Information Technology Services Division

ICT 6.5.2016 FIBRE OPTIC REQUIREMENTS

[ITSD Networking and Audio Visual Services]

BUILDING WIRING SPECIFICATION FOR DATA & VOICE SERVICES

Abstract

This standard outlines the specifications for cable support and installation; this standard pertains to cable installation through out Deakin University and associated locations managed by Deakin University Information Technology Services Division

Document Control

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Document History

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V1.0.1	David Donnarumma	Moved to ITSD standard format	23/07/2010
V1.0.2	David Donnarumma	Removed part numbers	31/08/2010
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Occupational health and safety

One of the major objectives of the University is to ensure that staff, students, visitors and the community does not suffer injuries and illnesses as a result of the activities and operations of and at the University
It is expected that awarded Cabling Contractor and any nominated sub-contractor will make available the necessary resources to comply with all relevant Occupational Health & Safety Acts and Regulations, thereby ensuring that the workplace environment is safe and without risk to health.

Everyone in the workplace environment is required to be aware of potential hazards and take steps to prevent workplace accidents, injuries and illnesses.

It is therefore important to note that Cabling Contractor(s), any nominated sub-contractor(s) and their staff shall conform to normal site safety requirements as advised by Deakin University.

Maintaining a safe working environment

Consideration for the following should be understood in order to maintain a safe working environment during the course of the installations.

1. Safety of students, instructors and Contractors shall be observed at all times.
2. All Contractors that perform any work on a Deakin University site are to undertake a site safety induction, where applicable.
3. Where applicable, no Contractor is permitted to commence any work on site at a Deakin University Campus without having completed this site safety induction.
4. Where applicable, the safety induction program will be arranged with the Deakin University Site Manager.

Note of concern

Asbestos

The Cabling Contractor, any sub-contractor and staff are to adhere to policies and procedures described within the **Deakin University Asbestos Management** documentation available from Deakin University upon request.

The Asbestos Register identified within the Deakin University Asbestos Management documentation is available from Deakin University upon request.

1 Standards brief

This standard outlines the specifications for optical fibre distribution cable installation; this standard pertains to optical fibre installation through out Deakin University and associated locations managed by Deakin University eSolutions Services Division.

This standardisation is paramount to providing a quality and guaranteed services to all voice and data outlets within the Deakin University premises and locations managed by Deakin University eSolutions Services Division.

2 Standard document access

All Deakin University ITSD staff and authorised/approved contracted personnel are provided access to this document.

3 Policy

This standard is applicable to all additions and alterations to fibre plant through out Deakin University and associated locations managed by Deakin University eSolutions Services Division.

4 Purpose

To describe product and expectations of Deakin University with respect to fibre additions and alterations through out Deakin University and associated locations managed by Deakin University eSolutions Services Division.

5 Conflict of information or clarification

Whenever a conflict of information occurs or clarification of instruction is required all query shall be made to the 'Deakin University eSolutions Audio-Visual & Networks Unit Leader or their delegate', here after referred to as the DeS AVN Representative.

For all projects or tasks that include data cabling a DeS AVN Representative will be assigned. This person is to be the first point of contact for all queries. If this person is not available to answer queries the Deakin University eSolutions Audio-Visual & Networks Unit Leader is to be contacted for alternative representation.

6 Exclusions

This document does not reference Copper products, installation or installers. All Copper works are specifically documented in the Building Wiring Standard.

This document does not describe cable contractor requirements or selection criteria. Nor does it describe cable installation methodology.

This document does not apply to Deakin University DeS Data-centres. Advice on requirements for such installations should be sought from the designated Deakin University DeS representative.

7 Related information

8 General information

Deakin University only accepts the AFL optic fibre solutions for all new installation.

The installation shall be a minimum of 2x 12-core Single mode optic fibre terminated at both ends with SCA connectors with. Each 12-core optic fibre shall be run with maximum diversity of path to the communications room, see 4.3 Path diversity.

For existing installations AFL product is to be used.

These products are to be used at all sites covered by this standard.

All installations using AFL product shall comply with all installation and testing methodologies and practices of AFL Global.

Connectivity between access communications closets and central core closets should be geographically diverse to minimise the potential for outage to the closet through multiple fibre cuts.

When Optic Fibre is to be installed outdoors it shall be enclosed in a 100mm contiguous watertight PVC conduit. Pits are to be installed at turning points and at intervals of 40 metres.

It is the responsibility of the Cabling Contractor to supply all materials required to complete an installation.

NOTE: The installation or reuse of *Moduline* duct or any similar interior/exterior cable channel housing (of any other brand or type) is prohibited, unless written permission is provided by the Deakin University eSolutions Audio-Visual & Networks Unit Leader or their delegate.

Approved duct product is ECD EL 15075 or Panduit Pan-Way® T70 or Twin 70 Raceway System.

9 Cabling contractor responsibility

It is the responsibility of the Cable Contractor to ensure a safe working environment at all times.

It is the responsibility of the Cabling Contractor to supply all materials and tools required to complete installation and testing.

It is the responsibility of the Cabling Contractor to visit the site prior to providing a response, to familiarise themselves with access requirements and site conditions, existing installations and all work required to complete the works. Ignorance of the existing conditions, requirements or installations will not be accepted as justification for subsequent variation to contract conditions or cost.

10 Fibre Optical cabling

All optic fibre works shall strictly comply with the vendor's product warranty, installation specifications, methodologies and test regimes.

Also, where the vendor is not specific all other optic fibre works shall comply with all standards of the Australian Communications Authority and the Standards Association of Australia., Specifically with the mandatory provisions of all applicable Australian Standards, and ACMA (Australian Communications and Media Authority) requirements contained in Communications Cabling Manual 2000.

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

If a conflict of information arises consult Deakin AVN Representative for determination.

11 Product selection

Deakin has selected AFL Single Mode 12 Core Optic fibre for new fibre installation to allow maximum flexibility and future proofing.

All cabling and terminal materials used shall be approved new AFL products.

For indoor use AFL 'Standard Loose Tube Cable' single mode fibre is to be used, AFC Group product # AFCUF112-YL.

For outdoor use AFC Group 'Indoor/Outdoor distribution Cable' is to be used, AFC Group product # AFCLT112.

Termination is to AFL SCA pigtails using the Fusion Splice Connection, AFL product # P1SCA2M-C12-900 (12PK 900um single mode SCA pigtails), into an AFL Fibre Optic Breakout Tray (with SCA through adaptors), AFL product # FRE-24SS/SCA-DU.

Continuous pathway (conduit and duct) must be present from end to end to allow proper support of the optical fibre system.

It is the responsibility of the Cabling Contractor to supply all materials required to complete an installation, and to consult with the DeS AVN Representative if any doubt about an installation exists.

12 Intra and Inter-building fibre optic cables

Inter-Building cabling works are situations where network cabling spans two or more buildings.

12.1 Intra-building cabling

Intra-building cabling shall be AFL single mode optic fibre AFL product # AFCUF112-YL unless otherwise indicated by the DES AVN representative.

Where existing cabling exists advice should be sought from the DeS AVN representative.

12.2 Inter-building cabling

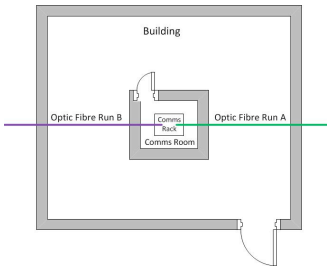
Backbone cabling between buildings will be end to end continuous run SMOF unless otherwise indicated by the DeS AVN representative.

No splicing of fibre optical cable is permitted unless approved by the DeS AVN representative.

12.3 Path diversity

All communications rooms shall be supplied with 2x Optic Fibre runs providing diverse path connections to the 2x core switches of the campus.

Diverse path is deemed as alternative building entry with convergence of the Optic Fibre runs only at the Communications Room



Passive patching from key communications room to the campus cores is possible with overall path to be determined case by case by the DeS AVN Network Unit Leader or their delegate.

Each Optic Fibre run shall be as a minimum 12 cores terminated at both ends in SCA connectors.

12.4 Intra and Inter-building cabling housing

The cable pathway infrastructure will provide the physical means to protect and support the optic fibre cable and shall conform to AS/NZS3084 in general and furthermore AS/NZS HB29.

Building approved risers should be used for passage of the cable, as indicated by the Deakin representative.

All proposed cable pathways for fibre optic cables are to be inspected for approval and subsequently approved by the Deakin University AVN representative prior to installation.

Required for fibre optic backbone cable is;

1. Galvanised steel cable ladder with a minimum width of 300mm and 75mm side rails for internal vertical risers.
2. Suitable securing to the cable ladder at intervals not greater then 400mm.
3. 100mm white heavy duty PVC conduit for external cable locations, with inspection pits and draw boxes installed at intervals of less then 40 metres.
4. Adherence to minimum bend radius.
5. Adherence to penetration and fire rating requirements where traversing such areas.
6. Use of nylon / PVC draw lines into Ducts.
7. Approved multi and micro-ducts for distribution of air blown fibres.
8. Use of suitable sheath to minimise rodent damage.

12.5 Inter-building cabling housing

Where penetration of concrete walls, ceilings, columns or floor beams or otherwise is required, the contractor shall provide sleeves for installation in conjunction with fixing of the formwork and replacing of concrete.

All penetrations of structural elements must be approved by the DeS AVN representative, and must also comply with current Deakin Faculty Management Services Division processes including completion of Job Safety analysis reports. Penetrations will be undertaken by coring, drilling, cutting or other Deakin approved methods to produce a penetration which is the minimum size required, and is neat.

12.6 Fire rating

Where a penetration traverses a fire rated area, the penetration must be sealed to ensure the integrity of the fire rated area and identified on drawings. All penetrations through fire-rated areas will require certification by an approved fire consultant before acceptance.

12.7 Inter-building cabling testing

All optic fibre cables installed shall be end to end tested to the minimum standard as defined AFL Global.

12.8 Trenching

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

All conduits located in trenches will be a minimum of 100m diameter white PVC, class 12.

If direct buried the conduit will conform with AS/NZS 2053 and AS/NZS 2032:2006 and AS/NZS 2566.2:2003 and later for depth, location and usage.

12.9 Approval

All clearances will be obtained by the Contractor in accordance with Deakin University Faculties Management Services Division prior to any work commencing. The Contractor will take reasonable care not to damage existing structures or services managed by other Deakin departments and will not trench within tree drop lines. The

Contractor will also follow Deakin Facilities Management Services procedures as well as Dial before you dig requirements at all times.

12.10 Back Fill

The Contractor will ensure there is at least 300mm of fill on top of conduits, and trenches will be backfilled and seeded by the Contractor, so as to not prevent a trip hazard. Unused fill will be removed from site and all stones cleared from site.

12.11 Communications tape

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

12.12 Segregation

Although fibre optic cable is electrically inert, any minimum segregation requirements from power cables must be adhered to. In the event of no specification, AS2834 and AS3080 or later will be observed.

12.13 Multi-story installations

In multi-story installations, optic fibre cables will not be installed between floors except via an approved communications cabling riser or duct.

The Contractor shall plan the Structured Cabling System and routing to ensure adequate segregation from hazardous services, ensure system integrity and performance, ensure that it does not present problems of maintenance or access, and ensure there is no conflict with the operation and maintenance of other systems.

Additionally where paths traverse to multiple destinations, the contractor should install geographically diverse paths unless otherwise approved by the DeS AVN representative.

12.14 Multi trades co ordination

The Cabling Contractor shall co-ordinate their works and the works of the other trades to ensure segregation requirements are maintained throughout the data cabling installation.

12.15 Cable fastenings

All optic fibre cabling will be made neat and tidy. AFL approved cable fasteners will be used at intervals as specified by AFL Global. In the event of no specification ACA TS009 will be observed.

12.16 Cable tray, duct and catenary

Installation of any Cable Tray, Duct and Catenary shall only be conducted with permission of a DeS AVN Representative.

Once a Cable Tray, Duct or Catenary path has been agreed the installation will be of the highest possible standard.

Sharing Cable Tray, Duct or Catenary with any other non-communications services is not allowed under any circumstances without permission from a Deakin AVN Representative*.*

All cable trays, catenaries and ductwork required to complete the installation will be the responsibility of the Cabling Contractor to supply and install

13 Terminations

13.1 Outlet termination and position

Termination of optic fibre will be completed in a Panduit 2 or 4 post communications rack with cable management on both sides. Where an exists rack is installed location with in the rack shall be determined by the DeS AVN Representative.

13.2 Fibre Optic Breakout Tray (FOBOT)

An AFL 24-port Sliding Patch Panel shall be installed unless otherwise stated by DeS AVN Representative. AFL product # FRE-24S/SCA-DU a 24 port 1RU slider enclosure which is suited to indoor or outdoor cables.

Note, shown loaded with SC connectors DU part includes SCA

13.3 FOBOT mounting

The FOBOT shall be mounted using the suppled ‘ears’ so that the front panel is flush with the rack verticals.

13.4 Fibre Optic connector mounting

The AFL FOBOT kit contains angled mounting plates. These plates are to be installed differently for the two types of racks the panel is to be mounted in.

Composite frame, these are racks that contain Cisco 3750 switches, the mounting plate are to be installed so that the SCA connections point to the right hand cable management (PRV6).

Optic Fibre distribution frame, these are racks that are either only optic fibre or contain a Cisco 6800 or 6500 router, the SCA connections to face the nearest cable management (PRV6).

Pictures to be added

13.5 Fibre Optic termination

All new works shall be AFL Group product through out. If existing carriers

All single-mode fibre terminations shall be completed with a factory machine polished fusion spliced pigtail with SCA style polished connector fitted to a minimum of 1.5m of

single-mode fibre. The connector body and nut is to be made of plastic with an 8 degree angle polish ferrule made of zirconia ceramic. The ferrule will have a rounded finish leading to the mating surface, to allow ease of cleaning and prevent snagging.

Connector body colour shall be green (internationally accepted TIA 598).

13.6 Fibre Optic Patch Leads

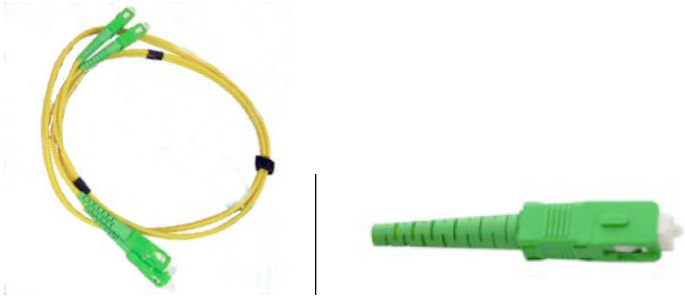
Optic Fibre Patch Leads shall be AFL product terminated at each end with SCA Duplex connectors and supplied in the lengths requested in the “Scope of Works” provided.

The Optic Fibre Patch Leads and connectors shall be ACMA approved and meet all AS/NZS 3080:2003 and IEC 60793-2 electrical, transmission and DB loss requirements.

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

1. SMOF would be 9/125m.m core/cladding diameter.

Optic fibre patch cords shall conform to the manufacturers system installed.



14 Labelling

All FOBOTS shall be labelled with a label conforming to DeS AVN Networking requirements for each application.
All cable labels are to be marked on the cable sheath with a tag type label. Sticker type labels are not to be used, unless the alternative labels being proposed can be proven to be durable (e.g. clear wrap around printable self-adhesive type may be suitable).

14.1 Cable labelling

The cable-labelling format (numbering code format) shall be specified to the Contractor by DeS AVN Networking before the commencement of cable installation and will indicate cable origin and core numbers to match the current system in use with in the campus.

The self adhesive cable labels shall be supplied and fitted by the Cabling Contractor. These are also considered to be under warranty through the installer for the life of the installation.

14.2 FOBOT labelling

The FOBOT-labelling format (numbering code format) shall be specified to the Contractor by the DeS AVN Representative before the commencement of frame installation. This will in general be labelled with a section of white rectangular traffolyte, 12x15mm in size, with an adhesive label with black text affixed to the traffolyte, with label format similar to FP01 to FP99.

The frame labels shall be supplied, printed and fitted by the Cabling Contractor at installation.

Required laser warning labels should be affixed to the FOBOT and the splice tray.

Each cable will be identified with destination (far end building/room number and the number of cores.

For label sizes syntax and font characteristics reference the DeS AVN standard for services and equipment Labelling.

14.3 Patching lead labelling

All patch leads will be labelled using a Panduit NWLC-7Y sleeve and wrap around cable label.

15 Testing

All testing shall follow the procedures and methodologies set out by AFL Global.

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

The results from the OTDR will form part of the test report.

15.1 Testing method

All terminated fibre cores shall be certified to the operational wavelength of 1310/1550nm for Single Mode Optical Fibre (SMOF) utilising a Light Source and Power Meter (ILM)

ILM testing shall be performed in both directions to verify the integrity of the cable and termination.

It is the responsibility of the cabler to obtain all current versions of all cable testing standards specific to the current cable installation and tools required to test to the specified standards.

15.2 Testing documentation

Each optic fibre core shall be tested for length, attenuation and defects using an OTDR and shall meet the minimum requirements of AFL Global.

Where there is no specific test or documentation required by AFL testing and documentation, testing will be as specified by DeS AVN representative.

15.3 Deakin University specific testing

Deakin eSolutions Networking reserves the right to spot test any or all services installed. This task may be performed by DeS Networking or their delegates.

16 Structured cabling system documentation

At the completion of the installation Cabling Contractor shall provide complete documentation covering the installation and maintenance of the optic fibre installation. Including 'as built' drawings showing all main optic fibre runs, optic fibre trays, optic fibre duct, catenaries, and telecommunications outlets: complete with outlet numbering.

16.1 Documentation quantity

The Cabling Contractor shall provide one (1) complete set of hardcopy documentation and one (1) complete set of electronic softcopy documentation.

16.2 Documentation delivery

The documentation shall be provided within twenty-one (21) working days of project completion to the DeS Services Division representative.

16.3 Documentation drawing sizes and format

All documentation shall be presented on either single or double-sided A4 pages. Where practical, drawings shall be on A4 size paper. However, A3 size may be used for larger drawings if the A4 size is insufficient.

Documentation will be presented in both hardcopy and electronic softcopy formats as an electronic AutoCAD R14 softcopy on CD-R media for inclusion into Deakin University plans.

16.4 Documentation contents

The Installation / Systems manual shall cover, but is not limited to, the following areas:

1. A detailed overview of the optic fibre installation.
2. Full description of the specific installation.
3. Full schematics showing the overall layout of the installation.
4. Test results (on a per connection basis):
5. Optic Fibre Tester / Scanner test results (presentation is to be in Deakin eSolutions approved electronic Cable Tester / Scanner format on a CD-R and hard copy format).

17 Appendix C – Geographic diversity

Geographic diversity provides protection against both optic fibre runs being damaged in a single incident. Below is an *example* of such a design.

The ultimate scenario

Entry Point to the building are from opposite sides. Neither Optic fibre shares or follows the cable path within the building. Entry points to the communications room do not penetrate the same wall. Optic fibre pathways within the communications room are kept separated until the last possible point.