NEXTDC

Structured Cabling Installation Requirements

NEXTDC Limited and its subsidiaries (ACN 143 582 521)

Contents

1.0 Introduction

The purpose of this document is to ensure that all work related to structured communications cabling systems is conducted to the highest level and meets the specific requirements developed for the NEXTDC facilities.

The Facilities Operations Team will inspect the work conducted and will only approve it if it meets the requirements detailed in this document. Any non-compliant items will need to be rectified before the Facilities Operations Team will sign off any work as being complete. Failure to correct non-compliant work will result in NEXTDC rectifying the work at the contractors' expense. Examples of unacceptable installation is included in Appendix B.

This document is written specifically for NEXTDC's staff, it's clients, carriers and their contractors working within the NEXTDC facilities.

Prior to any works commencing on site NEXTDC requires:

- contractors shall request a permit to work through the CEC. Any potentially hazardous, hot or dusty works need to be included in the permit to work submission
- the contractor to present a detailed scope of works, outlining the work proposed, type and number of items of equipment to be installed and the cable routes Installation drawings may also be required upon request from NEXTDC.
- that NEXTDC have approved this scope of works and the contractor and Facilities Operations Team have organised a mutually agreeable date and time for the works to be executed
- that the contractor walks the Facilities Operations Team through the works to be undertaken, to allow any last-minute site considerations to be discussed and agreed
- that the contractor has completed any required safe work method statements (SWMS)
- the contractor has all the test equipment as detailed in this document and is fit for purpose and under correct and current calibration.
- that NEXTDC have reviewed, and are satisfied, that the contractor's insurance, qualifications, and licenses are current and acceptable.
- contractors must be inducted at that site before the cabling work may commence.
- All building cabling connected to the telecommunications network must be installed by a qualified person who is nationally registered with an Australian Communications and Media Authority (ACMA) accredited registrar under the Cabling Provider Rules (CPR)

During the works NEXTDC requires:

- the contractor to work in a safe manner at all times
- the contractor to ensure the security of our facility is maintained
- that the works are undertaken as agreed, and if any variation is required it is discussed and agreed in writing with the Facilities Operations Team prior to being undertaken
- the contractor to respect and work with other clients and contractors within the data centre. Work area is to be kept clean and tidy as possible, debris and dust to be dealt with immediately.
- Contractor is to ensure that correct barriers and signage is in place at all times.
- At the end of the installation a complete cable path layout shall be supplied to the facility detailing all required facility information ie complete path, A end and B end and penetration used.

Please note that approval to install cabling does not imply exclusive and unhindered access to an area of a facility.

2.0 General Requirements

2.1 Pre-Work Notification

The contractor shall provide to the NEXTDC Facilities Operations Team a detailed plan of the work to be conducted via a Cable License installation request.

This shall include as a minimum:

- a brief description of the work to be undertaken and the reason it is required

- the type of each item of equipment to be installed including manufacturer and part number and the quantities of each item

- the type of each cable to be installed including manufacturer and part number and the lengths of each cable

- the cable routes which will be used. This will include the penetration allocated for the cable entry (if applicable).

- the intended start date and time required to execute the work.

No work shall be conducted on site until the Facilities Operations Team has approved the plan.

2.2 Site Access and Induction

Please refer to the **Facility Rules** and **ONEDC®** regarding contractor access, induction, and the permit to work processes. All contractors MUST undergo a site induction, otherwise be escorted by an authorised person at all times.

2.3 Standards

All work conducted in NEXTDC facilities shall comply with the following standards:

AS/NZS 3080:2003	Telecommunication installations – generic cabling for commercial premises (ISO/IEC 11802:2002, MOD)
AS/NZS ISO/IEC 4764:2012	Generic cabling systems for data centres
AS/ACIF S009:2006	Installation requirements for customer cabling (wiring rules)
AS 3000:2018	Electrical installations ("The Wiring Rules")

2.4 Vacating the Site

Before vacating the site, the contractor shall:

- remove all packaging materials, scrap materials and unused items of equipment from the NEXTDC facility

- notify the Facilities Operations Team that the work is complete, hand over all the completed commissioning sheets, and accompany the Facilities Operations Team on an inspection of the work executed

  (The work will not be deemed complete until the Facilities Operations Team has inspected and approved it before the contractor leaves the site).

- surrender security passes upon leaving the site.

3.0 Testing

All equipment installed by NEXTDC contractors shall be thoroughly tested and the results recorded on the templates located in **Appendix A: Insertion Loss Test Form and in electronic format**. The completed commissioning sheets shall be handed over to the Facilities Operations Team before leaving the site upon completion of the works. The completed electronic forms may be supplied via email and then be added to the ticket.
NEXTDC staff shall record the results of the test on the **Cabling Register**. The Insertion **Loss Test Form (Appendix A)** shall be used when providing test results to a customer.
Cables installed by a telecommunications carrier, for their exclusive use, shall be tested by the carrier or their contractor to the carrier's normal specifications. Cables installed by customers, for their exclusive use, shall be tested by the customer or their contractor to the customer's normal specifications.

3.1 Test Equipment

Testing of optical fibre cabling undertaken by NEXTDC Staff shall be executed using the light sources power meters:

- Before plugging the leads into the test gear, clean it with the one-click cleaner.
- Immediately replace the dust caps on the meter and leads once they are unplugged to prevent unnecessary contamination.
- Ensure the meter is set to dBm (not dB or uW).
- Ensure that when testing single mode fibre, you use the yellow patch leads. The orange or aqua test leads are for multimode fibre only.

3.2 Testing – Optical Fibre Cabling

- Testing of optical fibre cabling shall be as per the requirements of ISO/IEC 14763-4:2018.
- An Insertion Loss Test at both 1310nm and 1550nm shall be conducted on every core installed.
- A Bi-Directional OTDR Test shall be performed on all cores with acceptable Insertion Loss Test results as per ISO/IEC 14763-4:2018, which cannot be remedied by cleaning of patches and connectors, to ascertain the location of the fault. Once the fault is remedied the Insertion Loss Test shall be conducted again.
- Ensure all dust caps are replaced.

3.3 Testing – Copper Cabling

- Testing of copper cabling shall be as per the requirements of IEC 61935-1.
- All copper cabling shall be Category 6 and thus shall meet the Class E channel performance requirements of AS/NZS 3080 (ISO/IEC 11802).
- Every cable installed shall be tested and certified as meeting Category 6 requirements.
- All test results shall be recorded and handed over to the Facilities Operations Team.

4.0 Labelling

Each item of equipment and each cable installed as part of the structured cabling systems shall be labelled as per the NEXTDC labelling scheme in this section. Labels shall be located on the equipment as per the photographs in this section.

Cables shall be labelled at each end, just before the cable enters/exits its respective equipment and also labelled on the cable at either side of the entry point of a fire penetration. The cable must be labelled with the SID of the cable licence or the NEXTDC A end and B end if it is a NEXTDC backbone cable. There are three types of label employed in the NEXTDC facilities:

- flat laminated labels for equipment (i.e. racks, FTPs, patch panels)
- flag labels for cables
- cable tied plastic labels for cables installed in corrugated conduit.

4.1 Equipment and Cable Designation Scheme

NEXTDC Labelling Scheme – Rev A

ITEM	EQUIPMENT	GENERAL SCHEME AND EXAMPLE	KEY
1	FIBRE CROSS CONNECT RACKS	IR[Room]-[Rack][Shelf OR Module]-[Ports]	Room = 1 or 2 (the Cross Connect Room number).
1.1	Rack	IR1-A	Rack = A to n (excluding I and O).
1.2	Shelf (Tyco) OR Module (Corning)	IR1-A01	Shelf = 01 to 14 for Tyco. Module = 01 to 72 for Corning.
1.3	Shelf (Huber+Suhner)	IR1-A01-A/B	A = Left hand side of Enclosure B = Right hand side of Enclosure
1.3	Port	IR1-A01-001	Port = 001 to 144 for Tyco or H&S, 001 to 012 for Corning.
1.4	Block of Ports	IR1-A01-001/072	
		IR1-A01-001/006	
2	COPPER CROSS CONNECT RACKS	IR[Room]-C[Rack][RU]-[Jack]	Room = 1 to n (the Cross Connect Room number, or for M1 the Corridor number).
2.1	Rack	IR1-CA	Rack = A to n (excluding I and O).
2.2	RU	IR1-CA45	RU = 01 to 45.
2.3	Port	IR1-CA45-01	Port = 01 to n.
2.4	Block of Ports	IR1-CA45-01/12	Multiple RUs: 40/45 = RUs 40 to 45 (including 41, 42, 43 and 44). 40&45 = RUs 40 and 45 only.
3	ZONE ENCLOSURES	DH[Room]-Z[Enclosure]-[Module]-[Port]	Room = 1 to n (the Data Hall number).
3.1	Enclosure	DH2-Z01	Enclosure = 01 to n.
3.2	Module	DH2-Z01-A	Module = A to n (excluding I and O). Dependent on the brand and model of enclosure.
3.3	Port	DH2-Z01-A-01	Port = 01 to 12.
3.4	Block of Ports	DH2-Z01-A-01/06	
4	CLIENT RACK	[Facility]-[Room][Suite]-[Row]-[Rack]-[Location][RU][Cassette]*	
4.1	Rack	M1-1A-01-01	Facility = Facility Designation; Room = 1 to n (the Data Hall number); Suite = A to n; Row = 01 to n; Rack = 01 to n.
4.2	Termination Panel	M1-1A-01-01-F43	Location = F or R (front or rear); RU = 01 to 45.
4.3	Fibre OR Copper Cassette	M1-1A-01-01-F43A	Cassette = A to D for Tyco, A to C for Corning and A1/A2 to B1/B2 for H+S
5	MDF	MD[Room]-[Vertical]-[Ports]	Room = 1 or 2 (the Cross Connect Room number).
5.1	Vertical	MD2-A	Vertical = A to n (excluding I and O).
5.2	Pair	MD2-A-001	Ports = 001 to n.
5.3	Block of Pairs	MD2-A-001/100	
6	IDF	ID[Room]-[Vertical]-[Ports]	Room = 1 or 2 (the Cross Connect Room number).
6.1	Vertical	ID2-A	Vertical = A to n (excluding I and O).
6.2	Pair	ID2-A-001	Ports = 001 to n.
6.3	Block of Pairs	ID2-A-001/100	
7	DRAW PITS	P[Designation]	
7.1	Pit	PA1	Designation = Unique draw pit identifier. Site dependent.
8	CABLES	[Equipment A] to [Equipment B]	Equipment A = Designation of the equipment at one end of the cable.
8.1	Incoming Fibre Cable	PA1 TO IR1-A01 (144 core fibre)	Equipment B = Designation of the equipment at the other end of the cable.

ITEM	EQUIPMENT	GENERAL SCHEME AND EXAMPLE	KEY
8.2	Incoming Copper Cable	PB2 TO MD2-A001/100 (100 pair copper)	
8.3	Internal Fibre Cables	IR1-A01 TO IR2-C14 (Tyco Shelf to Tyco Shelf)	
8.4		IR2-B14 TO DH2-Z02-D (Tyco Shelf to a Zone Enclosure Module)	
8.5		IR1-C06-001/012 TO M1-1A-01-01-F43A (Tyco Shelf Part Tray to Client Rack Cassette)	
8.6		IR2-A36 TO IR2-B12 (Corning Module to Corning Module)	
8.7		IR2-B72 TO DH2-Z02-D-01(Corning Module to Zone Enclosure Module Port)	
8.8		IR2-B14/B25 TO DH2-Z02-D (Corning Modules to Zone Enclosure Module)	
8.9		IR2-C01 TO B1-3A-01-01-F43A (Corning Module to Client Rack Cassette)	
8.10	Internal Copper Cable	IR2-CB43-01/06 TO B1-4A-01-01-F43A (Copper Cross Connect Rack to Client Rack)	

*Refer to the "Rack Naming Convention" Document

4.2 Fibre Cross Connect Racks

Table below shows the types and brands of connections utilised on each site

Facility	B1/C1	P1/S1	M1	Generation 2's
Fibre Termination Type (Customer Facing)	SC	LC	LC	LC
Fibre Termination within IR Room	SC	LCA	LCA	LCA
Fibre FOBOT Brand	Corning	Commscope	AMP Netconnect	Huber +Suhner
Zone Enclosures	Tyco	Corning	Tyco	Huber +Suhner
Copper Termination Type	CAT6E	CAT6E	CAT6E	NA
Copper Patch Module Brand	Panduit	Panduit	Tyco NetPodium	Copper not available

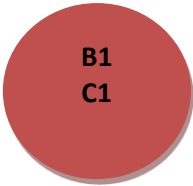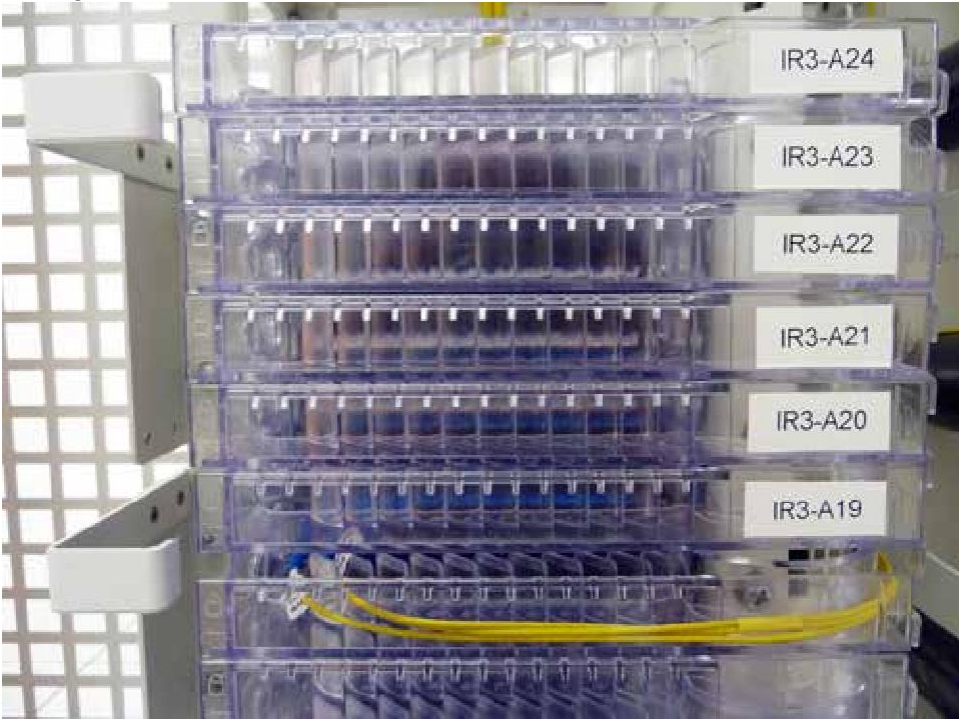Tyco GR2 Rack.

**M1
P1
S1**

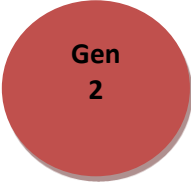Corning EMF Rack.

**B1
C1**

Tyco GR2 Rack – Shelf.

**M1
P1
S1**

Corning EMF Rack – Module.

Huber + Suhner IR frame

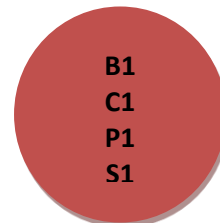| A01-A	DH3-Z01-A06-1/144	A01-B	DH3-1A-02-05-F20
	NEXTDC DH TIES		OPTUS 144f

A10-A	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	A10-B	RU43 RU42 RU41 RU40	B13-A	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	B13-B
A09-A	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	A09-B	RU39 RU38 RU37 RU36	B12-A	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	B12-B
A08-A	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	A08-B	RU35 RU34 RU33 RU32	B11-A	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	133-144 121-132 109-120 97-108 85-96 73-84 61-72 49-60 37-48 25-36 13-24 1-12	B11-B

4.3 Copper Cross Connect Racks

Tyco NetPodium Rack.

M1

Panduit PatchRunner.

B1
C1
P1
S1

Tyco NetPodium Rack – Patch Panel.
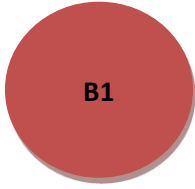

M1

Panduit PatchRunner – Patch Panel.

**B1
C1
P1
S1**
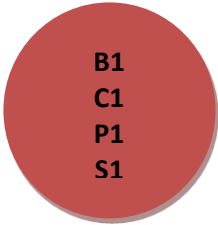
4.4 Zone Enclosures
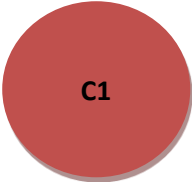
Tyco Zone Enclosure.

**M1
P1
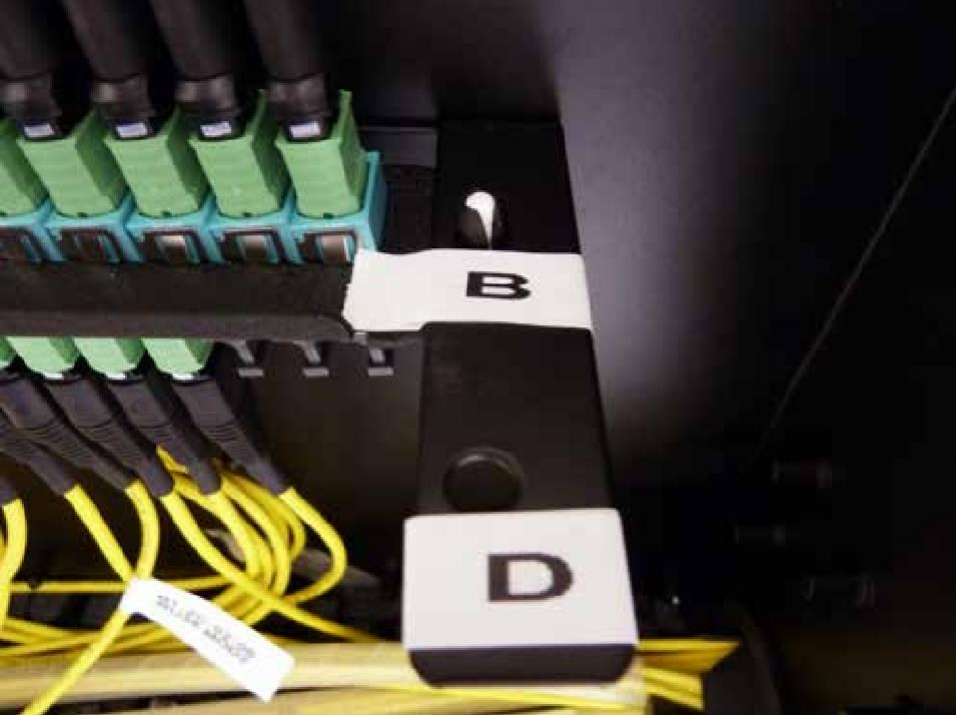S1**

Corning Zone Enclosure Small.

B1

Corning Zone Enclosure Large.

C1

Tyco Zone Enclosure – Module.
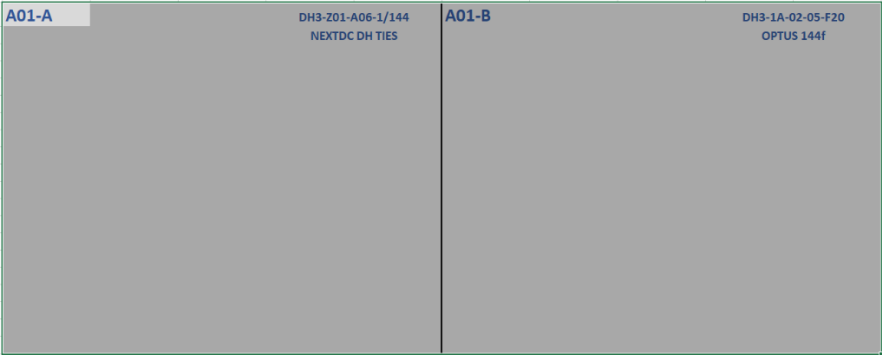

M1
P1
S1

Corning Zone Enclosure Small – Module.


B1

Corning Zone Enclosure Large – Module.

C1
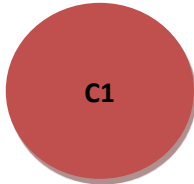
Huber + Suhner Zone frame

| A01-A | DH3-Z01-A06-1/144 | A01-B | DH3-1A-02-05-F20 |
| | NEXTDC DH TIES | | OPTUS 144f |

| A10-A | 133-144 121-132 109-120 | 133-144 121-132 109-120 | A10-B | RU43 | B13-A | 133-144 121-132 109-120 | 133-144 121-132 109-120 | B13-B |
	97-108 85-96 73-84	97-108 85-96 73-84		RU42		97-108 85-96 73-84	97-108 85-96 73-84	
	61-72 49-60 37-48	61-72 49-60 37-48		RU41		61-72 49-60 37-48	61-72 49-60 37-48	
	25-36 13-24 1-12	25-36 13-24 1-12		RU40		25-36 13-24 1-12	25-36 13-24 1-12	
A09-A	133-144 121-132 109-120	133-144 121-132 109-120	A09-B	RU39	B12-A	133-144 121-132 109-120	133-144 121-132 109-120	B12-B
	97-108 85-96 73-84	97-108 85-96 73-84		RU38		97-108 85-96 73-84	97-108 85-96 73-84	
	61-72 49-60 37-48	61-72 49-60 37-48		RU37		61-72 49-60 37-48	61-72 49-60 37-48	
	25-36 13-24 1-12	25-36 13-24 1-12		RU36		25-36 13-24 1-12	25-36 13-24 1-12	
A08-A	133-144 121-132 109-120	133-144 121-132 109-120	A08-B	RU35	B11-A	133-144 121-132 109-120	133-144 121-132 109-120	B11-B
	97-108 85-96 73-84	97-108 85-96 73-84		RU34		97-108 85-96 73-84	97-108 85-96 73-84	
	61-72 49-60 37-48	61-72 49-60 37-48		RU33		61-72 49-60 37-48	61-72 49-60 37-48	
	25-36 13-24 1-12	25-36 13-24 1-12		RU32		25-36 13-24 1-12	25-36 13-24 1-12	

4.5 Client Racks

Tyco Patch Panel – Cassettes (1no. Fibre and 1no. Copper Cassette).
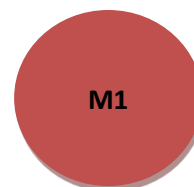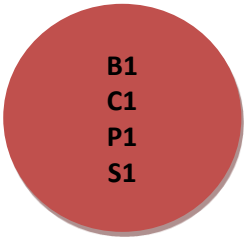
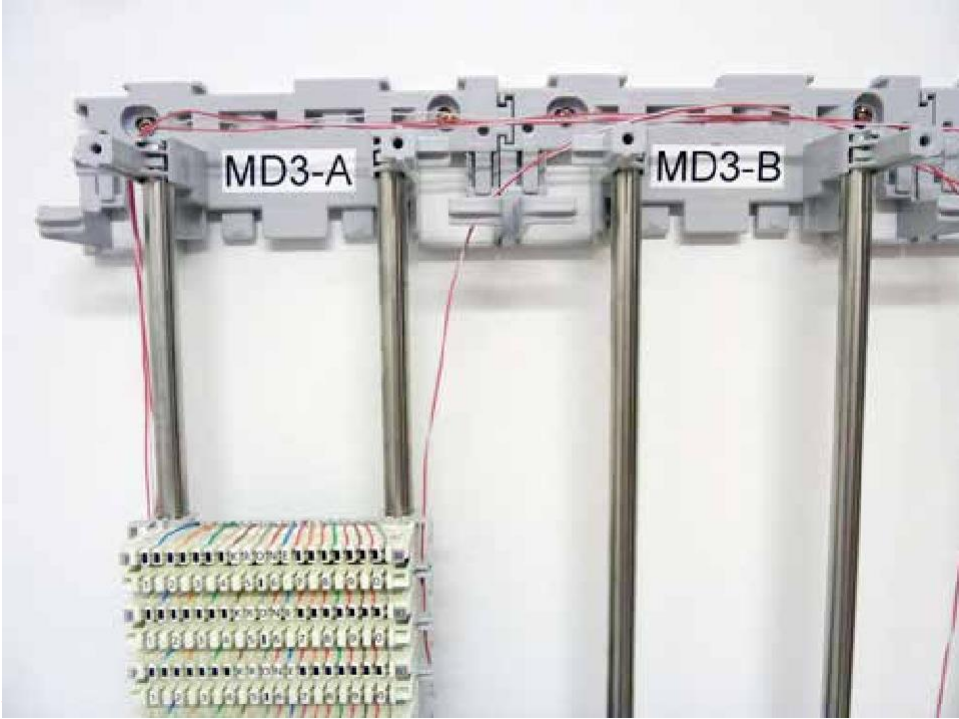Corning Patch Panel – Fibre Cassettes.
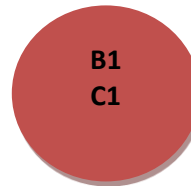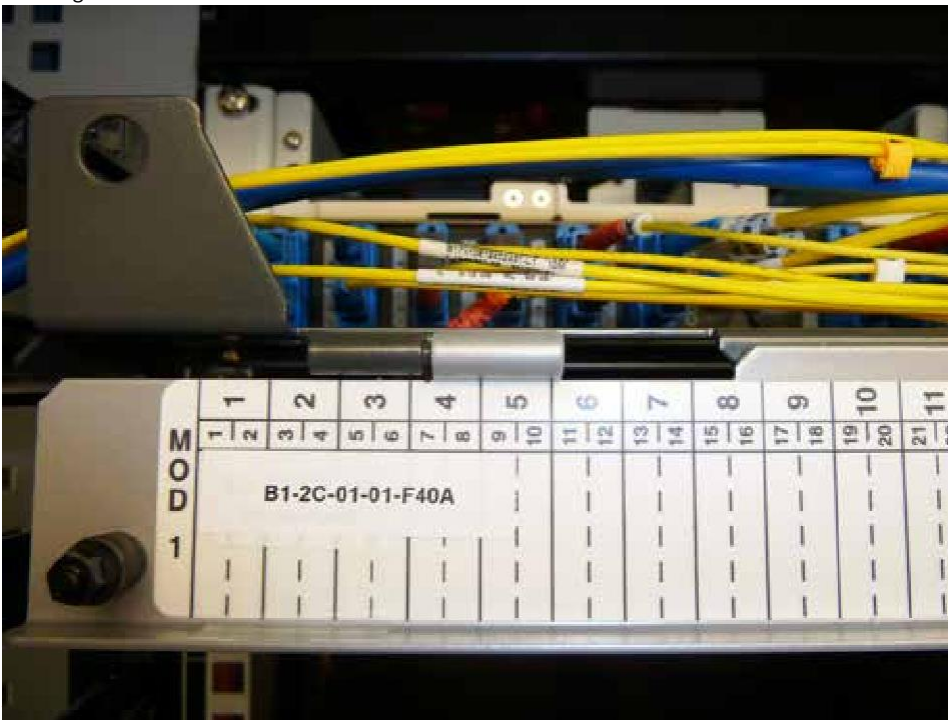
Huber + Suhner ZDPHD
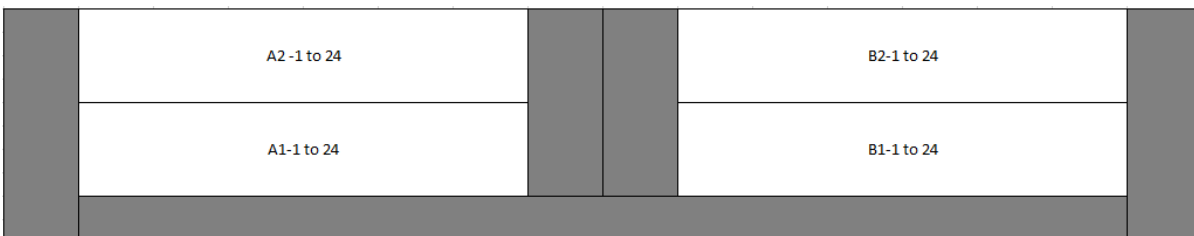
Panduit Patch Panel – Copper Cassettes.

4.6 MDFs & IDFs

MDF Verticals.

4.7 Cables

Incoming Cables and Trunk Cables in Corrugated Conduit – Cable tied plastic labels (in addition to the Carriers own label).

Trunk Cables – Flag type labels wrapped around cable.

Patch Cables – Flag type labels wrapped around cable.

5.0 Installation

5.1 General Cable Rules

- No fibre cable shall be spliced, or connector joined, except at the end points (a cross connect rack, a zone enclosure, or a client rack). Jumpering of fibre cable is to be undertaken only at points designated for the purpose (customer rack, zone enclosure, cross connect frames).
- No copper cable shall be joined, all copper cable must be one continuous run from the source outlet to the destination outlet. Jumpering of copper cable only to be done at points designated for the purpose (MDF, IDF, customer rack, facility cabling rack).
- All NEXTDC fixed copper network cable to be wired to TIA-568A:

  - 1 – white/green (T2)
  - 2 – green (R2)
  - 3 – white/orange (T3)
  - 4 – blue (R1)
  - 5 – white/blue (T1)
  - 6 – orange (R3)
  - 7 – white/brown (T4)
  - 8 – brown (R4)

- All copper terminations shall be performed using the correct tools. Punching down with a screwdriver or similar is not acceptable.
- Copper cables must not be supported by or anchored to mechanical devices which form part of other services i.e. ducts, pipes, catenary wires supporting electrical cables, etc.
- Fixed copper cabling shall be solid core. Patch copper cabling shall be stranded.
- Only Austel/ACMA approved hardware may be used.

5.2 Cable Management

5.2.1 Draw Pits

At B1 telecommunication draw pits are a P8 size polyethylene pit with concrete lid. They are located on the public footpath outside of the data centre. Work in
these pits must comply with the local council regulations in addition to the NEXTDC policies outlined in this document.

At all facilities the telecommunication draw pits are a concrete pit with lockable alarmed galvanized steel or concrete lid. These pits are located within the property boundary. Additional pits are installed where significant changes of direction occur. All pits are managed by the appropriate Facility Operations Team.

Concrete/Polymer Draw Pit at B1.

Concrete/Steel Draw Pit at Facilities other than B1.

- Starter conduits have been pre-installed and capped off in these pits. Under no circumstances shall additional penetrations be made in any pit. The existing starter conduits shall be used in all cases.
- The installation of copper lead-in cables will require additional planning with the Facilities Operations Team as some cable conduit routes are near low and high voltage cable routes and may not be suitable.
  Additionally, only some draw pits have a direct cable pathway to the building MDF.
- Cable loops, joints or any type of equipment shall not be installed in the telecommunication pits. Pits shall be used solely as means for Carrier cables to transition from an entry conduit to an exit conduit.
- Cables must be labelled within the pit using an appropriate external grade label.
- Carriers shall install fibre cables with a minimum core count of 144 unless specific approval has been granted by NEXTDC. This is to ensure efficient use of conduit space.
- Blown fibre shall not be installed through the draw pits and entry conduits. It consumes an excessive amount of space and requires an enlarged bending radius when compared to the equivalent tube cable.
- Subduct is only permitted in the street entry conduits if the Carrier the conduit is allocated to requires it. All NEXTDC pit pipe use in the facility boundary is allocated by the Facilities Operations team.
- Hauling ropes must be left in place at the completion of the work.
- Pits are to be left clean and tidy upon completion of works. All rubbish, offcuts, and dirt shall be swept out.

Telecommunications pit showing labelling and draw ropes.
Note: no sub-ducts, rubbish, equipment, cable loops or cable junctions.
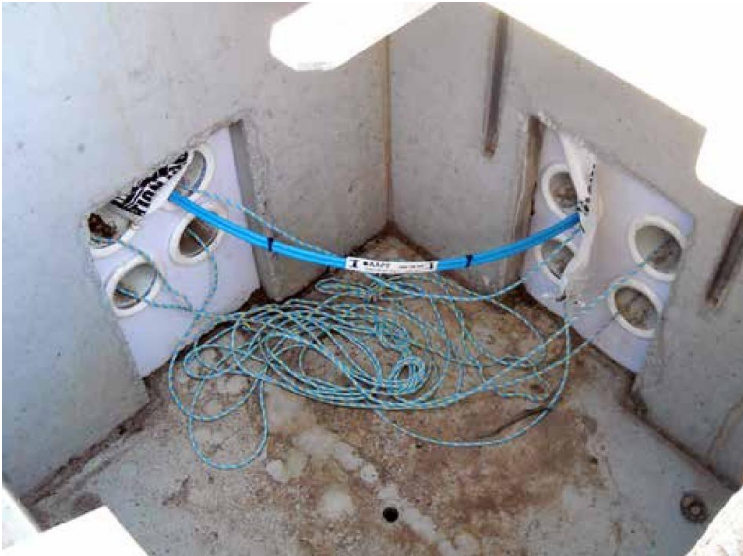
5.2.2 Cable Tray, Ladder and Basket

Telecommunications cables trays, ladders and baskets for fibre and copper are installed throughout the NEXTDC facilities.

- Cables shall be installed straight along all trays, parallel to and touching adjacent cables.
- Cables shall follow the radius of any curve or intersection of cable tray and not cut the corner as so the spacing of parallel cables is consistent.
- Excess cable shall not be stored on the trays. It shall be looped inside the customer rack.
- No equipment shall be installed on any cable tray.
- Corrugated conduit shall not be installed on cable trays.
- Cable joiners shall not be used. The correct length of cable shall be installed for a joint free circuit.
- Care must be exercised when pulling a new cable over existing cables to ensure that the existing cable does not suffer abrasions due to friction.
- Copper cables transitioning from cable trays into customer racks shall be installed as so they drop vertically. Fibre cables exiting fibre duct shall leave the duct via a waterfall designed for the duct system.
- Cables shall be labelled as per the Labelling section of this document. Labels shall be located at each end of the cable.
- Cables shall be tied at regular intervals appropriate to the cable type. In any case the spacing shall be not more than 1m. Cable ties shall be adjacent to cable ties on adjacent cables. Cable ties shall be cut flush to avoid injury.
- If any fire rated materials are penetrated, then they must be resealed as soon as possible and be inspected by the Facilities Operations Team and re-certified by the appropriate authority. The cost to rectify any penetrations will be at the cost of the contractor performing the installation.
- Any redundant cable shall be completely removed from the cable tray network.
- Any enclosed fibre duct or Anaconda must be approved by NEXTDC and comply with any applicable policy set by the Cable licence terms and conditions as well as approval by the Facilities Operations team. This dedicated anaconda or dedicated duct work shall also be labelled with the SID of the cable licence.

Correctly installed fibre cables running parallel on cable tray, with regular even cable ties.

Correctly installed bundled Cat6 cables running parallel on cable basket, with regular even cable ties.

5.2.3 Fibre Ducting

The fibre ducting is used to transport the fibre cables between the zone enclosures and the customer racks.

- The fibre ducting shall only be used for patch cables of size 2mm to 4mm. Ruggedised trunk cables (typically 6mm and 7mm) shall be installed on the normal cable basket and tray only.
- Waterfalls shall be installed onto the fibre duct for each customer rack requiring fibre. This is for neatness and to protect the cable. These shall be supplied by NEXTDC.
- Each duct shall only be filled to 50% of its capacity i.e. a 4"x4" section of duct shall be filled to only 2" deep with cable.
- Cable slack shall be stored in the customer racks. Normal sections of duct shall not be used for cable storage.
- Nothing shall be stored in the fibre ducting but fibre cable.
- Any redundant cable shall be completely removed from the ducting system.

5.3 Fibre Cross Connect Racks

Corning EMF racks are used in B1 and C1, Tyco GR2 racks are used in M1, S1 and P1. The HUBER+SUHNER CDR frame is used at some generation 1 sites and all Generation 2 NEXTDC facilities.

5.3.1 Corning EMF – Splicing

- All cables shall be labelled as they enter the Corning rack.
- Cables dropping from the overhead cable tray into the rack shall drop into the rack directly within the rack frame and not be routed around the upper cross brace.
- When terminating loose tube fibre cables into the modules, transport tube must be used over the entire length of the bare tube to eliminate the chance of the tube kinking.
- All tubes shall be prepped into modules. Leaving them dangling or coiled at the back of the frame is not acceptable.
- Cables shall not be routed through the back the module. They shall be routed through the front as per the manufacturer's recommendations.
- Ensure correct slack is provided on the loose tube and transport tube to allow for correct withdrawing of the module.
- The contractor shall only use the trays allocated by the Facilities Operations Team.

Loose tube fibres protected by transport tube.



Correct routing of transport tube into module.

5.3.2 Corning EMF – Patching

- Patching shall be as per Corning's recommendations (Corning Document 003-599).

- Patch leads shall be the length specified by Corning (5.5 metres within a single frame, or 7 metres + 1.5 metres per extra frame when crossing frames).

- Always use the rear troughs to transition between frames. Do not route fibre directly through frames.

- When routing a patch cable, the first end installed shall be into the rack with the most fibre, then route the slack in the rack with the least fibre.

- Only 2mm patch cables shall be used.

- Excess patch lead length must be stored in the correct location as per the Corning design.

- Slack shall not be weaved or coiled though the spools. It shall only be routed as per the below diagram.

Slide the module out carefully to the detent position. If the fibre behind is too tight to allow for this, then it must be fixed prior to proceeding.
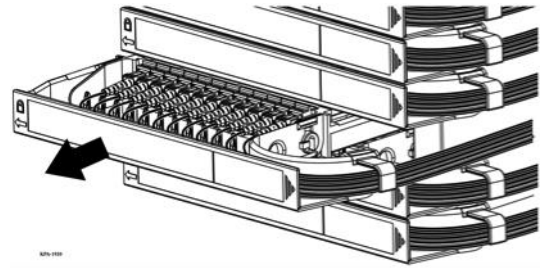
Press the release buttons on the side of the module (as pictured) to enable the front panel to flip down. Carefully guide the fibre as this is done.
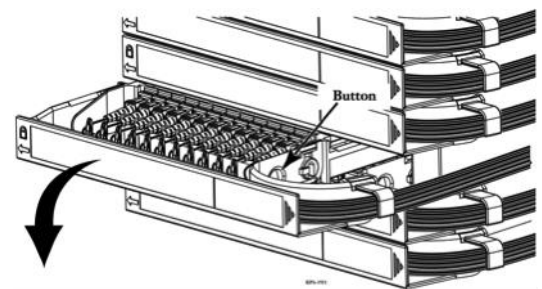
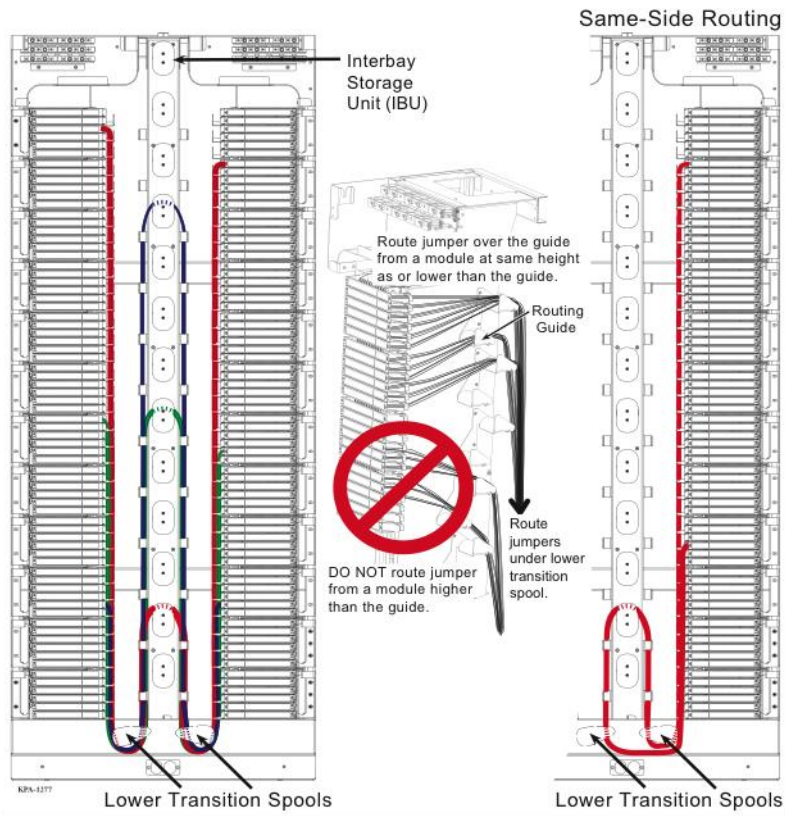Remove the dust caps and clean the connectors. Plug the patch lead in.
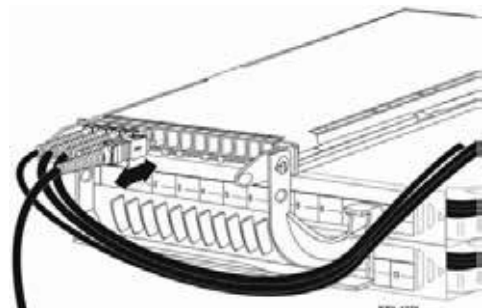
Dress the cables and swing the front of the housing back into place, and then slide the module back into the housing.
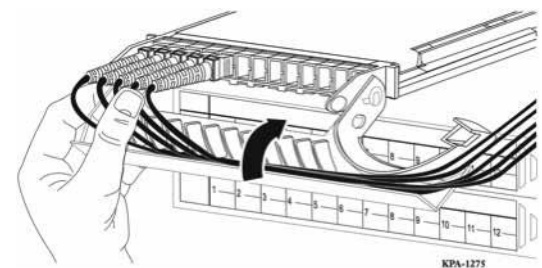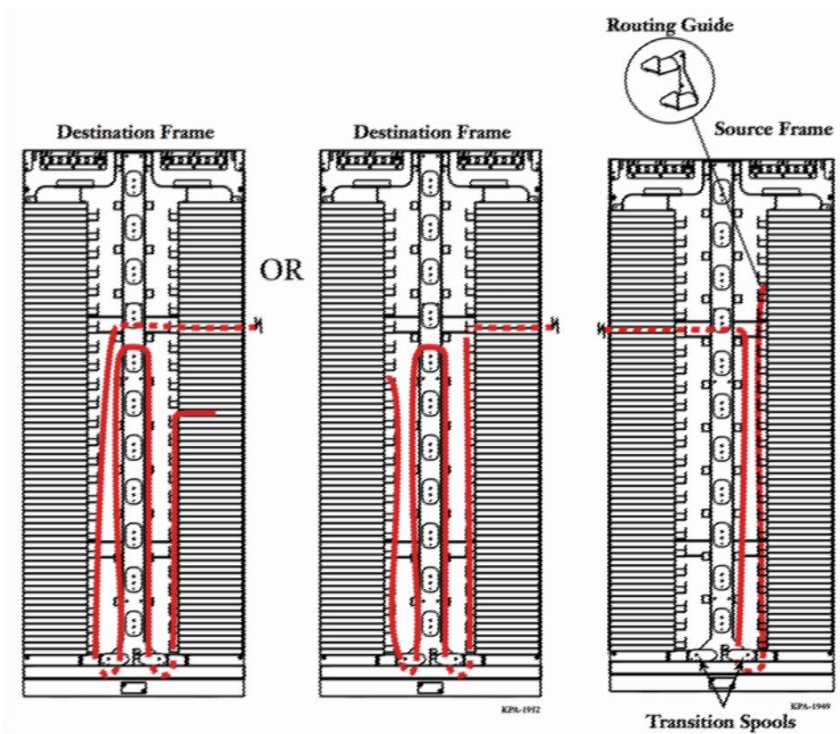
Diagrams from Corning.

Patch cables running within racks shall be routed as per this diagram.

Patch cables running between racks shall be routed as per this diagram.

Diagrams from Corning.

5.3.3 Tyco Electronics GR2 – Splicing

- All cables shall be labelled as they enter the Tyco rack.
- Cables dropping from the overhead cable tray into the rack shall drop into the rack directly within the rack frame and not be routed around the upper cross brace.
- All cables shall be completely prepped. Any un- terminated tubes shall be transported up into GPS trays. Leaving them dangling or coiled at the back of the frame is not acceptable.
- Only 900mm of fibre shall be coiled in the GPS trays.
- Corrugated conduit shall be securely cable-tied in place and foam strips used under each cable tie to prevent slipping.
- Grommets shall be installed on the GPS shelf entry holes.
- The clear plastic cover shall be installed on every GPS tray.
- The contractor shall only use the trays allocated by the Facilities Team.

Tyco GR2 racks. Cables drop into rack directly, not around or under the top frame.

Grommets need to be installed on every GPS shelf.

Cable tied corrugated conduit with foam strips to prevent slipping.

24 core trays are used so no more than 900mm of fibre can be stored in the tray. The plastic cover supplied by the manufacturer must be installed over the top of this.
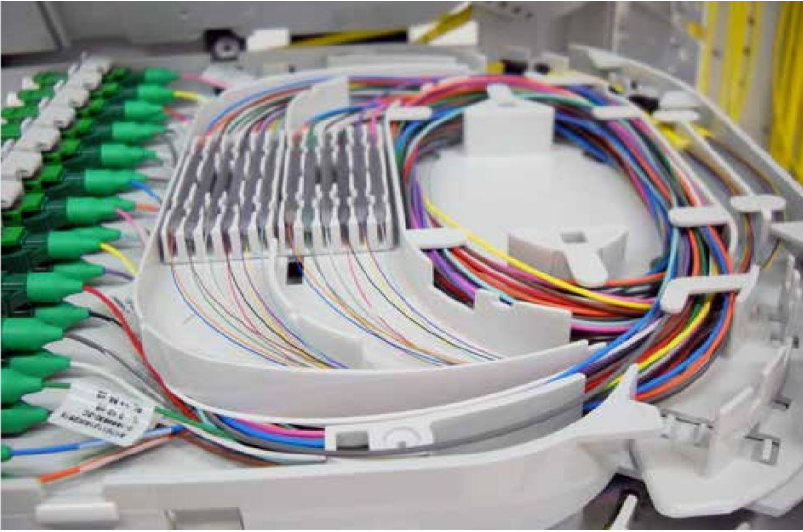
5.3.4 Tyco Electronics GR2 – Patching

- When patching the metal clips must be used when the GPS trays are pulled out. Failure to do so may result in patch leads being marginally too short and being stressed the next time the tray is correctly pulled out.
- Patch leads enter via the right-hand side of the GPS shelf, cross the back of the shelf, and patch on the left side of the through connectors.
- Cables shall be labelled at each end as per the Labelling section of this document.
- Patch cables shall be routed as per the diagram below.
- Patch cable lengths shall be as per the table below.
- Only 2mm patch cables shall be used.
- Only LCA connectors shall be used.

Trumpets need to be installed on every GPS shelf.
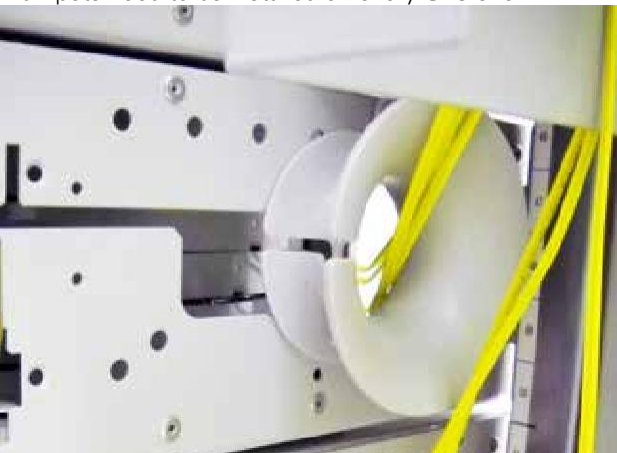
When GPS trays are pulled out for patching the metal clips must be used.
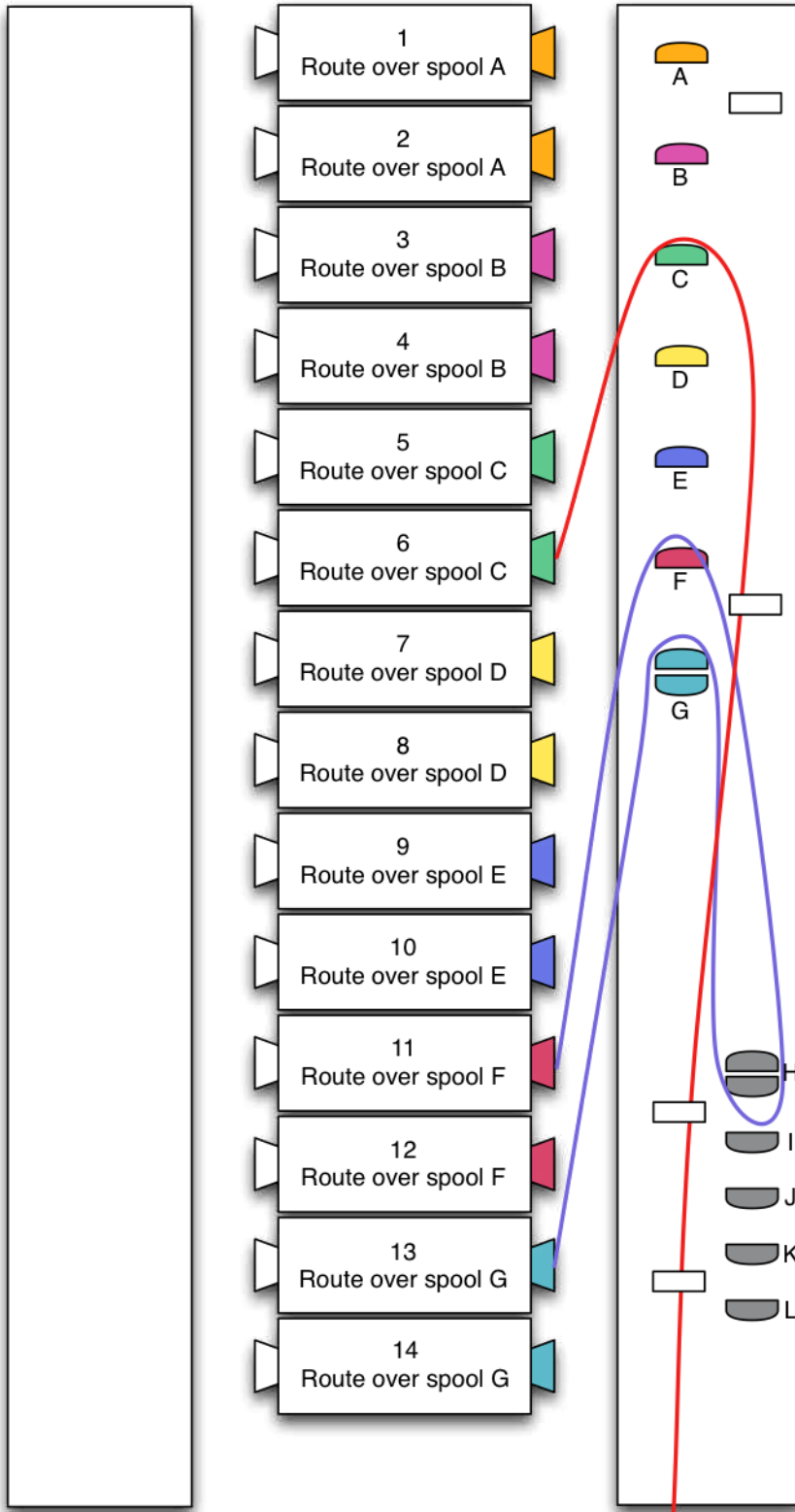

Correct patch cable routing within the GPS tray.
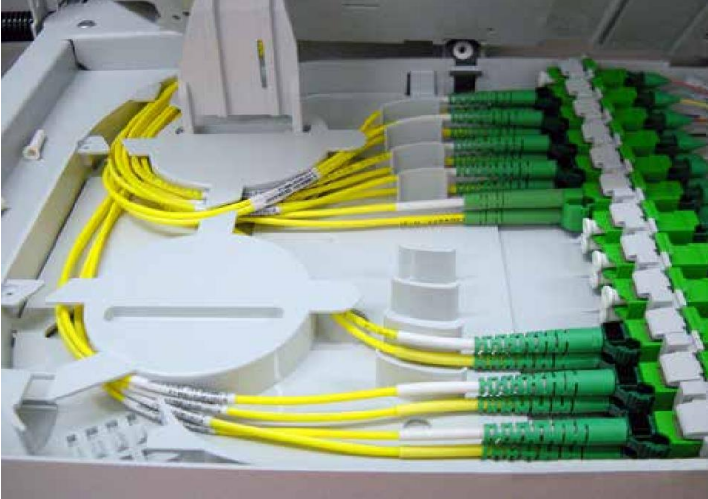
Patch cables exit the GPS shelf above trunk cables, and behind the fabric cable strap.

Patch cable routing within racks shall be as per the above diagram.

A patch lead that has both ends in the same rack shall be 5 metres in length and routed as per the purple cable example on the left. This cable is routed from tray 11 over spool F (maroon tray to maroon spool) with the slack taken up around spool H, and then over spool G before entering tray 13 (aqua tray to aqua spool). Note: these cables do not get routed through the cable brackets.

A patch lead that is connected between different racks shall be of the correct length (as per the table below) and should never be routed around spools H to L, as per the red cable example on the left. This cable is routed from tray 6 over spool C (green tray to green spool), through the cable brackets, and down to the trough at the bottom.
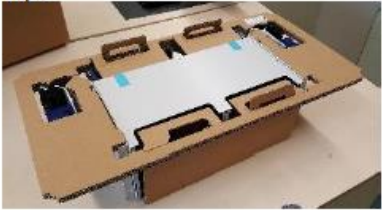
Patch cable lengths shall be as per the below tables.

8	7	6	5
1	2	3	4

		To Frame							
		1	2	3	4	5	6	7	8
From Frame	1	5.0	7.0	8.2	9.4	9.7	8.5	7.3	7.0
	2	7.0	5.0	7.0	8.2	8.5	7.3	7.0	8.2
	3	8.2	7.0	5.0	7.0	7.3	7.0	8.2	9.4
	4	9.4	8.2	7.0	5.0	7.0	8.2	9.4	10.6
	5	9.7	8.5	7.3	7.0	5.0	7.0	8.2	9.4
	6	8.5	7.3	7.0	8.2	7.0	5.0	7.0	8.2
	7	7.3	7.0	8.2	9.4	8.2	7.0	5.0	7.0
	8	7.0	8.2	9.4	10.6	9.4	8.2	7.0	5.0

5.3.5 Huber + Suhner – Installation of chassis

UNPACKING IANOS REARMOUNT CHASSIS

INSTALL IANOS REARMOUNT CHASSIS IN RACK
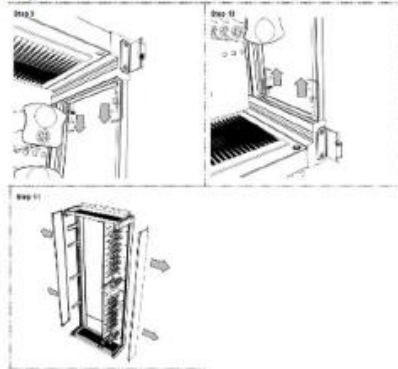
5.3.6 Huber + Suhner – Splicing

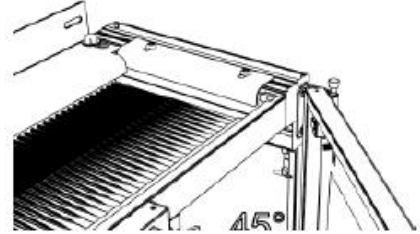**INSTALL IANOS FRONT SPLICING MODULE**

Step 10
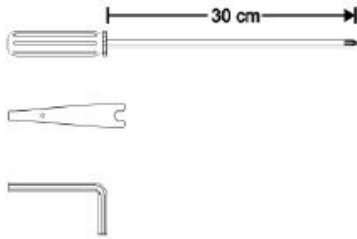
Required Tools

Step 11

Remove the side panel and door where required.
Cable can be brought into the CDR frame from bottom, top, left or right

Step 12

Feed able through brushed entry and into the cable managers inside the segregation panels

Step 13

Cable manager Large(85021673)

If dressing the cable for termination in the bottom of the frame the cable needs to be dressed to the front of the frame to make space for future cabling.
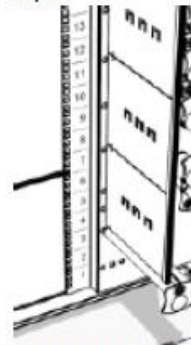
When the FO cable is in position. The cable can be fixed to the cable manager

Step 14

Prepare the cable at the breakout plate.
The breakout plate can be positioned at any point down the channel of the aluminium frame.
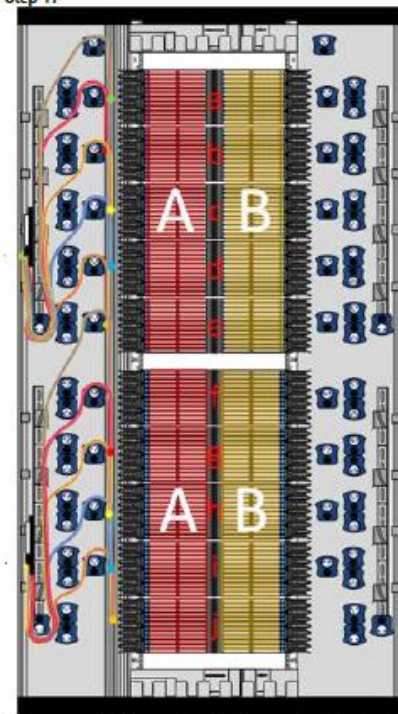
Step 15

To mount the breakout plate you may need to remove a section of segregation.
To do this just unscrew the fixings and remove

Step 16

Mount the breakout plate with 2x M6 bolts onto the aluminium channel

Step 17

Measure and cut the miniflex to the required length

Step 18

Feed fiber tubes through the mini flex (85017566)

Step 19
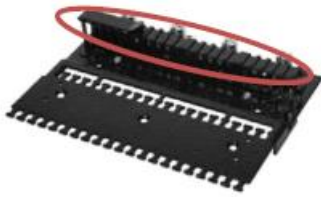
Fix miniflex in breakout plate slots to secure in place

Step 20

Cable manager

Feed miniflex through the cable manager and into position.
Make sure all miniflex is neatly dressed into the rear of the frame when all splicing has been completed and re fit any parts removed during installation.

Step 21

Step 22

Step 23

Step 24

Step 25

Step 26

5.3.7 Huber + Suhner – Patching

When patching in a CDR frame ensure that you use one rubber clip to lock down the MTP and another for the Cross-connects. This allows the MTP to stay in place and the cross-connect rubber clip to be removed as many times as necessary.
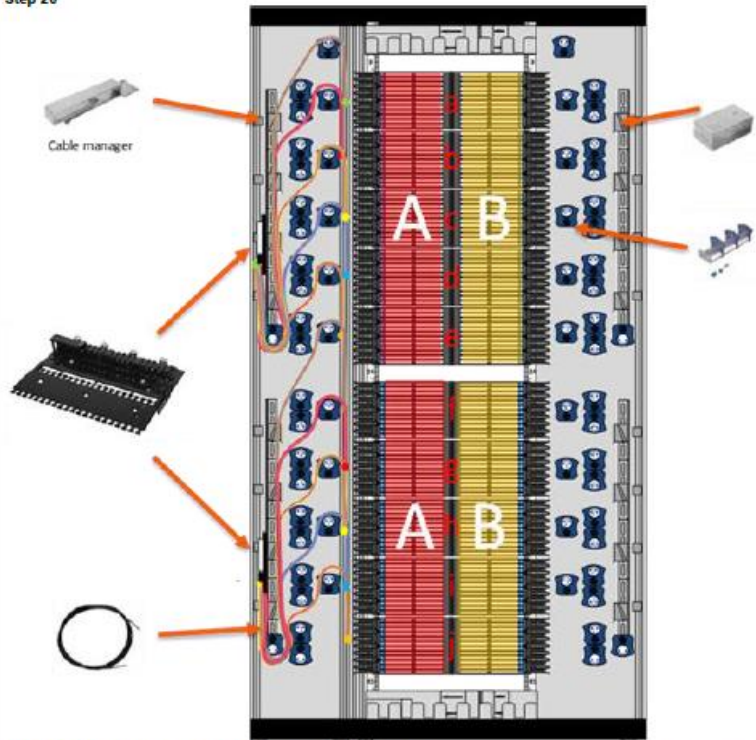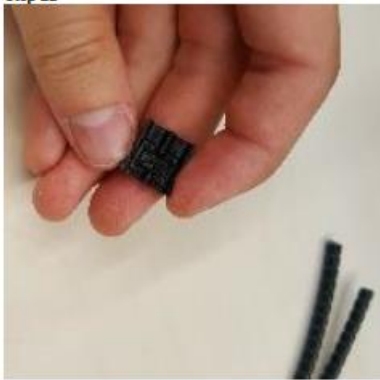
Do not pass the patch lead through the eye of the rubber clip. The rubber clip is to lay over the patch lead.

When patching:

- Always go to the shorter mandrel above patch to make first loop
- Guide Cords between the double mandrels so the cord goes around the lower of the double Mandrel.
- Depending on the destination of the patch and slack, guide the patch leads up and down.
- Use vertical cavity to store Cords
- Use available mandrels to manage excess loops and direction changes.
- Return to the chassis the same way.

Cables shall be labelled at each end as per the Labelling section of this document.

Patch cables shall be routed as per the diagram below.

Patch cable lengths shall be as per the table below.

Only 2mm patch cables shall be used.

Only LCA connectors shall be used in the zone frame and interconnect CDR frames.

NEXTDC Patching guide for CDR IANOS front face solution
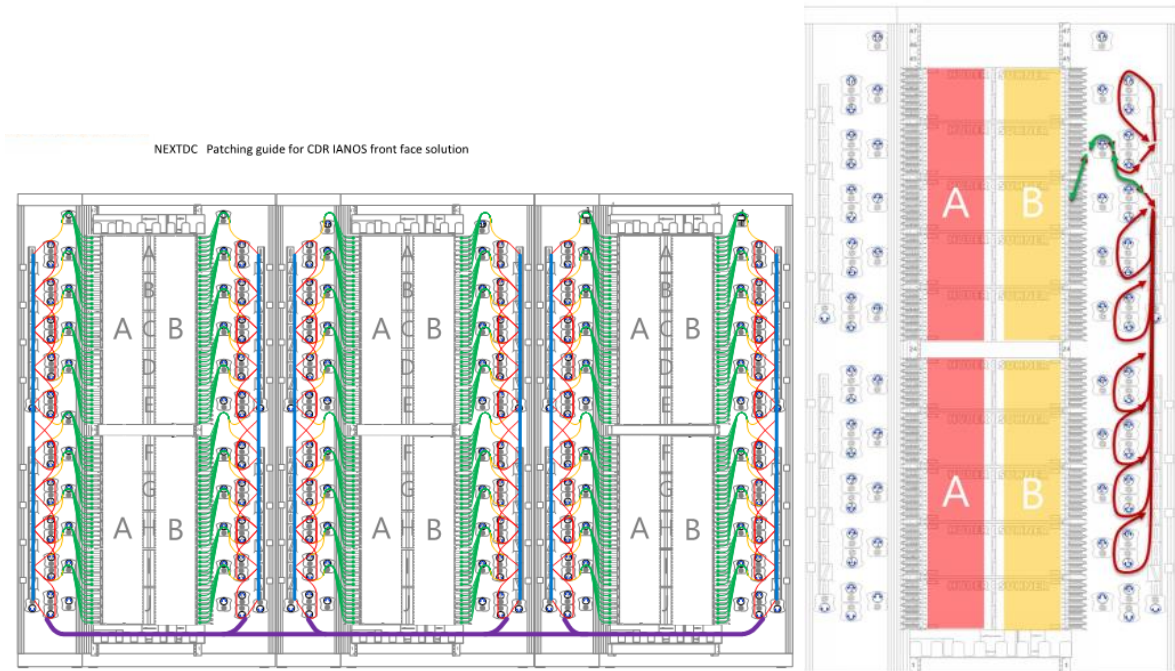
Patch cord lengths are :

	A	B	C	D	E	F	G	H	I	J
A	2.7 m	2.5 m	2.3 m	2.1 m	2 m	3.6 m	3.4 m	3.2 m	3 m	2.9 m
B	2.7 m	2.5 m	2.3 m	2.1 m	2 m	3.6 m	3.4 m	3.2 m	3 m	2.9 m

		Half A		Half B	
		Top section	Bottom section	Top section	Bottom section
Half A	Top section	3.5	5.0	6.5	5.0
	Bottom section	5.0	3.5	5.0	5.0
Half B	Top section	6.5	5.0	3.5	5.0
	Bottom section	5.0	5.0	5.0	3.5

Step 27
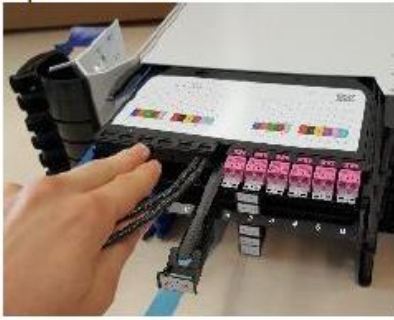
Step 28

Step 29
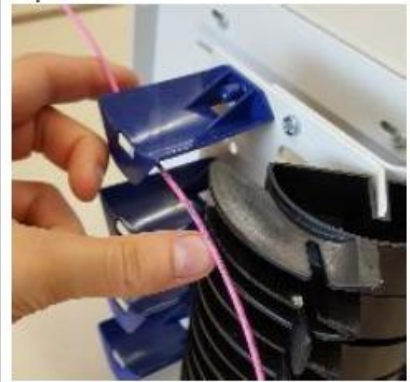
Step 30

Step 31

Step 32

Step 33

Step 34

Step 35

Step 36

Step 37

Step 38

Step 39

Step 40

Step 41

Step 42

Step 43

Step 44

INSTALL IANOS FRONT TRANSITION MODULE

Step 45

Step 46

Step 47

Step 48

Step 49

Step 50

Step 51

Step 52

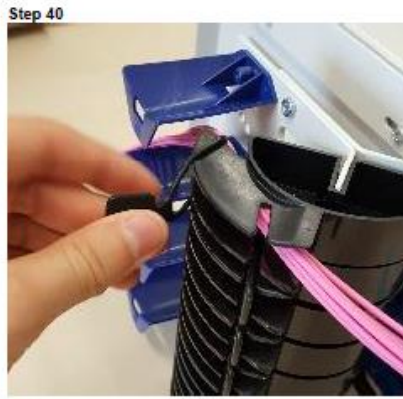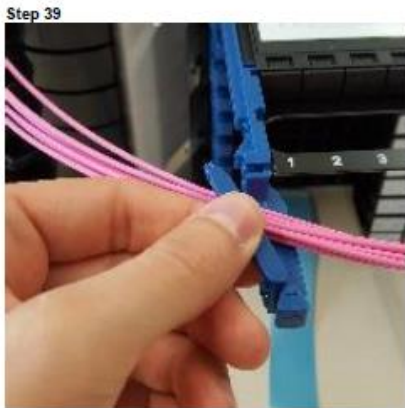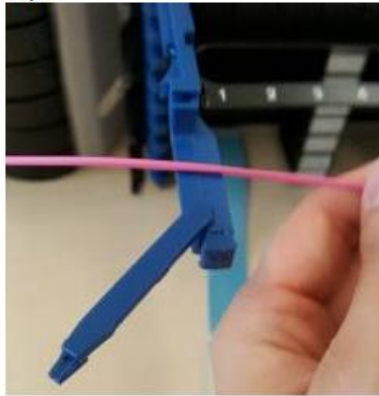Step 53

Step 54

Step 55

Step 56

Step 57
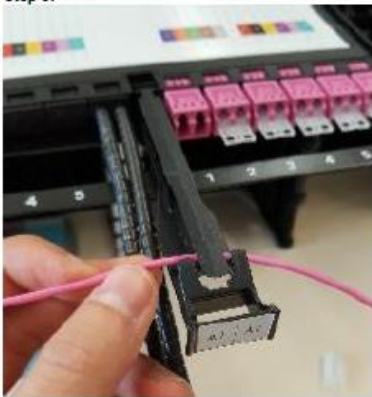
Step 58

Step 59

Step 60

Step 61

Step 62

Step 63	Step 64	Step 65

Step 66		

5.4 Zone Enclosures

Four different types of zone enclosures are used in the NEXTDC facilities. Each type of enclosure consists of a bulkhead into which MPO through connect modules are mounted. One or two trunk cables from an Inter-connect room is terminated on one side of a module in a Zone Box/Zone Frame, and up to 12 individual 12 core MPO cables can run to individual customer racks from the other side of a module.

5.4.1 Corning Zone Enclosures - Small

These overhead mounted zone enclosures are used in B1.

- All trunk cables from the EMF racks shall enter the enclosure on one side only. All customer cables shall exit the enclosure on the other side.
- Excessive slack shall not be stored in the zone enclosure.
- Trunk cables from the EMF racks shall be labelled just before they enter the enclosure, as per the Labelling section of this document.
- 12 core cables running to customer racks shall be labelled within the enclosure adjacent to the port.

Corning zone enclosure small.
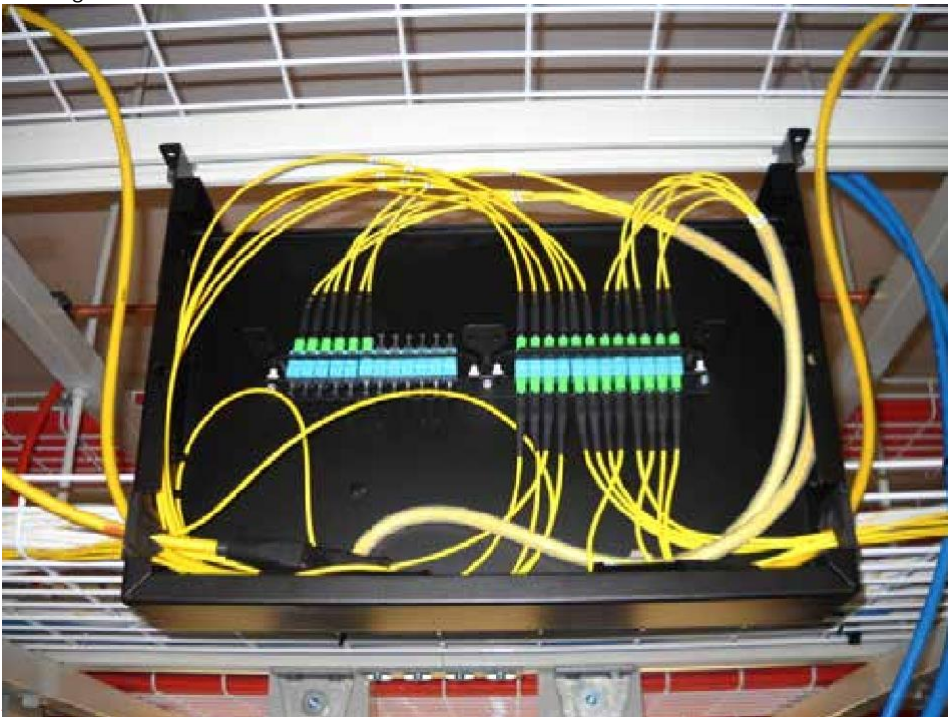
5.4.2 Corning Zone Enclosures – Large

These wall mounted zone enclosures are used in C1.

- Trunk cables shall enter through the penetration on the side of the zone box to which the rear of the though connect modules face (the left-hand side in the below photo). This penetration shall only be used for trunk cables.
- 12 core MPO cables shall enter though the penetration on the side of the box to which the front of the through connect modules face (the right-hand side in the below photo). This penetration shall only be used for 12 core MPO cables.
- All penetrations shall have grommets installed.
- All cables shall be clamped as they enter the zone enclosure.
- Do not store excess slack in the enclosure.
- Trunk cables from the EMF racks shall be labelled just before they enter the enclosure,
- 12 core cables running to customer racks shall be labelled within the enclosure adjacent to the port, as per the Labelling section of this document.

Zone enclosure showing trunk cables entering on the left and 12 core cables entering on the right.

Penetration showing grommet and clamp.

5.4.3 Tyco Zone Enclosures

These wall mounted zone enclosures are used in M1.

- Trunk cables shall enter the enclosure on the right-hand side only.
- The trunk cables from the GR2 racks shall have all sheathing removed from the length of cable within the zone enclosure. No sheathed cable shall be stored within the enclosure.
- The trunk cable shall be labelled just before it enters the enclosure.
- The trunk cable entry to the enclosure will via a gland.
- The spools within the enclosure shall be used for routing cable from the port to the penetration, not for burning excess slack.

Tyco zone enclosure.
Note: cable glands at top, no sheathing, cable ties, minimal slack.

5.5 Client Racks

Corning fibre patch panels and Corning copper patch panels were used in B1 and are used in C1. Tyco patch panels which house both fibre and copper cassettes are used in M1. CommScope RapidPanels are used in S1 and P1. Huber+Suhner are used in B1, B2, M2, S2 and P2.

5.5.1 Corning Patch Panels

The in-rack termination for Corning fibre consists of a 1 RU fibre module panel, capable of housing three Corning fibre cassettes. This panel has integrated fibre management to accommodate a small amount of cable slack.

5.5.2 Tyco Patch Panels

The in-rack termination for Tyco fibre consists of a 1RU module panel, capable of housing four fibre or copper modules.

- Cable rings supplied with the cassette shall be installed and cables routed through them.
- Velcro cable ties shall be used to secure the fibre or copper to the patch panel frame. Plastic cable ties may only be used for copper cables
- The earthing clamp shall be installed but left unbonded.
- All cables shall be labelled as the exit the rear of the patch panel.

5.5.3 CommScope RapidPanel

The in-rack termination for CommScope RapidPanel consists of a sealed 1RU 24 fibre patch panel that is divided into 2 x 12 fibre panels. The main Fibre Cable leaves the panel from the rear as a 24-core figure 8 cable divided as 2 x 12 core MPO cables. The front of the patch panel is set out as 12 duplex LC ports

5.5.4 HUBER+SUHNER ZDPHD

The HUBER+SUHNER ZDPHD is the in-rack fibre optic and copper solution. It consists of several items that make up the solution.

- 24 port cassettes.
- RU mount.
- Rear cable manager.

The RU mount is capable of housing four 24 port cassettes that hand off in LC connections. It has a total density of 96 LC fibre ports. If the solution incorporates a copper hand-off then the solution has a total of 48 fibre ports and 6 copper connection hand-offs.

Cable rings installed and utilised for the applicable cassettes. Cable ties installed and excess slack absorbed.

5.6 Copper Cross Connect Frames

At B1, S1, P1 and C1 Panduit PatchRunner cable management racks are used. At M1 tyco NetPodium cable management racks are used. At the second-generation sites NEXTDC uses HUBER+SUHNER ZDPHD cable management rack.

5.6.1 Panduit PatchRunner

- Incoming and trunk cables shall enter the rack and run in the vertical cable management areas on the sides of the rack. Remove the cable fingers if need be for the cable to enter the centre of the rack. Do not bend or break the cable fingers.
- Remove the sheath from the incoming/trunk cable and run the individual cores in corrugated conduit as per the below photo.
- Slack spools shall be used to absorb cable slack. There shall be no cable slack in either the horizontal or vertical cable management areas or on the overhead cable trays.
- Every patch cable shall pass into the vertical cable management compartment over a cable finger. The cable finger used shall be at the same RU height as the patch panel the cable is plugged into.
- Cables from the left face of the angled patch panel shall be routed to the left of the rack, cables from the right face of the angled patch panel shall be routed to the right of the rack.
- For patch cables with both ends in the same rack the vertical cable management on each side of the rack and the rack to rack pathways at the top and bottom of the rack shall be used for the cable route. No other routes are acceptable.
- For patch cables transitioning between racks the rack to rack pathways at both the top and bottom of the racks shall be used. Cables shall not pass between racks at any other location.
- For cables transitioning between racks cable slack shall be routed around the spools in the cabinet with the least amount of cabling installed.

Rear view of patch panel. Cable cores are split into their respective block groups and run in corrugated conduit.

Patch cables pass into the vertical cable management on the side of the rack that their angled panel is facing. Every cable passes over its adjacent cable finger.

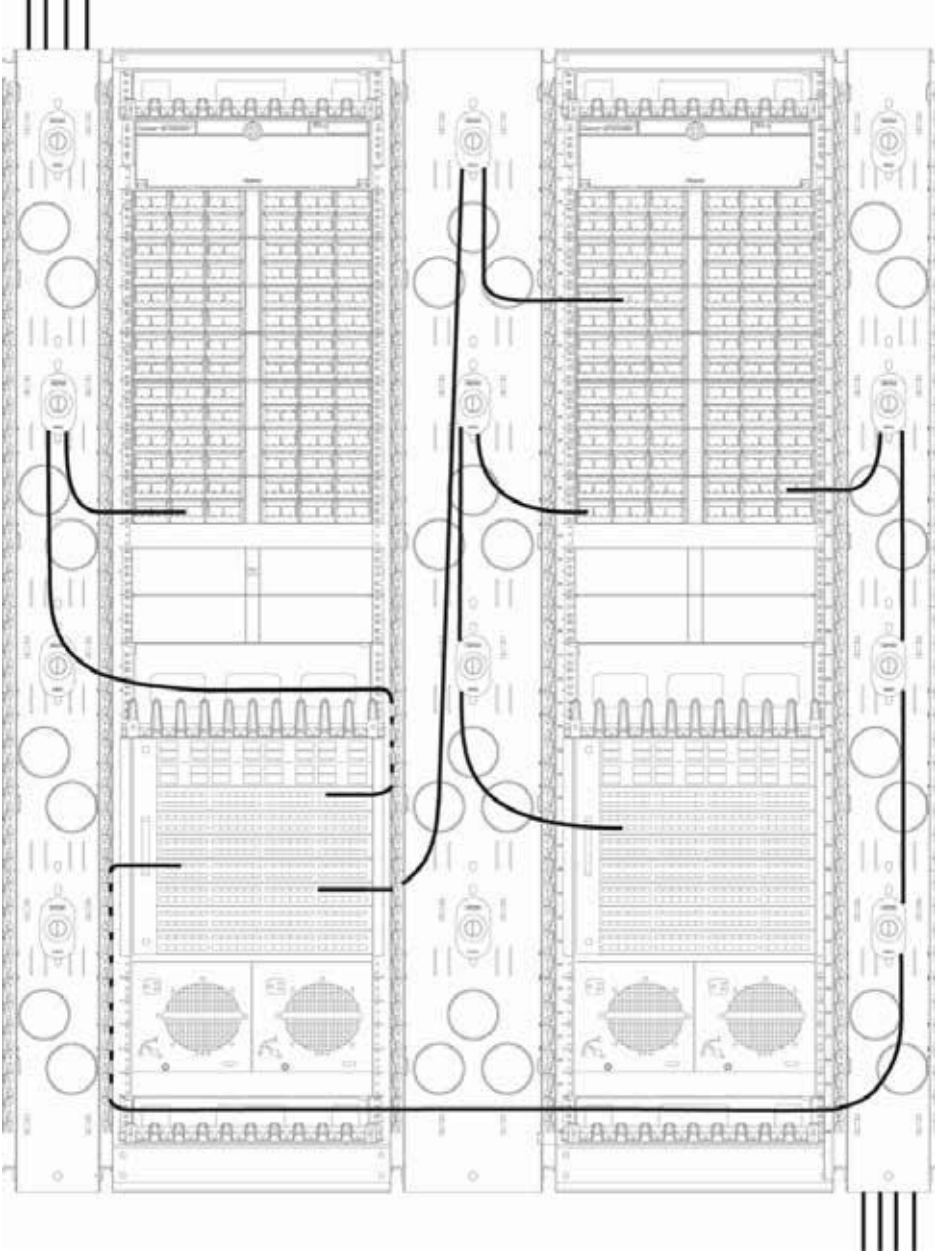Panduit PatchRunner cable routing examples.

Diagram from Panduit.

5.6.2 Tyco NetPodium

Tyco NetPodium copper management frames are used in M1.

- Incoming and trunk cables shall enter the rack and run in the vertical cable management areas at the back of the rack.
- Every patch cable shall pass into the vertical cable management compartment over a rubber cable manager. The cable manager used shall be at the same RU height as the patch panel the cable is plugged into.
- Cables from the left half of the patch panel shall be routed to the left of the rack, cables from the right half of the patch panel shall be routed to the right of the rack.
- For patch cables with both ends in the same rack the vertical cable management on each side of the rack and the rack to rack pathways at the top and bottom of the rack shall be used for the cable route. No other routes are acceptable.
- For patch cables transitioning between racks the rack to rack pathways at both the top and bottom of the racks shall be used. Cables shall not pass between racks at any other location.
- Cables shall be tied to the integrated patch panel management behind each patch panel.

Patch cables passing over the cable manager.

Cables tied to rear cable management.
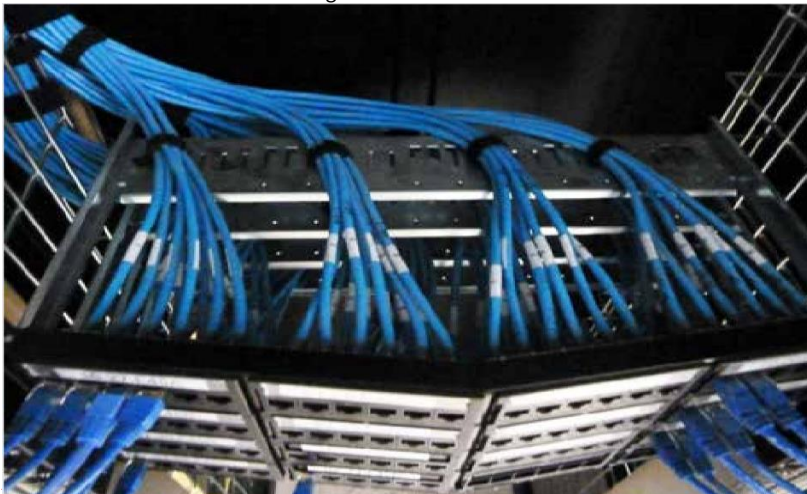
5.7 Building MDF's and IDF's

NEXTDC facilities have a main distribution frame (MDF), and usually one or more intermediate distribution frames (IDFs).

- No equipment (i.e. ADSL filters) shall be installed on any MDFs or IDFs.
- No new blocks shall be added or terminated without consulting the Facilities Operations Team as all positions are allocated to specific purposes (even those for which blocks are not already present).
- All new services delivered to the MDF must be tested and tagged at the MDF, and the MDF record book must updated accordingly.
- There shall be no double jumpering.
- Any jumpering must be recorded in the associated record book according to industry standard practice.
- Jumpers from the left 5 pairs should be routed to the left of the module, and jumpers from the right 5 pairs should be routed to the right of the module. Jumpers shall be routed correctly around the cable arms between blocks.
- A small amount of slack (a few centimetres) should be left in case re-termination is required. Excessive slack is not acceptable.

MDF with jumpers routed correctly (vertical and horizontal runs using the cable arms – not point to point across the MDF).
Note: acceptable tagging in bottom left corner.
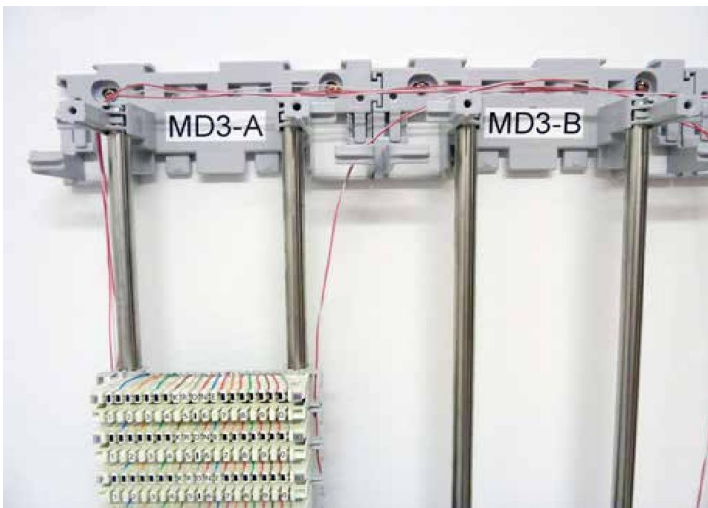
Appendix A: Optical Insertion LossTest Sheet

Job Details

Title		Date	

Optical Fibre Details

Cable ID:	From:	To:	Optical Length Link (OTDR)(L):

End A:		Operator End A:		Light Source End A:		Light Meter End A:	
End B:		Operator End B:		Light Source End B:		Light Meter End B:	

Wavelength 1310nm

Description	Constant	Value
Fibre Link measured by OTDR	L	0.1
Fibre attenuation coefficient (dB/Km)	F	0.3
Maximum average loss per MPO Connector	S	0.75
Number of MPO connectors in circuit	N	6
Number of optical through connectors in circuit	C	4
Maximum insertion loss at 1310nm IL = (F x L)+(S x N)+(0.5 x C) =		-6.53

Wavelength 1550nm

Description	Constant	Value
Fibre Link measured by OTDR	L	0.1
Fibre attenuation coefficient (dB/Km)	F	0.2
Maximum average loss per MPO Connector	S	0.75
Number of MPO connectors in circuit	N	6
Number of optical through connectors in circuit	Ct	4
Maximum insertion loss at 1550nm IL = (F x L)+(S x N)+(0.75 x C)+0.3 =		-6.52

Wavelength 1310nm

Fibre No		Launched from End A			Launched from End B			IL (A+B)/2	Pass/Fail
End A	End B	Ref P	RCVD P	Loss	Ref P	RCVD P	Loss		

Minimum Insertion Loss at 1310nm (dB)   Maximum Insertion Loss at 1310nm (dB)
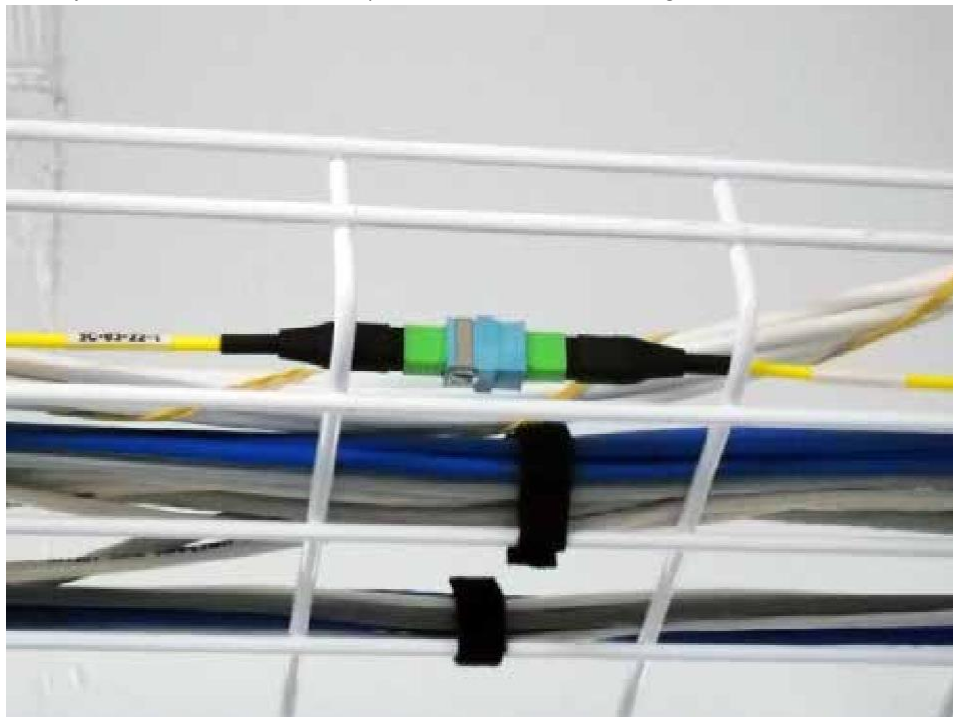
Wavelength 1550nm

Fibre No		Launched from End A			Launched from End B			IL (A+B)/2	Pass/Fail
End A	End B	Ref P	RCVD P	Loss	Ref P	RCVD P	Loss		

Minimum Insertion Loss at 1310nm (dB)   Maximum Insertion Loss at 1310nm (dB)

Appendix B: Examples of Unacceptable Installations

Cable joiners shall not be used anywhere. Use the correct length cable.

This cable is too short and is not sitting on the cable basket properly. Use the correct length cable.

This cable is not bundled and tied correctly. Hence it is also not running straight on the cable basket.

No equipment shall be installed on cable trays/ladders/baskets or in fibre duct.

A cable (or bundle of cables) has been hauled over the top of the Cat 6 bundle. The friction has resulted in the insulation melting and being torn away.

Cable slack is to be neatly coiled in the side of the customer cabinet. Coiled on the cable tray is not acceptable, as it will obstruct future cable installations. The end result will be cable run over the top of the coil, compressing it against the basket tray.
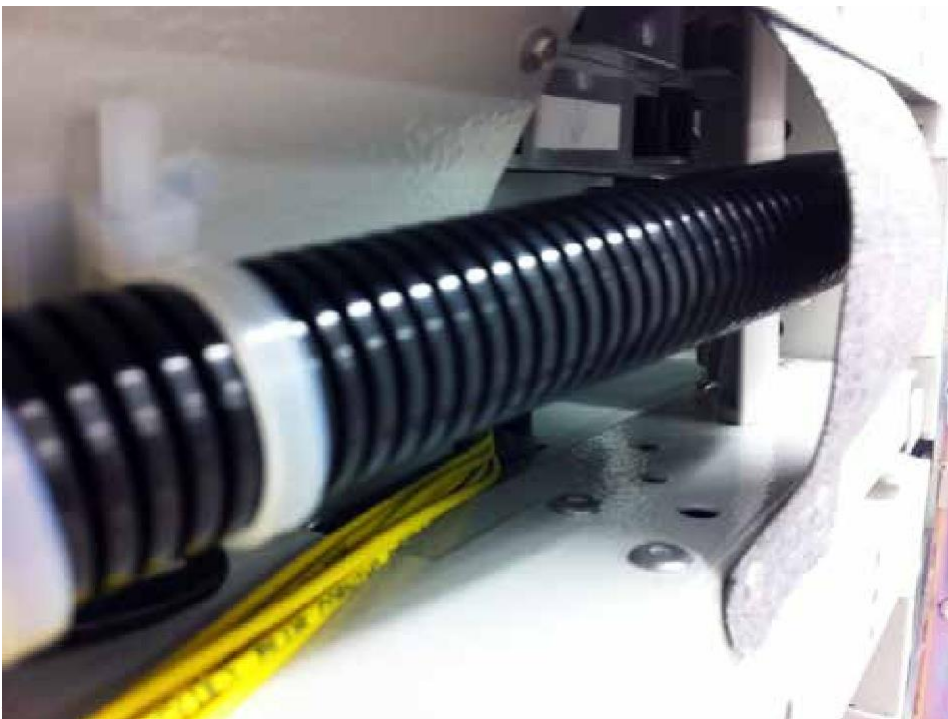
These trunk cables have been installed without waterfalls. Waterfalls can be retrospectively fitted.
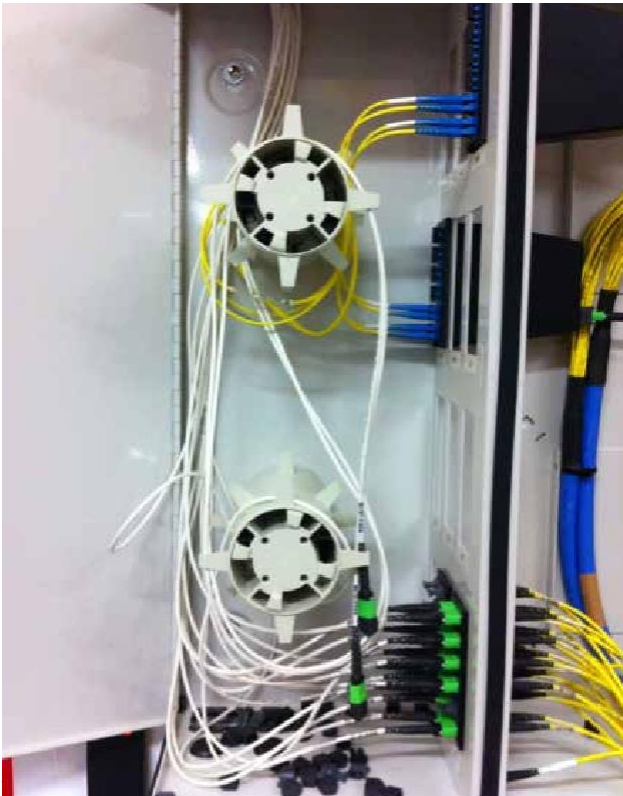

This flexi-conduit is missing a cable tie (as pictured right), and as a result the patch leads have been incorrectly routed underneath it.

Slack should be stored in the client's cabinet not looped inside the zone enclosures.

The blue sheathing should have been removed so only a small amount passes through the cable glanding and into the enclosure.
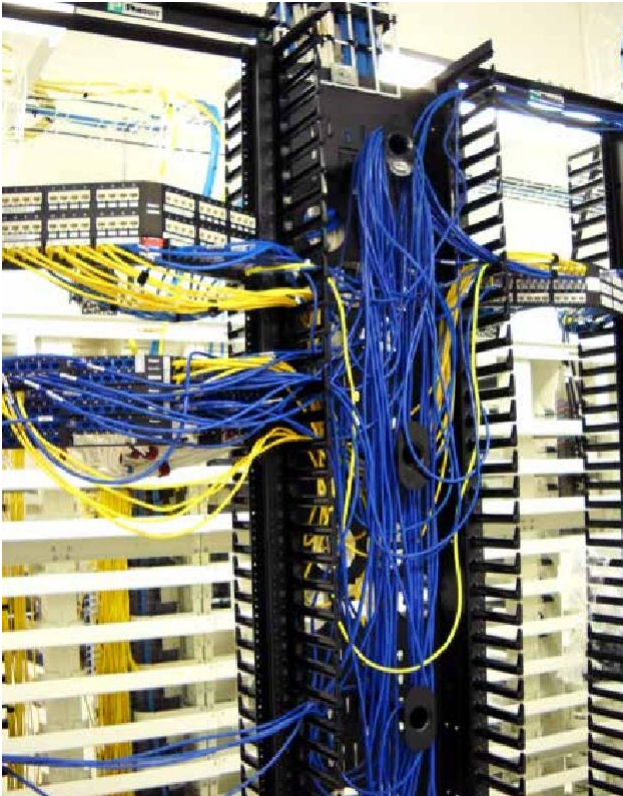
Incorrectly seated connector.

The patch cables on the left of this photo should be routed to the left side of the rack.

Patch cables routed to the wrong side of the frame, slack storage incorrectly used, patch cables incorrectly routed between racks, no labels.

Jumpers need to be installed in horizontal and vertical runs only, not draped across an MDF without using the cable fingers. No equipment (such as this ADSL filter) shall be installed on an MDF or IDF.
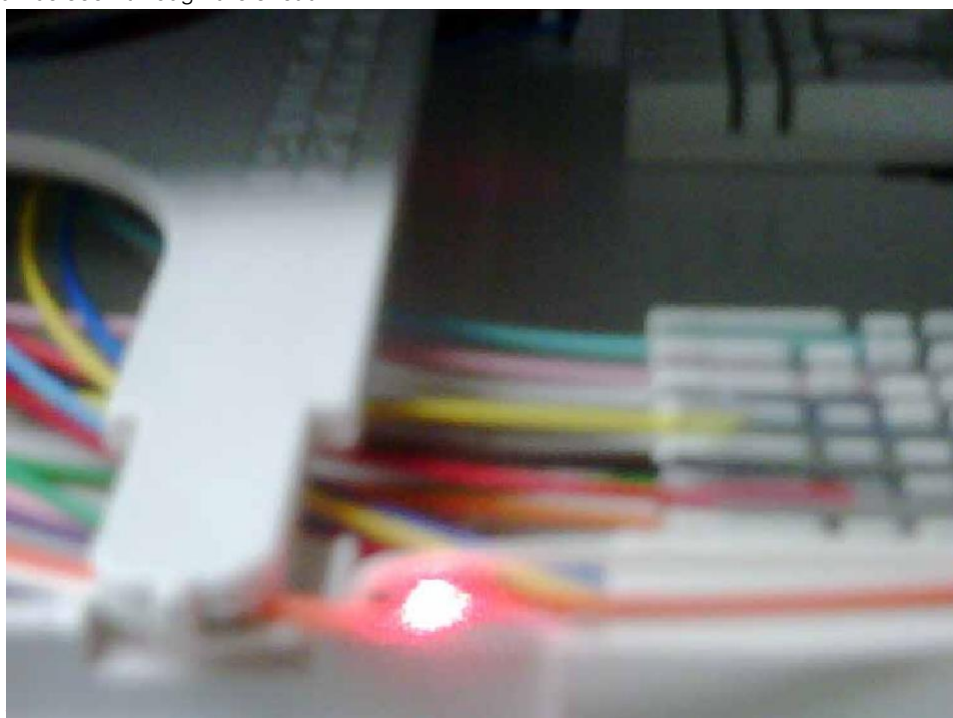
Kinking a fibre can damage or break the fibre core. A patch lead that has been subject to a tight kink, has been compressed or pinched in something should be treated as suspect and tested.


A patch lead with a broken fibre core will often leak enough light when a visible light source is detected that the red light can be seen through the sheath.

In the photo below it can be seen that SC connectors have been plugged into an SCA panel. As a result, these circuits will be experiencing higher than usual loss and possible other undesirable side-effects. This mismatch probably counts for 3-4dB of loss.
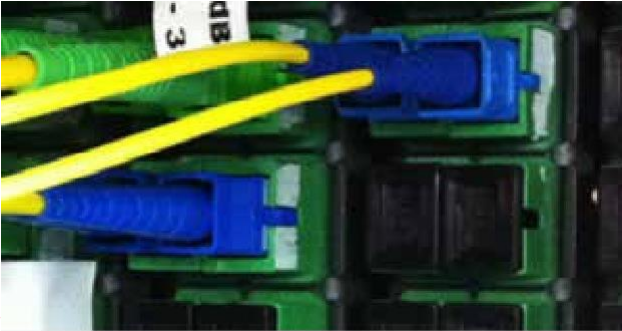
In this photo 6 of the SCA connectors have been left uncapped and dust will accumulate in these connectors. It also poses a potential OH&S safety risk if a high-power laser were to be connected to the other end and someone inadvertently looked into the connector. Caps should be placed on unused connectors as soon as they are unplugged.