 1863 Standard for Communication Circuit Accessories • UL 444 Listing of Communication Cable as Required by NEC.

7. Australian Communications Authority Compliance

The structured cabling system must comply with the requirements of the ACA, thus maintaining reasonable immunity to electromagnetic disturbances from other environmental sources. To meet these requirements, the cabling system shall conform to the latest edition at the time of the relevant standards including but not limited to:

- AS 3548 Electrical Interference - Limits and methods of measurements of radio disturbance characteristics of information technology equipment
- IEC 801 Pt 3 & 4 Immunity to radiated electromagnetic fields and electrical transients.

8. Workplace Health and Safety Compliance

- All work shall comply with the Occupational Workplace Health and Safety rules of the University available on the UoN website.
- Contractors shall take appropriate measures to minimise the impact of dust and leave the workplace clean and tidy upon completion.
- Contractors shall minimise the physical and noise disturbance in the work area. Where such disturbances prevent the normal operation of staff or equipment in that area, the cabling work shall be done outside normal business hours.
- Contractors shall exercise their duty of care, and ensure that their presence and installation practices do not create health or safety hazards to people and equipment.

9. Sealing

The contractor shall:

- Effectively seal all openings, made or provided, in or through building walls, floors, ceilings, and other areas after cable reticulation;
- Effectively seal all cable duct openings above ground level, and all cable entries into trenches or buildings to prevent the ingress of moisture and the entry of rodents;
- Ensure that all spare conduit and cable entries into telecommunications equipment rooms are effectively plugged and sealed to prevent the ingress of moisture;
- Ensure that all openings through roofs and external walls are made weatherproof. Where necessary, this will include the installation of flashing and/or rain hoods to prevent the entry of driving rain, seepage, etc.

10. Fire Rating

All cable installations and fire stopping shall be in accordance with local fire ordinances. All materials shall comply with the latest edition at the time of all relevant standards including but not limited to:

- UL 1863 Standard for Communication Circuit Accessories
- UL 444 Listing of Communication Cables

11. Material Colours

- All exposed materials shall be of a colour which is consistent with the surrounding decor and shall be approved by UoN representative.
- The colour of telecommunications cable trays, conduit etc. shall conform to UoN requirements provided for each job.

12. Painting and Corrosion

The contractor shall be responsible for corrosion protection and the painting of all brackets, support cable ladders, weather shields, etc. being supplied and/or installed. The contractor shall also be responsible for the restoration of any damaged paintwork on equipment and accessories to the supplied finish, or to a matching finish approved in writing by UoN.

13. Level of Documentation

The contractor shall:

- Provide soft and hard copies of all test results.
- Identify (label) all cables and equipment as outlined in this document for each specific subsystem.
- Ensure that record books pertaining to new installations and changes are updated and accurate for each subsystem. Record entries shall be neat, tidy and completed in pencil.

14. Removal of Redundant Cables

It is mandatory that all redundant data and telephone cables are removed during or after a new installation. However, phone and data services must be retained to areas that require them during such an installation. It is the responsibility of the contractor to identify and remove all redundant cables. It is suggested that consideration be given to recycling redundant cables.

15. Warranties and Guarantees of Performance

15.1. Installation testing:

- 100 percent of all cabling shall be tested prior to commissioning. All tests shall be from end-to-end and shall include the connectors and terminating equipment at both ends.
- All as installed cable lengths shall be recorded and submitted with the test results, to the ITS representative.
- UTP cabling shall be tested for conformance to EIA/TIA 568A Category 6/6A, or as approved by the Information Technology Directorate, and in accordance to TSB- 67. The tester used shall be

TSB-67 Level IIe compliant and have a current calibration certificate from a National Association of Testing Authorities accredited certification facility.

15.2. In accordance with those standards all the completed work will be tested and certified by the installer. Copies of all "as installed" plans and tests results will be forwarded to ITS.

Upon receipt of these documents ITS will authorise connection of the work to the network.

Drawings shall be submitted in hard and soft copy.

15.3. Fibre optic cables shall be tested at 850 nm, 1300 nm and 1550 nm. Test results of all tests shall be forwarded to the ITS representative for their records.

15.4. The following warranty and warranty documentation shall be provided by the installation contractor:

- A minimum twenty-year passive product warranty backed by the manufacturer.
- A minimum twenty-year application assurance warranty on applications and standards described in this document including Category 6/6A certification.
- A copy of any additional contractor support warranty.
- All warranties will commence from the date of commissioning.
- All components of the structured cable system shall be matched and guaranteed as an end-to-end system. Substitution of nominally equivalent components in lieu of vendor matched components will not be allowed unless specifically authorised in writing by the ITD representative.

16. Fly Leads - Materials

- In new building installations all data fly leads shall be factory-terminated, 4-pair, minimum category 6A STP with RJ45 connectors, and shall not exceed 5m. Fly-leads shall be the same make and specification as the structured cabling system being installed within the building.
- In building refurbishments as a minimum specification, all data fly leads shall be factory terminated, 4-pair, minimum category 6 UTP with RJ45 connectors, and shall not exceed 5m. The field fly-leads shall be the same make and specification as the structured cabling system being installed within the building.
- All patch leads for rack end shall be Panduit STP28X Cat6A STP leads. Confirm lengths with ITS Representative before supply.
- Telephone fly leads may be category 3 with RJ45 connectors at wall outlets. Type 610 sockets may be used to maintain consistency with other phone installations in the same work area.
- Fiber optic fly leads shall have LC, SC or ST connectors to suit the installation. Leads to be manufactured by Corning. Confirm lengths with ITS Representative before supply.

17. Cable Installation Practices

- Where cable management facilities are provided in modular furniture or partitions, the cable slack from fly leads shall be housed inside these facilities.
- Where no cable management facilities extra fly leads shall be laid against a wall and behind semipermanent furniture such as desks, filing cabinets and bookshelves. Fly leads must never be laid next to chairs and other furniture which is moved on a regular basis.
- No cable slack shall protrude into the work area where it can be damaged by people or mobile furniture. If necessary, cable slack shall be taped to the back of semi-permanent furniture.
- Fly leads shall not be run along any part of the floor where they could pose a safety hazard to people or equipment.

18. Horizontal Subsystem

New Installations

18.1.1 Installations in new buildings shall be a minimum standard of CAT 6A 4-pair, shielded twisted pair (STP).

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- 18.1.2 All STP information outlets shall be minimum category 6A and shall be electrically and mechanically matched to the STP cable to which it connects. ie CAT 6A to CAT 6A.
 - 18.1.3 All horizontal STP cables shall be terminated in the telecommunications equipment room on 1RU 24 port, category 6A RJ45 patch panels.
 - 18.1.4 All patch panels shall be electrically and mechanically matched to the STP cable to which they connect.
 - 18.2 Panel Specifications should match horizontal cable specifications.

Building refreshes or refurbishments

- 18.2.1 All horizontal cables shall be minimum category 6, 4-pair, unshielded twisted pair (UTP) cable and shall not exceed 90m from end-to-end. Cabling should match Category 6A (STP) or higher if it is installed in the building.
 - 18.2.2 All UTP information outlets shall be minimum category 6 and shall be electrically and mechanically matched to the UTP cable to which it connects. ie CAT 6 to CAT 6.
 - 18.2.3 All horizontal UTP cables shall be terminated in the telecommunications equipment room on 1RU 24 port, category 6 / 6A RJ45 patch panels. **All patch panels shall be electrically and mechanically matched to the UTP cable to which they connect.**
 - 18.2.4 Panel Specifications should match horizontal cable specifications.
19. Horizontal fibre optic cable shall only be installed when specified in writing by the ITS representative and shall be a minimum of 2 core fibre to each workstation area.
20. All fibre optic cable shall be terminated using LC connectors or as requested by ITS representative.
21. The contractor shall supply and install approved mechanical protection on all horizontal cables.
22. In work areas and public places, horizontal cables must be fully enclosed within cable ducts.
23. In ceilings, telecommunications equipment rooms, telecommunications' risers, and other non-public areas, mechanical protection shall consist of cable ladders, cable trays, conduits, and unions.
24. Cables shall be supported clear of the ceiling structure by approved cable support systems. Under no circumstances shall cables be laid on ceiling tiles, bed to a ceiling support, or bed to the outside of a union with a cable tie.

Cable Ducts

25. Cable ducts shall be installed in all work areas and public places for the containment of telecommunications cables. These ducts shall;
- a Be identical to existing ducts in that located they exist.
 - b Be approved by Facilities Management and ITS representatives.
 - c In ceilings, telecommunications equipment rooms, telecommunications risers and other
 - d Be located at a height consistent with existing ducts. Where no duct currently exists, the installer shall consult the Manager - Operations to determine the appropriate height for fixing.
26. **Cable Trays, Ladders, Catenary Wires and Unicons**
- If twenty five (25) or more cables run in ceiling space in parallel, a cable tray is the preferred method of reticulation. A basket style tray similar to the Cabac product shall be used. Tray size shall be determined to provide sufficient space for future cabling installations.
- Please consult with university IT staff to determine cable tray pathways and tray sizing prior to installation.
27. From the cable tray system, cables shall be supported clear of the ceiling structure by unicon clips at maximum intervals of 1.2m, and be extended to the top of the service columns or partition wall and down to the workstation location. No more than five UTP cables will be allowed in one unicon.
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Conduits

28. Where cables traverse inaccessible ceiling areas, such as those behind lock-in type ceiling ties, drywall and plaster, conduits with draw wires shall be used for the distribution and containment of cables.
29. Inspection type tees, bends, etc, are permitted with approval by the ITS representative.
30. Draw wires shall be provided in all conduits after installation for possible future cabling additions.

31. Catenary Wires

- Catenary wires may be used in circumstances where it is not possible to install cable trays, ladders, or conduits. Approval should be obtained from the ITS representative prior to the installation and use of catenary wires.
- A maximum of twenty-four (24) cables shall be attached on any single catenary wire.

30. Installation Practices

- All horizontal cables shall be terminated in the telecommunications equipment room/closet.
- 1 RU patch cable management unit shall be mounted under each RJ45 patch panel.
- The cables shall be terminated in accordance with EIA/TIA 568A. Some existing installations may require termination to match existing installation (i.e. 568B). All new or refurbished installations will be 568A.

31. Patch Panel Identification

- Each patch panel shall be fitted with a label in accordance with Australian Standard AS 3084.
- The identification label shall clearly identify the corresponding outlet number.

32. Labelling

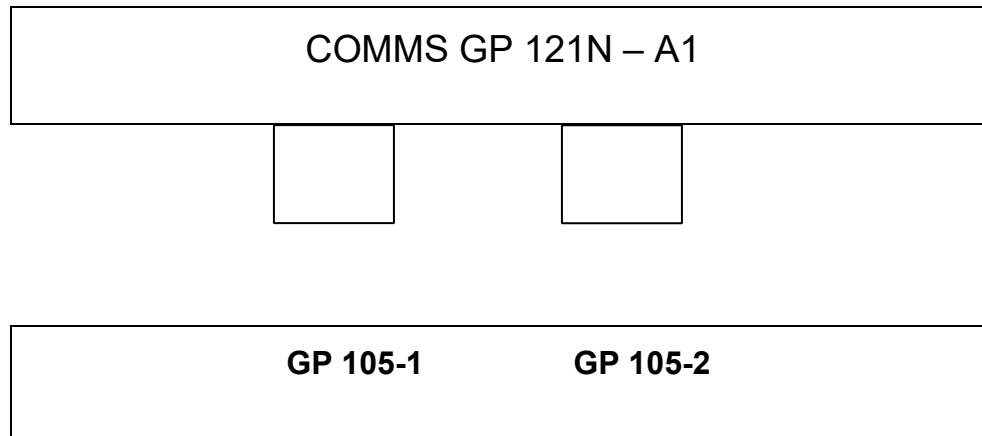
Each outlet shall have a printed label identifying the room, outlet number and from which distribution frame it is supplied. All outlet labels should have the room number as a prefix and then be individually numbered from 1 to the highest number in a clockwise direction around the room. For example: 105-1 where "105" is the room number and "1" is the number of the outlet in that room.

Labelling Notes

- Room numbers and outlets should NOT have leading zero's.
- The room numbers shall be taken from the University Small Scale Plans - latest revision. Small scale floor plans will be made available to the contractor for updating and recording.

Labelling Example for Dual Outlets

COMMS GP 121N – A1
GP 105-1 GP 105-2



33. Identification of Fibre Optic Interconnection Units

- Each fibre cable termination shall be clearly numbered, commencing with number 1 at the top left, and continuing from left to right in natural reading order. The numbering shall recommence at 1 for each unique destination; for example, if there are two 12 core cables going to the campus telecommunications room, they shall be numbered 1-24. Another 12 core cable going to another destination shall be numbered 1-12.
- Each group of fibres shall be clearly labelled to identify the destination (building and room) to which it connects.
- A warning notice detailing the hazards associated with optical devices shall be affixed to each termination enclosure in a prominent position.

34. Equipment Subsystem – Materials

Communications Cabling Termination Racks

- All new network room installations shall have Panduit 45RU 2 post, free standing lab racks installed. Each of these racks must be electrically earthed as per Australian Standards – AS 3000 & AS 3080. Please see picture below which shows a typical rack communications rack layout.
- Install a 600mm wide basket style cable tray (Cabac or similar) above the free standing lab racks to assist with the management and distribution of communication cables. This tray shall interconnect with cable distribution trays which reticulate communications cabling throughout the building.
- 300mm Panduit style vertical cable minders (with swing doors) shall be installed between each of the freestanding lab racks. 200mm Panduit style vertical cable minders (with swing doors) shall be fitted to the ends of each lab rack installation.

- 2 x 2RU Panduit style horizontal cable minders with hinged covers shall be provided for each network rack. EG: 2 racks = 4 x 2RU minders in total.
- Provide 2 x Panduit style end panels for each rack installation.



35. Wall Mounted Cabinets

These of wall-mounted data cabinets is discouraged. Where no suitable alternatives exist, wall mounted cabinets may be used with the written authorisation of the ITS representative. These cabinets shall;

- Have minimum dimensions of 600 mm height, 700 mm plus hinge depth, 600 mm width.
- Be fitted with steel sides, and lockable front steel or Perspex door. (Door is optional depending on cabinet location. If unsure, contact appropriate ITS representative).

36. Underground Cables

Refer to previous standards sections for the installation of underground cables and Underground Pipe work for separation of cables.

- Ensure segregation between telecommunications and other types of cables comply with ACA Cabling requirements, particularly electrical and control cabling.

- Telecommunications cables shall be laid with a minimum of 500mm cover to the top most surface of the conduits. Stacking of conduits with other services shall be rejected. There will be a minimum clearance of 300mm between telecommunication and electrical conduits. All telecommunication conduits in ground shall be white. Underground cable joints are not acceptable.
- Maximum distance between pits on underground cable runs shall be 60 metres. All underground pits shall have their lids marked with a brass plate indicating the service installed and the route from the pit, and shall be adequately drained. Brass marker plates with lettering not less than 10mm high shall be installed at kerbs and road crossings and at any changes in direction. In unpaved areas, the marker shall be set in a concrete pad not less than 300mm square x 200mm deep. Separation distances to other services shall be as required by relevant Acts and Regulations.
- All underground cable pathways/conduits must have a copper trace wire installed as well as a separate draw wire.

37. Identification

- All inter-building cables shall be identified with an indelible label in every pit.
- All inter-building cables shall be identified with an indelible label in every telecommunications riser closet and telecommunications equipment room through which they pass.

38. Typical Equipment Rack Layout

38.1. Single Rack Installation

- Fibre Termination Rack
- 1RU Cable Management
- 24 Port Patch Panels for Telecommunication Outlets and Associated 1RU Cable Management
- 24 Port Patch Panels for Voice Circuits and Associated 1RU Cable Management
- Network Switch
- 2RU Cable Management • Network Switch
- 2RU Cable Management

38.2. Double Rack Installation

- Fibre Termination Rack
- 1RU Cable Management
- 24 Port Patch Panels for Telecommunication Outlets and Associated 1RU Cable Management
- Network Switches and Associated 2RU Cable Management
- 24 Port Patch Panels for Voice Circuits and Associated 1RU Cable Management
- Side Panels Removed Between Racks

39. Recommended Documents

Communication Cabling Manual (CCM) particularly in the following parts:

- AS/NZS 3080:2000 - Telecommunications Installations-Integrated Telecommunications cabling Systems for Commercial Premises
- SAA/SNZ HB29:2001 - Telecommunications Cabling Handbook
- AS 3084 - Telecommunications Installations-Telecommunications Pathways and Spaces for Commercial Buildings
- AS/NZS 3085.1 - Telecommunications Installations-Administration of Communications Cabling Systems, Part 1: Basic Requirements

- AS/NZS 3087:2001 - Telecommunications Installations-Generic Cabling Systems Specification for Testing of Balanced Communication Cabling in Accordance with Values Set Out Within AS/NZS 3080
- ACA TS009 - Installation Requirements for Customer Cabling (Wiring Rules)

40. Wireless Networks and Equipment

All wireless access point installations will be coordinated through IT Services. This is due to the potential for interference to the UoN campus wireless LAN. Wireless access points comms outlets and wireless access points to be installed as per below image.



41. Terms and Abbreviations

All telecommunications terms and abbreviations used in this document are defined in the Australian Standard /N/ZS 3080:2000.

42. Network Rooms

Where a new network room is to be created, the size and location of the network room needs to be determined as part of the initial project planning. The network room must be located in a central area which keeps all horizontal communication cabling lengths to a minimum, with a mandatory requirement of keeping each run under a maximum length of 90 metres. In larger buildings there may be a requirement for more than 1 network room. New network rooms shall be located close to central cable risers and main communication pathways, this must be planned for during the design phase of a project.

The size of a network room shall be determined by the amount of IT Infrastructure required to support the building. All network rooms **MUST** be a minimum of 3 metres x 3 metres in size. The size of all network rooms **MUST** be approved by the IT Services team at The University of Newcastle.

All network rooms shall be air conditioned via their own split system air conditioning unit.

All network rooms shall be painted white and have a light colour antistatic Vinyl floor covering installed.

Each network room has the following minimum power requirements. Larger network rooms may have additional requirements on a case by case basis.

- 1 x Clipsal 56 Series 32A Socket (Round Pins) on dedicated non RCD circuit
- 4 x Clipsal 56 Series 20A Socket (Flat Pins) on dedicated non RCD circuits
- 1 x Cleaners 10A Double GPO

43. Cabling Installation Details and Requirements

43.1 Existing Buildings

The University of Newcastle has Commscope category 6/category 6A and Siemon Cat6a communication cabling installed in its existing buildings. Commscope and Siemon provide a twenty year guarantee with their cabling solutions, which covers against faulty materials or poor installation practices. Where new cabling is to be installed in an existing building, the cabling type used **must** be the same as the existing cabling within the building. Accredited Commscope and Siemon installers **shall** be engaged to carry out the installation. This will ensure the integrity of our 20 year communication cabling warranty for all university buildings.

All refurbishment work **MUST** allow for the installation of Commscope or Siemon Category 6 or 6A communication cabling in all university buildings, computer rooms and data centre areas. Confirm with ITS representative if existing cabling should be upgraded before refurbishment works commence.

43.2 New Buildings A cabling solution which provides a minimum warranty of 20 years on all materials and installation practices must be installed. The University of Newcastle uses Siemon or Panduit structured cabling throughout its new buildings and one of these cabling solutions **must** be used in the interests of keeping a consistent communications cabling approach. All structured cabling **must** be installed by UON approved communications cabling contractors who are accredited installers with the particular cabling product being used.

The minimum cabling performance specification for all new buildings is category 6A. Category 6A cabling MUST be installed in all new university buildings, computer rooms and data centre areas.

43.3 University Communication Contractors The three companies listed below are all experienced communication cabling contractors for The University of Newcastle. Each of these three companies is familiar with the university site and are accredited installers for the cabling manufacturers approved by the University. These companies should be invited to provide quotations and tender submissions for all communication cabling work at The University of Newcastle.

Nerencom

Contact: Neil Stevens

Ph: 02 49909269 Mob: 0408909279

neil@nerencom.com.au

OAS Integrated Cabling Solutions

Contact: Craig McMillan

Ph: 02 49401888 Mob: 0428 694681

craig.mcmillan@oascabbling.com.au

Star Group

Contact: Mark Andrews

Ph: 02 49735500 Mob: 0408297588

mark.andrews@commstar.com.au