



Communications Infrastructure

Standards and Specifications

Copper and Optical Fibre Cabling

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Table of Contents

1	INTRODUCTION.....	4
1.1	Purpose	4
1.2	Scope.....	4
1.3	Accountability and Management.....	4
1.4	Requesting and Purchasing CU ITS Cabling Products and Services.....	5
1.5	Implementation	5
2	STANDARDS.....	6
2.1	Conformity to Relevant Standards.....	6
2.2	Approved Manufacturer Certified Solutions & Products.....	7
2.3	Cabling Standard - Structured Cabling System (SCS)	7
2.4	Installation Company Quality Assurance	7
2.5	Application Assurance and Warranty	7
2.6	General Cabling Installation Standards and Workmanship	8
2.7	Installation Staff Standards and Accreditation	9
3	GUIDELINES	10
3.1	Types of Use	10
3.2	Design Guidelines.....	10
4	TELECOMMUNICATION ROOM (TR).....	12
4.1	General.....	12
4.2	Data Services	14
4.3	Voice Service	14
4.4	Access.....	14
4.5	Lighting.....	14
4.6	Air conditioning.....	15
4.7	Racks	15
4.8	Grounding and Bonding	15
4.9	Power	16
4.10	Patch Panels	16
4.11	Cable Management.....	17
4.12	Cable Trays.....	17
4.13	Miscellaneous	18
5	CAMPUS BACKBONE CABLING SYSTEM	18
5.1	General.....	18
5.2	Underground Installations	19

5.3	Outdoor Above Ground Installations.....	19
5.4	Cabling Pathways	19
5.5	Optical Fibre	19
5.6	Optical Fibre Terminations.....	20
5.7	Voice Grade Cabling	20
6	BUILDING BACKBONE CABLING SYSTEM.....	20
6.1	General.....	20
6.2	Voice Grade Cabling	21
6.3	Overvoltage.....	21
6.4	Cabling Pathways	21
7	HORIZONTAL CABLING	21
7.1	General.....	21
7.2	Cabling Pathways	22
7.3	Cable Terminations - Inter-Connect System	23
7.4	Work Area	23
7.4.1	Telecommunication Outlets (TO).....	23
7.4.2	Flush Mounted Faceplates.....	24
8	LABELLING AND NUMBERING	25
9	COMPLIANCE TESTING	26
10	DOCUMENTATION	27
10.1	General.....	27
10.2	Work Area	27
10.3	Test Result Documentation.....	27
11	CUSTOMER ACCEPTANCE.....	27
11.1	General.....	27
12	APPENDIX A. Example Communications Rack Layouts	29
13	APPENDIX B. CARD ACCESS/CBORD CABLING CONTROLLER DEMARC.....	30
14	APPENDIX C. LIST OF MATERIALS.....	31
15	DEFINITION OF TERMS	36
16	ABBREVIATIONS	38

1 INTRODUCTION

1.1 Purpose

This standard provides the minimum installation and operational requirements for Carleton University (CU) cabling systems. This standard applies to all Carleton University Computing and Communications (CU ITS) copper and fibre cabling (voice and data), in horizontal cabling, and backbone cabling. The standard is to be applied to all copper and fibre optical cabling within all Carleton University campus and buildings, regardless of their intended use.

1.2 Scope

The principles of the standard must be applied when conducting cabling projects or move/add/change (MAC) for:

- The construction of new buildings.
- Renovation of existing buildings.
- Upgrade to existing cabling infrastructure.
- Implementation of cabling infrastructure to interconnect new or existing buildings.
- Existing and/or addition of connections for end point devices.

1.3 Accountability and Management

This standard outlines effective and consistent management of cabling throughout all Carleton University buildings.

All parties (CU ITS, Cabling Contractor, Clients and others) must ensure that:

- All cabling work conducted is consistent with regulatory and legislative obligations including relevant Canadian Standards.
- All relevant stakeholders are consulted prior to commencing cabling projects.
- Comprehensive audits are conducted on completion of cabling projects.
- Only cabling systems offering appropriate are used.
- Warranty documentation for cabling infrastructure is kept up to date and that copies are provided to CU ITS.

Any conflicting information should be clarified with CU ITS. Any conflicting information should be governed by reference to the following documents:

- Relevant Canadian Standards.
- Relevant Industry Standards.
- Relevant Network standard.
- Internal instructions by CU ITS.

1.4 Requesting and Purchasing CU ITS Cabling Products and Services

This standard requires that all requests and purchases comply with Carleton University standards.

All parties must ensure that:

- Where cabling is purchased as part of a major building project, contracts between Carleton University and the cabling contractor/vendor are formed in compliance with Carleton University Purchasing Services Policies.
- This standard is referenced as requirements in tender and contract documentation.
- Cabling contractor/vendor must be a CommScope Systimax Solution Partner and Cormant-CS (CableSolve) Business Solution Partner or Master Dealer Licensed Distributor.
- Unless there are issues that cannot be addressed, cabling works should be assigned to the preferred cabling contractor/vendor that was selected through the regular (every 5 years) Request for Proposal (RFP) process.
- All MAC work orders must go through ITS Service Desk ticketing system.

1.5 Implementation

The University employs a Structured Cabling System which shall consist of a flexible cabling infrastructure to support computer, telephone, video and other IP based communications systems (e.g. WIFI, Building Automation, Security), independent of their manufacturer. The structured cabling infrastructure has, at the workstation, a telecommunications outlet that is wired to a central point using star topology, providing flexibility for University personnel.

The requirements of the Structured Cabling System described in this document apply to all new cabling installations on all buildings of Carleton University. These guidelines also apply to the refurbishment of existing installations or any Moves, Adds or Changes (MAC's) to existing installations.

The Structured Cabling Solution shall use CommScope Systimax unshielded Category 6 components, Singlemode OS2, and Multimode OM3, and OM4 optical fibre.

The solution should define the method(s) of flexible patching for the telecommunications services to enable simple MAC's without frequent rewiring of locations.

All communications cabling works done at Carleton University shall be managed by CU ITS with an exception in areas where specific department have an agreement with CU ITS that they will be responsible in the management of cabling infrastructure for the platform or environment that they are supporting. A good example for this is Card Access/CBORD controller environment.¹

Any works which do not adhere to the guidelines contained in this document will be deemed noncompliant, and will be rectified by the contractor responsible for the works at the contractor's expense.

¹ APPENDIX B, CARD ACCESS/CBORD CABLING CONTROLLER DEMARC

This document will change to reflect current industry standards and CU ITS requirements, and as such will be subject to version changes as required.

It is the responsibility of the contractor to ensure that they have the latest version of the CU Communications Infrastructure Standards and Specifications document.

2 STANDARDS

2.1 Conformity to Relevant Standards

All Structured Cabling work shall be installed in strict compliance with the Carleton University's Communications Cabling Infrastructure specifications, to the latest standards listed below and the latest applicable CommScope Enterprise Solutions (Systimax Network Infrastructure) warranty specification (www.commscope.com/Docs/A-Warranty-You-Can-Trust.pdf).

Carleton University's Communications Cabling Infrastructure specifications take precedence over such standards and the applicable CommScope Enterprise Solutions specification. The relevant Canadian Standards take precedence over any international standard unless otherwise specified in this document. All cabling and connection equipment and materials supplied shall be products that are approved by the manufacturer.

The latest versions of the following standards and specifications are to be complied with unless otherwise specified in this document. In all cases, where there is a discrepancy or clarification is required between this document and the following standards and specifications, clarification and approval in writing from CU ITS shall be obtained prior to submission of tender. No variation will be allowed after tender submission.

- ANSI/TIA-568.D-1, Commercial Building Telecommunications Infrastructure Standard
- ANSI/TIA-568-C.2, Balanced Twisted Pair Telecommunications Cabling and Components Standard
- ANSI/TIA-568-C.3, Optical Fiber Cabling Components
- ANSI/TIA-569-C, Commercial Building Standard for Telecommunications Pathways and Spaces
- ANSI/TIA-606-B, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- ANSI/TIA-607-B, Generic Telecommunication Grounding and Bonding for Customer Premises
- ANSI/TIA-598-C, Colour Coding of Fiber Optic Cables
- ANSI/TIA/EIA-942, CommScope Telecommunications Infrastructure Standard for Data Centers
- ANSI/NECA/BICSI-568, Standard for Installing Commercial Building Telecommunications Cabling
- ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard
- ANSI/TIA-526-7, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
- Systimax® PowerSUM and GigaSPEED® XL Cabling Design Guidelines

- CommScope® Enterprise Data Center Design Guide
- BICSI Guidelines and Installation Practices
- TDMM: CommScope Telecommunications Distribution Methods Manual 13th edition

2.2 [Approved Manufacturer Certified Solutions & Products](#)

CommScope Systimax Solution Copper (e.g. Category 6) and Optical Fibre Products and Solutions shall be used in all Carleton University buildings. “Equivalent” products are not acceptable.²

2.3 [Cabling Standard - Structured Cabling System \(SCS\)](#)

The Structured Cabling Solution shall be designed and installed to provide the CommScope Systimax Telecommunications infrastructure (patch panels, frames, patch leads, cables, faceplate and outlets) necessary to build a uniform premises distribution system, which will function for a multimedia communications solution to support minimum 1000Mbps (1 Gigabit Ethernet).

The solution shall be designed and installed to enable flexible point to point patching of the Telecommunications services to allow for simple Moves, Adds & Changes, (MAC’s) without frequent rewiring of locations.

All of the products supplied into installations must be new and not reused products. All of the specified manufacturer’s products supplied shall be genuine.

The communications channel shall be capable of supporting the provision of power to the Data Terminal Equipment as specified in the latest IEEE 802.3at “Power over Ethernet” standard.

2.4 [Installation Company Quality Assurance](#)

The installation company shall have a quality system in place that conforms to the requirements set out in the ANSI-TIA standards and the installation company shall provide details of certification with CommScope.

The installation company shall install, terminate, test and commission the cabling infrastructure to the relevant industry standards and the manufacturer’s standard unless approved in writing by CU ITS.

2.5 [Application Assurance and Warranty](#)

All installations of telecommunications infrastructure in new or existing Carleton University premises require CommScope Systimax SCS 20-year Extended Product Warranty and Application Assurance, and shall be provided by the nominated manufacturer for warranty from the date of successful completion of testing and commissioning of the Structured Cabling System.

² APPENDIX C. LIST OF MATERIALS - CommScope Systimax Solutions

The application assurance shall cover the failure of the offered cabling system to operate the applications that the system was initially designed to support, namely those identified in the current (at the time of tendering) versions of the Cabling Performance Specifications (that is the ANSI TIA set of standards).

For any specifications not mentioned in this document, please refer to the latest appropriate Canadian/BICSI/ANSI/TIA and Vendor specific direction to conform to the correct specifications and certifications. The CU ITS is to be notified of these instances prior to any action being taken associated with these.

2.6 General Cabling Installation Standards and Workmanship

All cables shall be run and installed in a professional manner, in accordance to the latest published COMMScope Systimax CAT 6 Installation Guidelines. It contains the appropriate and collective requirements of these standards and is therefore the mandated minimum requirements for cabling products, installation and compliance testing.

The cabling system shall be planned and designed to ensure adequate segregation from electrical and hazardous services, ensuring system integrity and performance, ensuring that it does not present problems of current and future maintenance or access, and ensuring there is no conflict with the operation and maintenance of other systems. The installer shall seal all openings, either external or internal, made or provided through building walls, floors, ceilings or other fixtures after the cable has been reticulated to ensure the integrity of the barrier that has been penetrated. This includes but is not limited to the ingress of moisture, entry of rodents and other vermin and fire where applicable. All exposed cabling shall be mechanically protected to ensure protection from external forces.

The installation company shall be responsible for providing corrosion resistant products used in the installation of the structured cabling system and must ensure that any future corrosion of these products is limited. The installer is also responsible for the restoration of any damaged paintwork on equipment or accessories and this restoration must meet the original finish. If any damage occurs during the installation it must be reported to the CU ITS immediately.

All communications equipment installed within Carleton University campus shall be installed in such a way that it is aesthetically pleasing and is in conformity to the equipment surrounding it. All exposed materials shall be consistent and shall not conflict with the surrounding décor.

The Contractor shall take responsibility for ensuring that after the work being carried out, the buildings / grounds / work areas are returned to its original state, as not to draw attention to the work that has been done i.e. installing the same duct work already existing in the area, painting, back filling, laying turf, etc.

The Contractor shall check the surface finishes and paintwork around the area of installation and touch-up or repair/replace all damaged parts after the installation of cabling and equipment.

The Contractor shall provide literature including data on maintenance and operation of all equipment installed. Relevant catalogues of all materials, instruments, equipment, and components, to be supplied shall be provided CU ITS electronically.

All installed equipment and materials shall be permanently and legibly marked to indicate clearly the name of the manufacturer's registered trademark.

Any existing data cabling affected by the relocation of the communication outlets is to be reinstated. All old cabling is to be totally removed by removing all cabling from the wall outlet to the network patch panel terminations in the cabinet/communications room.

Any cabling infrastructure found by the Cabling Contractor to be non-conforming to ITS guidelines, the manufacturer's guidelines, or Canadian Standards, while doing work on the physical layer network, shall be reported to CU ITS. A recommendation for rectification of the non-compliance should be included as part of the report.

2.7 Installation Staff Standards and Accreditation

The Cabling Contractor and nominated personnel must all hold current relevant and necessary licences/open registration with appropriate endorsements, and must present these prior to commencement of work.

The Contractor shall provide a technical support staff member holding a current, and valid BICSI RCDD certification.

The successful Contractor shall supply a list of names of installation staff and a copy of their accreditation certificates from the specified manufacturer. This requirement does not apply to apprentices or trainees under the full-time supervision of an authorised installer of the specified manufacturer. A minimum of 50% of the installation staff on site at any time throughout the installation must be certified by the specified cabling manufacturer.

Carleton ITS reserves the right to inspect, and validate the certification requirements specified in this document.

The Contractor shall provide a list of their technical support staff listing their working experience in the relevant field.

The Contractor shall state the nearest location of their principal support centre. This centre shall have permanently stationed support staff capable of providing technical support effectively and efficiently when requested by CU ITS.

Contractors are required to undertake Carleton University site inductions for each site before commencing work on that site.

Contractors working on sites must attend Workplace Health & safety induction, including asbestos training. Contractors must adhere to facilities safety plan procedures and forward appropriate documentation as required under this.

Contractors on sites must be uniformed, with company identification, clearly showing who they are and what company they are employed by.

3 GUIDELINES

3.1 Types of Use

The Structured Cabling System shall be capable of supporting current and future services that require, minimum, 300 MHz signalling as specified by ISO/IEC 11801 Class E.

These include but are not limited to the following services:

- IEEE 802.3 (Ethernet)
- IEEE 802.11 (Wireless LAN)
- Building Security and Access
- Analogue Telephone
- Digital Telephone
- Facsimile
- EFTPOS
- Building Management Systems
- Security Cameras
- Modems
- Digital and Analogue video
- Composite baseband video and audio
- Broadband Video
- RGB baseband video
- 3D Imaging
- Digital and Analogue Audio

3.2 Design Guidelines

The Structured Cabling System is designed to support a high speed, high availability and redundant network that allows for future growth and capacity increase.

All cabling infrastructure is to be installed by vendor certified installers, to the level as set out by this document. All cabling infrastructure is to be installed and tested to vendor certification.

Each building shall be provided with:

Backbone Cabling Infrastructure

- Optical Fibre services via diverse paths and building entry points.
- Backbone Optical Fibre to be terminated at the fibre patch panel in the Building Distributor (BD).
- Backbone cable Infrastructure shall be terminated in the BD.

Telecommunications Rooms (TR)

A minimum of one TR per floor shall be provided; the number and size of TRs per floor shall be governed by 90 meter maximum cable run length and the size of the floor space.

- Cabinets to be at least 44 RU 800mm x 900mm with 900mm space at front, back and sides of racks or rack assembly as per Canadian standards.
- Each cabinet to be supplied at minimum with 2 x 20A circuits for power, each on their own separate dedicated circuit.
- Power and HVAC infrastructure shall have sufficient capacity to provide adequate power load and maintain requisite (or appropriate) temperature control - i.e. 23 degrees, ANSI/TIA.
- Room to be permanently locked and keyed as per the standard CU ITS communications room keys.

Cable Risers and Pathways

- Cable risers and pathways to be independent from all other services.
- Main cable pathways shall be cable tray or steel wire basket form.
- Shall allow for 50% spare capacity for future growth.
- Shall be fire rated where the cabling traverses' floors or fire rated building infrastructure as required by relevant codes.
- Cable pathways above solid or feature ceilings to be cable tray with appropriate access panels to be installed for future access.

Horizontal Cabling and Telecommunication Outlets

- Horizontal cabling to be an unshielded structured cabling system, at least Category 6, with RJ45 outlets at each end.
- Horizontal cabling to be no more 90 meters from patch panel to wall outlet termination.
- Telecommunication outlets at new workstations are to be at least four connector faceplates, with two cables on each.
- Ceiling mounted outlets and in-ceiling telecommunication outlets for wireless access points are to be positioned as per the CU ITS direction, and standards.
- Cabling for wireless will have their runs terminated with a ceiling mounted or in-ceiling telecommunication outlet secured to a permanent structural member.

Labelling of cabling infrastructure

- Labelling as per CU Cabling Specifications document section 8 of this document.

Test results, Documentation and Record Books

- Test results and as-built drawings for all cabling infrastructure to be provided on completion of works to CU ITS in the form set out by the Cabling Specifications document, section 10 "Documentation".

Acceptance and handover

- It is a requirement that all works adhere to the above guidelines and to specifics outlined in the cabling specification document in order for acceptance, handover, and any associated payments for works to take place.
- Acceptance of BD/FD to include the cleaning of the communications room floor, inside the cabinets and frames and wipe down of cabinets, racks and associated infrastructure, so as to prevent the ingress of building dust in active network equipment once installed.

4 TELECOMMUNICATION ROOM (TR)

4.1 General

The Telecommunications rooms are comprised of Campus Distributors (CD), Building Distributors (BD), and Floor Distributors (FD), all are interconnected, and in turn connect to Data centers. The communications rooms shall be able to contain:

- Telecommunications equipment
- Horizontal and vertical cable terminations
- Associated inter-connecting cables.

The Campus Distributor (CD) is defined as the space that houses equipment which connect all buildings and Data Centers together in a meshed network architecture. The CD is a connection point between all BDs. Carleton currently deploys four (4) CDs (PoP rooms).

The Building Distributor (BD) is defined as the space that acts as the transition point between the outside plant backbone and the vertical distribution pathways in a building; that is, it forms the backbone/building interface.

Building Distributor (BD) covers space dedicated to providing telecommunication and networking services inside buildings.

The BD is used to terminate the campus cabling, building backbone cabling, horizontal cabling, as well as house network equipment in order to allow data and voice services to be provided for the work area in a structured cabling system.

The BD may contain telecommunications equipment and other communications equipment such as CATV, IPTV, CCTV, Security, Fire Alarm, Lighting Control, Public Address and Audio.

The BD may also contain small UPS equipment, and other Building Automation Service (BAS) equipment. Only electrical equipment servicing BD/FD shall be located inside the room.

The layout of the equipment racks, voice frames and other equipment & services within the BD shall be approved in writing by a CU ITS prior to installation. The design and layout of the cabling infrastructure terminated within the equipment racks shall also be approved in writing by CU ITS prior to installation.

Environment for the BD must be such that it ensures a dust free area that will allow any active equipment to operate within its optimal operating temperature.

Each BD shall be connected to the CD with singlemode fibre cable/s to connect services to the University's network.

The Floor Distributor (FD) is defined as the space that acts as the transition point between vertical and horizontal distribution pathways. FDs contain telecommunications equipment, cable terminations and cross-connect wiring, and as such they exist on every floor(s) of the building(s).

Running fluid pipes and drains through communications rooms is not recommended. In cases where this is unavoidable, pipes carrying fluids must have a rigid barrier installed over it to prevent equipment damage, e.g. metal hat section, double conduited. Plans for these must have prior written approval from a CU ITS before installation.

No high voltage electrical services to be present or traversing communication rooms.

4.2 Data Services

All fibre optic cables to be terminated on fiber optic patch panel capable of presenting up to 144 strands of fiber.

All Category 6 cabling must be terminated on 24/48 or 96 port Category 6, 19" rack-mounted patch panels in the communications room's equipment racks.

CommScope Systimax Patch cords shall be provided when patching of voice and or data circuits as required, to facilitate MAC's and maintain the vendor's System Warranty.

Data patch cords will be CommScope Systimax Category 6. The Patch cord length shall be 3 meters. Every requested active outlet shall be provided with a patch cord .Any additional patch cords will be provided upon request.

4.3 Voice Service

For copper voice circuits, each BD will connected to ITS CU voice Network via COMMSCOPE Systimax CAT 5E fire rated 25 pairs cable.

The mounting system shall be-110 mount frames to match the existing installation.

4.4 Access

Access to the telecommunications rooms (TR) must be secured to prevent access by unauthorised p ersonnel. Doors must be keyed to the standard CU ITS door key or Card Access for new or existing installations. Shared access to TR must have prior written approval from CU ITS.

- For security reasons TRs shall only be used for CU ITS approved services.
- The floor level in the TRs should be the same as the outer access area, so that equipment racks and equipment can be easily installed and maintained.
- There must be ease of access to the ceiling space above the enclosure(s) and this access will remain uncluttered by other installations, including air conditioning and electrical installations.
- Ceiling space to allow for access and installation, including future access and installation.
- The proposed TR must be fully accessible from common areas and internal to the building.
- The door shall be a minimum of 91 cm wide and 203 cm high, without doorsill.
- TR Door should swing outwards unless against codes.

4.5 Lighting

Lighting shall be a minimum of 540 Lux measured one meter from the finished floor and mounted a minimum of 2.6 meters above the finished floor (AFF).

Lighting shall be placed such that the work areas, front, rear, and side areas of racks are illuminated to the specified levels.

4.6 Air conditioning

A stand-alone air conditioning (A/C) system is to be provided in the Building Distributor to ensure a suitable operating environment for equipment in the room. This system is to be designed so that 24 hours, 7 days a week operation can be maintained.

4.7 Racks

Telecommunication racks shall be 19" (488 mm) wide, floor mounted, and black in colour, accommodate a minimum of 44 rack unit spaces, and have anchor holes in the base.

All telecommunications racks are to be fitted with one (1) black 24 outlets vertical, rack mounted power strip. Ground and bond all racks to the FD's grounding bus bar as specified below.

The colour of the rack and accessories shall be black.

Wall mount equipment racks are not the University's preferred option for mounting infrastructure equipment. The use of wall mount cabinets within the University shall only be used with prior written approval by CU ITS.

4.8 Grounding and Bonding

The grounding and bonding of the telecommunications system shall meet all relevant legislations and codes.

All grounding and bonding shall be installed as per:

- TIA-942, Telecommunications Infrastructure Standard for Data Centers.
- J-STD-607-B, Commercial Building Grounding and Bonding Requirements for Telecommunications.
- TIA/-606-B, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- STD 1100-2005, IEEE Recommend Practice for Powering and Grounding Electronic Equipment (IEEE Emerald Book).
- CEC, Canadian Electric Code (CEC).

4.9 Power

Follows are the power requirements on Building Distributor (BD) and Floor Distributor (FD):

- Building Distributor, 2 dedicated 30A at 120 volts emergency power circuits terminated in twisted L5-30R, and 4 dedicated 30A at 208/240 volts emergency power circuits terminated in twisted L6-30R, the voltage, amperage, and being on emergency power shall be identifiably labeled at each outlet. The voltages for these services and the outlet locations are based upon the elements contained within or anticipated for the space; as such CU ITS shall confirm these requirements.
- Building Distributor, 4 dedicated 20A at 120volts on emergency power circuits placed at 4 foot intervals around the perimeter of the room. The 20A at 120 volt receptacles shall be type 5-20RA. The voltage, amperage, and being on emergency power shall be identifiably labeled at each outlet. The voltages for these services and the outlet locations are based upon the elements contained within or anticipated for the space; as such CU ITS shall confirm these requirements. Unless otherwise specified by CU ITS all electrical outlets shall be installed such that the top of the installed faceplate is at 150 mm or less above finished floor (AFF).
- Floor Distributor, 2 dedicated 20A at 120 volts on emergency power circuits, terminated with the keyed 5-20RA receptacle, with voltage, amperage, and being on emergency power identifiably labeled at each outlet. Location of these circuits is based on equipment layout and needs. The room shall have at a minimum 2 x 20A dedicated circuits placed at 4 foot intervals, 6 inches above floor, terminated with the keyed 5-20RA receptacles. The room shall have at a minimum 2 x 20A circuits, terminated with the keyed 5-20RA receptacles and available within the room, and identified as such service.

The main building ground shall be extended to the BD and FD; balanced ground windows shall be installed, and interconnected using green insulated wiring. The gauge of the cable to be calculated using CEC and ICEA P32-382 guidelines. The cable shall extend from the main building grounding bus bar uncut to the last grounding bus bar on the circuit. Bonding wire shall be use to connect the equipment to the bus bar.

In absence of specific instructions the grounding and bonding shall be at a minimum done in accordance with the standard J-STD-607-B., Commercial Building Grounding and Bonding Requirements for Telecommunications.

4.10 Patch Panels

New patch panels installed in the racks shall be a 24, 48 or 96 port patch panel. Each installed patch panel shall include rear cable management that is attached to the back of the patch panel. The preferred patch panel for general use is the VP-3960 96 ports patch panel. The 24 and 48 patch panel are the 360 PatchMax panel

4.11 Cable Management

Provide a 140 mm vertical cable manager on each side of the 483 mm rack at a minimum, except where racks are ganged together. 255 mm vertical cable managers may be recommended when the number of cables is important and future growth is anticipated.

Where racks are ganged together utilize a 255 mm (vertical manager), between the racks. The vertical cable manager shall have a metal door that hinges open from the right or left. The vertical cable manager shall have bend radius control built into the manager so as patch cables transition into the manager they are not resting on a sharp edge.

Horizontal cable management is provided by the VisiPatch patch panel. Follow manufacturer's recommendations for number and lay-out of panels, managers and cables.

Only approved cable management materials will be installed.

Adequate vertical and horizontal cable management shall be provided to manage the quantity of patch cords being used within the communications rack. Examples of standard rack layouts used by Carleton University can be found in Appendix A.

4.12 Cable Trays

Cable trays shall be wire basket type for plenum and FD applications where they are concealed from the public and solid bottom galvanized tray where it crosses public locations. A cover shall be provided to prevent damages by accident or vandalism in the public spaces. Size the tray for actual number of cables and future anticipation of the number of cables that could be eventually serve the area. Manufacturer's recommendations shall be followed for cable load. Size the cable tray as per requirements, anticipated future growth and upgrade. Minimum steel thickness for cable tray shall be:

- 1.0mm for trays up to 150mm wide and
- 1.2mm for trays up to 300mm wide.

Trays shall have minimum height of 77mm. Electrical continuity shall be maintained along the full length of cable trays.

Cable trays in TRs should be appropriate for the number of cables terminating in the communications room and allow for at least 50% growth. Where cables exit off cable tray or enter wall cavities the cables shall be protected with an approved ridge support (E.g. Corrugated Conduit) maintaining the cable's minimum bending radius for drops greater than 45°.

In buildings and floor distributors the minimum tray size shall be 100mm x 300mm. It shall cover the racks and provide a path to the pathways either from the ceiling, the floor or both. It is a basket type wire mesh tray and can be customized to the room. Provide drop out (cable exit) equipment to maintain the bend radius and minimized the load stress on the cables. Maintain a bend radius of four times the size of the cables for UTP cables and ten times for cable containing fiber optic.

4.13 Miscellaneous

- Additional rooms should be provided when the area to be served exceeds 2000 m².
- An additional TR will also be required when the horizontal pathway distance to any work area exceeds 90m.
- The FD shall be located as close as practicable to the centre of the area served - this will minimise the length of cable runs and help ensure that cable runs are kept within specified length.
- Horizontal pathways should terminate in the FD located on the same floor as the area being served.
- Concrete walls shall be treated to minimise dust and finishes shall be light in colour to enhance room lighting.
- In multilevel buildings the risers shall be vertically aligned.
- Appropriate sleeves or slots to be provided between each riser in a multilevel building with the minimum requirement being 2 x 100 mm conduit.
- Where the sleeves or slots penetrate they shall be constructed to protrude at least 75mm to act as a barrier, they shall not be left open except during cable installation and shall be properly fire-stopped as per Canadian Standards.
- Three entire adjacent walls (not the access door wall) shall be covered with 19 mm plywood backboard (good one side) from 15 cm AFF to the height of 2.6 meters above finish floor (AFF). All plywood is to be painted with two coats of fire-retardant paint on both sides. The fourth wall, that contains the access door, can be partially covered with plywood, so long as it does not interfere with the operation of the door. Large rooms as a minimum shall have two walls covered with rigidly fixed 19 mm plywood, 2.43 m high, good one side, painted with two coats of fire retardant painted on the good one side and edges. It shall be capable of supporting the attached equipment. The installation of the plywood is at the discretion of CU ITS and will be on an as needed basis.

5 CAMPUS BACKBONE CABLING SYSTEM

5.1 General

The campus backbone cabling system refers to cabling used to connect BDs, CDS, and FDs together, this encompasses connectivity within a building, between buildings, Datacenters and the rest of the Campus network.

CommScope Systimax Enterprise Networks fibre products and solutions shall be used in all Carleton University campus to maintain the vendor's CommScope Systimax SCS 20-year Extended Product Warranty.

Backbone cabling shall be considered as any cabling that interconnects campus buildings. Backbone connections to the BD from the campus distributors shall be run in star topology and specifications, including path and capacity, and shall be approved by a CU ITS.

The current CU standard for the campus backbone cabling infrastructure is to provide indoor/outdoor loose tube gel-filled tubes optical fibre cabling via diverse paths and building entry points.

Indoor/Outdoor Tight Buffered cable may be used for Indoor Riser applications.

- All backbone cabling for all data services shall be comprised of singlemode and multimode optic fibre cables.
- Communication access holes should be established at locations no greater than 70 meters apart and at any point or where there is a change in direction.
- Communications access holes must be aligned so that they are easily located. Communication access holes should be located such that they remain permanently unobstructed (by landscaping, flowerbeds etc.).
- New building construction; install 4 x 100 mm diameter conduits, on diverse paths to connect to campus backbone.

5.2 Underground Installations

Use indoor/outdoor loose tube moisture blocked Nylon jacketed with sacrificial sheath cable with gel-filled tubes for all underground applications.

5.3 Outdoor Above Ground Installations

All outdoor above ground cabling (i.e. outdoor wireless access points, security cameras etc.) must be approved by CU ITS and FMP prior to any such installation.

5.4 Cabling Pathways

Standard pathways for outdoor cabling between buildings shall be via the University service tunnels and conduits system, unless otherwise authorised via written prior approval by CU ITS. Any work associated with hand holes, man holes conduits or pathways in general, done at CU campus shall have approval from FMP before the commencement of works, and the grounds shall be reinstated to FMP requirements.

All new cable installs within conduit system shall have a draw rope installed, regardless of whether or not one is currently in place.

For all new conduits installed, conduit identification tape is to be installed 100 mm above conduit. Copper tracer wire or equivalent must also be installed, and may be included as part of the identification tape.

All hand/maintenance holes shall be installed in such a way as to allow positive drainage.

All hand/maintenance holes shall be large enough to accommodate a minimum of 2 x 100 mm conduits (entering and exiting).

All new hand/maintenance installs shall have an internal cover installed so as to prevent rodents, insects and dirt ingress. Every effort is to be made to ensure all joints are secured in such a way as to be kept off the bottom to avoid water immersion or moisture ingress, hung in an upright position.

5.5 Optical Fibre

Multi-core optical fibre cable shall consist of singlemode OS2 optical fibre (also known as ITU specification G.652 or G.657) and multimode including OM3 and OM4 fibre are used within a building infrastructure.

Optical fibre is specified as per current standards for transmission and budget loss. Joints are to be fusion spliced. CU does not accept puck and polish or mechanical splices.

5.6 Optical Fibre Terminations

Each TR houses the rack mounted fibre optic termination on a CommScope Systimax fibre optic patch panel.

The patch panel shall provide interconnect or splicing capabilities. The fibre optic patch panel shall consist of a rack mountable housing for terminating and or splicing fibre optic cables and allow for organization of the fibre optic interconnects. The assembly shall have rear openings for cable entry, with posts to accept strain relief terminations and with fibre storage guide facilities for maintaining bend radius.

The fibre optic patch panels shall be up to 48 ports for one rack unit to 144 ports, and shall be a slide tray for easy access. Other configuration may be considered on a case by case basis.

The adaptor cassettes shall have LC duplex couplings.

Other coupling styles include SC and ST, and are not to be used without written authorisation from CU ITS.

The polarity of the fibre permanent link installed shall be in a crossover or flipped design to enable a standard patch lead to be used to connect active devices. Failure to provide this solution is unacceptable and rectification will be required prior to hand over of any installation.

5.7 Voice Grade Cabling

Inter-building copper grade cabling is to be CommScope Systimax Category 5E 25 pairs indoor/outdoor cable with a minimum rating of CMR, for larger installations, higher capacity cables may be proposed to accommodate the requirement.

6 BUILDING BACKBONE CABLING SYSTEM

6.1 General

Within a building all of the backbone cables shall be run in a star topology, terminated in the BD at one end, and in a Floor Distributor (FD) at the other end.

CommScope Systimax products and solutions shall be used for backbone cabling solutions in all Carleton University's buildings.

The backbone system shall include UTP category 5E copper for legacy voice services and singlemode, and multimode optic cables for high-speed data networking.

The optical fibre cable (single and multimode) shall consist of 12 and 48 strands to provide a diversity of paths and redundancy.

Specifications of optical fibre shall be as per current industry standards. Current specifications shall be sought from ITS CU.

All connectors on fibre patch panels shall use LC duplex couplers with LC connectors.

Fibre optic cable shall be tight buffered cable for all internal horizontal and riser applications, except in wet internal locations. Indoor/Outdoor tight buffered cable may be used for indoor/outdoor riser applications.

6.2 Voice Grade Cabling

As per vendor specifications and standard category 5E copper cable, terminated at each end on CommScope Systimax certified termination equipment.

Copper cable is to be terminated on wall mounted frame.

The cross connection system for copper backbone cables coming from the BD shall be a 110 mounting panel.

6.3 Overvoltage

If necessary the contractor shall make provision to supply overvoltage protection to all above ground and underground copper cables that are terminated on a rack.

6.4 Cabling Pathways

Building backbone cabling system and associated pathways must have adequate segregation from electrical and hazardous services, ensuring system integrity and performance, ensuring that it does not present problems of maintenance or access.

All indoor conduits shall be installed in such a way that the indoor/outdoor optical fibre cable does not lie in trapped or pooled water/fluid.

All newly installed metallic pathways shall be bonded to the building and/or the electrical protective grounding system where applicable.

7 HORIZONTAL CABLING

7.1 General

CommScope Systimax products and solutions shall be used for horizontal cabling solutions in all Carleton University's buildings.

The horizontal data cabling for legacy and analog services such as intrusion alarm cabling is CAT 5E solid copper, blue or yellow unshielded twisted pair (UTP), 4-pair, 24 AWG, CMP or CMR rated. The cable shall be Systimax 1061 (CMR) or 2061 (CMP). Power Sum series. It shall be UL/ULC listed. The jacket shall be printed with a 1000' to 0' marking system and/or 305 meters to 0 meters system. Pulling tension is 25 lbs and maintains the

bend radius at four times the size of the outer jacket.

The horizontal data cabling for the data network is Category 6 cable. The Category 6 cable shall be 23 AWG, solid copper, blue unshielded twisted pair (UTP) 4 pair GigaSPEED XL 7 series, 1071 CMR and 2071 CMP. It shall be UL/ULC listed. The jacket shall be printed with a 1000' to 0' marking system and/or 305 meters to 0 meters system. Pulling tension is 25 lb and maintains the bend radius at four times the size of the outer jacket.

The length of each fixed horizontal cable from the TR to the telecommunications outlet shall not exceed 90 meters.

The cabling system shall be planned and designed to ensure adequate segregation from electrical and hazardous services, ensuring system integrity and performance, ensuring that it does not present problems of current and future maintenance or access, and ensuring there is no conflict with the operation and maintenance of other systems.

Termination of cables in the TR shall be on racks or assemblies to suit the selected modules and/or patch panels.

Copper cables installs and infrastructure shall meet the sites designated manufacturer's warranty.

Cables that penetrate fire barriers, inter-floor, building entries shall have the penetrations suitably fire-stopped by qualified operators as required by local building code regulations/laws and Carleton University Facilities Management (FMP) requirements.

7.2 Cabling Pathways

All cable pathway designs shall follow the most technically and economically feasible route from the TR to the Telecommunications outlet (TO). All cable pathway designs for refurbishments and new buildings shall be approved by CU ITS before installation.

All cable pathway designs for refurbishments and new buildings shall incorporate ease of access for the laying of future cables.

Cable pathways for horizontal cabling shall be tray for main cable routes.

All metal pathways shall be bonded to the building ground system thereby providing a bonding conductor facility to minimise the effects of noise coupling.

Cable pathways above fixed, feature or hard ceilings shall be cable tray, with access hatches in ceiling every 3 metres and at each change of direction for future maintenance and access to the cable path.

Adding cables to existing catenaries (J hook) should not exceed the maximum number of cables recommended by the vendor.

If by adding cables to existing catenaries the total number of cables in that catenary exceeds 80% of the maximum number of cables recommended by the vendor, a cable tray should then be considered.

The installer shall seal all openings, either external or internal, made or provided through building walls, floors, ceilings or other fixtures. To prevent ingress of moisture, entry of rodents, other vermin and fire where applicable.

Where cables exit from cable tray or enter wall cavities, the cable shall be protected with a ridge barrier and the bend radius to be within vendor's specification.

Conduit from hallway/ceiling to the Telecommunications outlet (TO) shall be a minimum of 27mm. Conduit size shall be calculated for the number of cables anticipated using industry sizing table.

7.3 Cable Terminations - Inter-Connect System

All data Category 6 horizontal UTP cabling shall be terminated on a VisiPatch panels or PatchMax panels. PatchMax panels could comprise 24 or 48 ports. The panels shall be mounted in a standard 48 cm rack. VisiPatch panels are 56 pairs, 1u kit, 112 pairs, 2u kit or the full 384 pairs (96 x 4 pair cables) kit and shall be black in colour. VisiPatch cords shall be used to connect patch panels to equipment. Leave ten (10) feet and or three (3) meters of slack in the telecommunications room to allow for future rack relocation if required. Do not store the slack in bundled loops. Store the cable slack in an extended loop or in a figure eight form.

Setup a minimum of two racks in the TR; install the fibre patch panel, associated cables and switching equipment in one of the rack. In the other rack mount the VisiPatch or PatchMax patch panels and terminate the horizontal cables on them. The connection between the racks is an interconnection using a patch cord. ITS structured Cabling System uses Systimax VisiPatch cords for the VisiPatch panels.

For horizontal Voice Cable Terminations (Legacy), CAT 5e UTP horizontal cabling terminates on 110 panel frames.

7.4 Work Area

Contractors shall supply and install the wiring or interconnections that connect active terminal devices to the telecommunication outlets. This includes patch cords, telecommunication outlets (TO), connectors, faceplates, as well as the work area patch cord needed to make connections. For outdoor use, all equipment must be rated to the appropriate weatherproof rating.

7.4.1 Telecommunication Outlets (TO)

The horizontal UTP Category 6 data cabling to be terminated at the workstation shall be terminated with modular 8 positions, 8 wire, and RJ45 CAT 6 connector. Systimax is the approved manufacturer. Modules are to be wired as per T568A. Modular data jacks shall be black in colour.

Jack termination shall use a paired termination sequence as per industry standards and practices. Maintain untwist of cable pairs to manufacturer's specifications during termination. The preferred termination is 568-A.

Leave thirty (30) centimeters of cable slack in the ceiling above each work area outlet location. If the cable is installed in conduit leave thirty (30) centimeters of cable slack in the closest pull box and or cable tray. This is to provide for re-termination in the event of a repair and to leave some slack in the cable to remove stress if any. Coils are not acceptable.

7.4.2 Flush Mounted Faceplates

The horizontal UTP cabling usually terminate at the workstation on a flush mounted wall plate. Each faceplate shall be 4 ports on a single gang or an eight ports double gang. Unused ports will have blank modules installed.

Faceplates shall be UL/ULC listed and CSA Certified. Horizontal UTP cabling terminated at the workstation in systems furniture shall use a four-port faceplate or furniture specific face plate for aesthetic reasons. All unused ports shall be filled in with blank inserts.

The horizontal UTP cabling can terminate in a small mount box for installation where the use of flush mount faceplate is not possible. The box can have from one (1) to twelve (12) port. They are usually grey in colour. Other colours are available for colour coding purpose on certain installations.

Mount the faceplate on a double gang electrical box (100 x 100 x 63) with a single gang plaster ring.

8 LABELLING AND NUMBERING

All labels shall be machine made bar coded label for voice and data structured cabling systems.

Cable labels shall be of self-laminating vinyl construction with a white printing area and a clear tail that self laminates the printed area when wrapped around a cable. The clear area should be of sufficient length to wrap around the cable at least one and one-half times and be installed within 5 cm of the termination point of the cable, patch cord or pigtail.

All adhesive cable labels shall meet the legibility, defacement, and adhesion requirements specified in UL 969 (Ref. D-16). In addition the labels shall meet the general exposure requirements in UL 969 for indoor use.

All cable labels shall be compliant with the TIA/EIA-606(B) Section 6.2.2 Cable Labeling, Section 6.2.4 Termination Hardware Labeling, and Section 6.2.6 Termination Position Labeling.

All patch panels, 110 block, Nordx BIX and VisiPatch labels are to be mechanically printed and are to follow the guidelines in CSA-T528-93 for Colour Coding of Termination Fields.

Label all cabling in accordance with CSA-528 specifications. One label per outlets (jack) should be attached to the front of the workstation faceplate, one to the front of the patch panel.

All labels must be mechanically printed. Hand written labels are not permitted.

All intra-building and inter-building backbone cables for voice and data shall be labeled. Labeling shall include destination (building) to and from at each end.

Install a label every 33 meters and before and after an obstruction.

The cable-labeling scheme for a typical workstation shall be as follows:

<u>CABLE</u>	<u>LABELING SCHEME</u>	<u>DESCRIPTION</u>
Cable	FD xxxx-Jkxxxx	2005-245
Means TR 2005 and jack 245		

All the cable data shall be entered in the CableSolve database; it includes the building, name, and the space and jack identification number. All telecommunication outlets (jacks) shall have a unique bar coded identifier. All VisiPatch ports and patch cords at the FD shall have a bar coded identifier. Barcode label are machine readable and downloaded to the CableSolve database.

9 COMPLIANCE TESTING

The cabling contractor is to use a tester such as Fluke DTX 1800 series or equivalent with the latest version of firmware to test the UTP cabling system. A light source meter will be used to test all fibre optic cables. The cabling contractor must ensure that all cabling is tested in accordance to the proposed specifications of the category installed. Upon completion of testing by the cabling contractor, a CU ITS may choose to witness up to 100% of the cables being tested.

All deficiencies must be corrected before the Project Manager will provide a certificate to release the holdback on the project.

Category 5e and Category 6 field test parameters shall be tested. Testing of all 4 pairs is to include but not be limited to the following:

- Wire Map
- Insertion Loss
- Equal Level Far End Cross Talk (ELFEXT)
- Power sum equal level far end cross talk (PSELFEXT)
- Delay Skew
- Attenuation (PSACR)
- near end cross talk (NEXT)
- Propagation Delay
- Cable length
- Power sum near end cross talk (PSNEXT)
- Return Loss

A tester with the most recent version of its software and firmware must perform all tests in accordance to ANSI/EIA/TIA 568-C.2. The nominal velocity of propagation (NVP) must be set specific to each cable manufacturer before testing. Calibrate portable testers as per manufacturer's recommendations. Fluke DTX 1800 or equivalent shall be used.

Test patch cords for the tester must be designed and approved for testing by the manufacturer. Field assembled patch cords are not acceptable.

Test each strand of fibre with a Power Meter / Light Source combination operating at wavelengths of 850 nm and 1300 nm for multimode fibres and 1310 nm and 1550 nm for single mode fibres. Perform these tests in both directions. These tests shall be completed after cable installation, splicing and connectors are installed. Provide test results in soft copy to the University representative for the project.

All cable faults must be corrected. Splicing of any cables will not be permitted, unless it's for repairing damages done by rodents or accidents, unless prior authorization is received in writing from CU ITS.

10 DOCUMENTATION

10.1 General

All documentation, as-built, test results, and related documents for the structured cabling will be provided to CU ITS. The owner (University) will endeavour to provide project plans, and original drawings in electronic format. Pdf files are acceptable.

10.2 Work Area

Documentation of work area outlet position and numbering is to be provided (as-built) electronically.

10.3 Test Result Documentation

A copy of the full test results for each copper cable run and each core of each optical fibre cable run shall be supplied to CU ITS in an electronic format. Results should be in a recognised test vendor's application format, such as from Fluke LinkWare.

11 CUSTOMER ACCEPTANCE

11.1 General

Customer acceptance includes, but is not limited to:

- Cabling infrastructure installed to vendor specifications for the System Warranty.
- Cabling infrastructure tested to and pass vendor certification as set out in "compliance testing" section of this document.
- Test results provided to CU as set out in "compliance testing" and "documentation" sections of this document.
- As-built diagrams provided as set out in the "documentation" section of this document.
- All defects corrected to the satisfaction of the client and the CU ITS infrastructure representative.

At the conclusion of the installation, CU ITS will require a reasonable (within two days) notice for a preliminary walkthrough with the installation contractor to perform checks for installation quality, accurate performance of the work, and to verify engineering diagrams.

Any required modifications to the documentation or installation shall be accomplished within a two-week period.

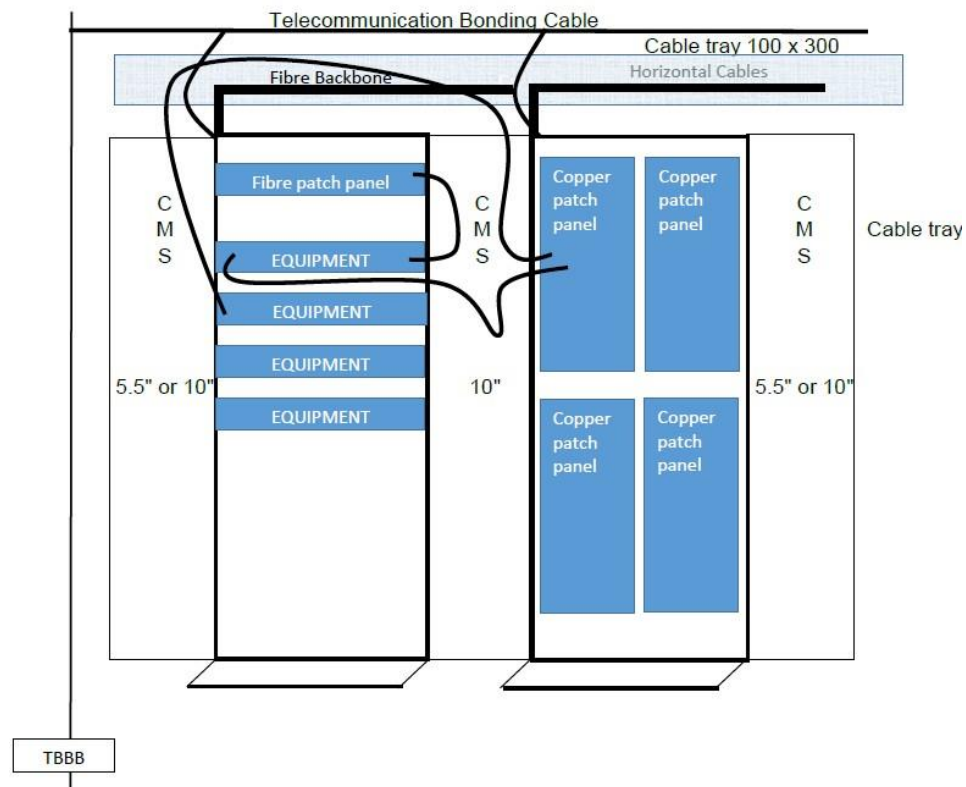
A minimum of two inspections are to be organised with the installation contractor and CU ITS. The first after the completion of roughing in the cabling infrastructure (prior to ceiling tiles or plasterboard being installed), the second after the termination of the patch panels and telecommunications outlet (TO).

"Customer Acceptance" shall consist of a final walkthrough with the installation contractor. The walk through shall be scheduled within three weeks of the completion of the installation in order to turn the project and documentation over to the end user.

"Customer Acceptance" does not release the installation contractor from repairing any cabling errors or improperly labelled circuits caused by the installation contractors that may be discovered at a later date. "Customer Acceptance" of TR to include the cleaning of the communications room floor and wipe down of cabinets, racks and associated infrastructure, so as to prevent the ingress of building dust in active network equipment once installed.

Failure to meet customer acceptance may result in delay or withhold of payment of works.

12 APPENDIX A. Example Communications Rack Layouts



A Building/Floor Distribution Rack will normally be 44 RU and may contain:

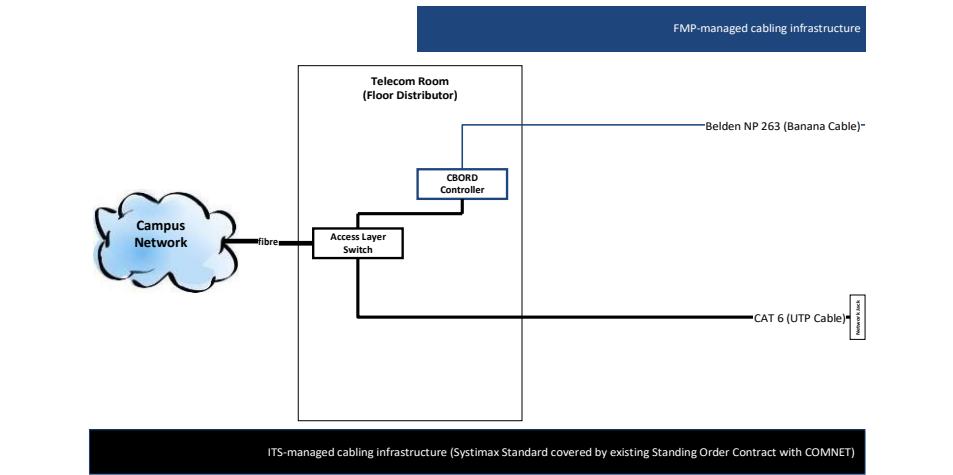
Rack 1:

- COMMScope Systimax patch panels for backbone fibre and inter-floor fibre at the top of the rack.
- Network switch(es) below patch panels with a reasonable gap.
- Vertical cable management.
- A vertical PDU's mounted to back uprights facing backwards and connected to 20 A plugs

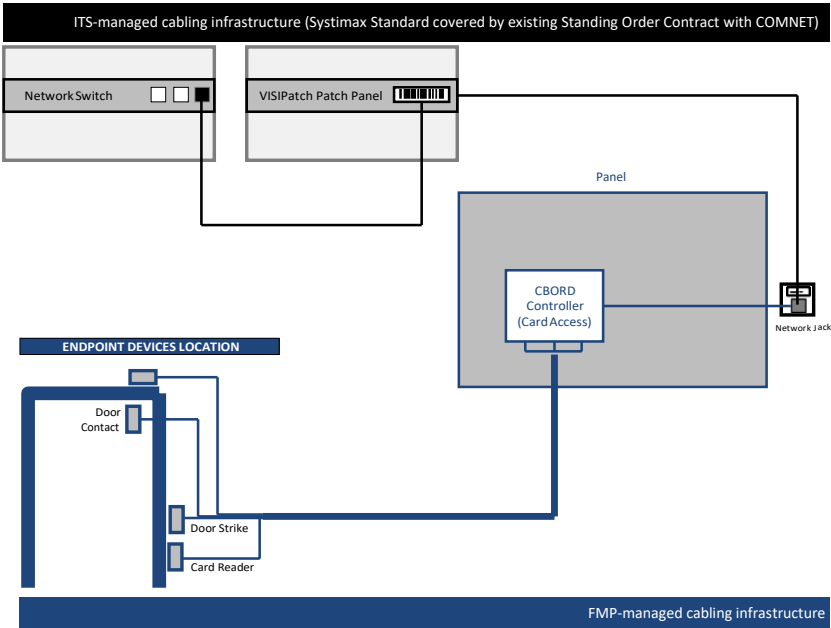
Rack 2:

- Copper cabling only
- Regular horizontal cable management/UTP patch leads.
- Vertical cable management

13 APPENDIX B. CARD ACCESS/CBORD CABLING CONTROLLER DEMARC



High Level Diagram – Campus Network and Card Access/CBORD Controller Environment



Detailed Diagram – Campus Network and Card Access/CBORD Controller Environment

14 APPENDIX C. LIST OF MATERIALS

Campus Distribution (CD) Fibre						
Item #	Systimax Part ID	Description	Fiber Count	U/M	Colour	Misc. Info
1	760004184	CS-CommScope TerraSPEED SM-Indoor-Outdoor Tight buffered riser cable	12	M	Black	Powder
2	760101071	CS-CommScope 360G2-4U-MOD-SD, 360G2 4U sliding mod cassette shelf, accept 12 mod cassettes	144 LC ports	Ea	Black	4U Shelf
3	760031054	CS-CommScope Splice Wallet/Fusion Splice	72 splices	Ea	White	Plastic
4	760109496	CS-CommScope 360G2 CARTRIDGE 12 LC LS SM with pig tails	12 LC ports	Ea	Grey	SM LC Cassette
5	FEWLCLC42-JXF004	CS Systimax Patch Cord SM-LC-LC, duplex	2	Ea	Yellow	1.2m
6	FEWLCLC42-JXF007	CS Systimax Patch Cord SM-LC-LC, duplex	2	Ea	Yellow	2.1m
7	FEWLCLC42-JXF010	CS Systimax Patch Cord SM-LC-LC, duplex	2	Ea	Yellow	3m
8	FEWLCLC42-JXF015	CS Systimax Patch Cord SM-LC-LC, duplex	2	Ea	Yellow	4.5m
9	FEWLCLC42-JXF020	CS Systimax Patch Cord SM-LC-LC, duplex	2	Ea	Yellow	6m
10	FEWLCLC42-JXF025	CS Systimax Patch Cord SM-LC-LC, duplex	2	Ea	Yellow	7.6m
11	FEWLCSC42-JXF004	CS Systimax Patch Cord SM-LC-SC, duplex	2	Ea	Yellow	1.2m
12	FEWLCSC42-JXF007	CS Systimax Patch Cord SM-LC-SC, duplex	2	Ea	Yellow	2.1m
13	FEWLCSC42JXF010	CS Systimax Patch Cord SM-LC-SC, duplex	2	Ea	Yellow	3m
14	FEWLCSC42JXF025	CS Systimax Patch Cord SM-LC-SC, duplex	2	Ea	Yellow	7.5m
15	760034199	CS Systimax LC Connector SM. SFC-LCR-09-BL	1	Ea	Blue	SM

Building Distributor (BD) & Floor Distributor (FD) Fibre						
Item #	Systimax Part ID	Description	Fiber Count	U/M	Colour	Misc. Info
16	700203086	LazrSPEED 150 MM 50u/10G Riser cable	12	M	Aqua	Riser Rated
17	760004440	5200 012A WRYL TerraSPEED SM Riser Cable	12	M	Yellow	Riser Rated
18	760101071	CS Systimax 360G2-4U-MOD-SD, 360G2 4U sliding mod cassette shelf, accept 12 mod cassettes	144 LC ports	Ea	4U	4U Shelf
19	760103143	CS Systimax 360G2-2U-MOD-SD, 360G2 2U sliding mod cassette shelf, accept 8 mod cassettes	96 LC ports	Ea	2U	2U Shelf
20	760103085	CS Systimax 360G2-1U-MOD-SD, 360G2 1U sliding mod cassette shelf, accepts 8 mod cassettes	48 LC PORTS	Ea	1U	1U Shelf
21	760031054	CS-CommScope Splice Wallet/Fusion Splice	72 splices	Ea	White	Plastic
22	760031856	CS-Systimax rolo splice tray, RS-4AF-16SF	48 splices	Ea	White	Plastic
23	760109256	CS Systimax 360G2CARTRIDGE 12 LC LS MM	12 LC ports	Ea	Ctrdg	MMLC cartridge
24	760109436	CS Systimax 360G2CARTRIDGE 12 LC LS SM with pig tails	12 LC ports	Ea	Ctrdg	SMLC cartridge
25	FEXLCLC42MXF004	CS Systimax Patch Cord MM-LC-LC, duplex	2	Ea	aqua	1.2m
26	FEXLCLC42MXF006	CS Systimax Patch Cord MM-LC-LC, duplex	2	Ea	aqua	2.1mm
27	FEXLCLC42MXF010	CS Systimax Patch Cord MM-LC-LC, duplex	2	Ea	aqua	3m
28	FEXLCLC42MXF015	CS Systimax Patch Cord MM-LC-LC, duplex	2	Ea	aqua	4.5m
29	FEXLCSC42MXF006	CS Systimax Patch Cord MM-LC-SC, duplex	2	Ea	aqua	2.1mm
30	FEXLCSC42MX010	CS Systimax Patch Cord MM-LC-SC, duplex	2	Ea	aqua	3m
31	FEWLCLC42-JXF004	CS Systimax Patch Cord SM-LC-LC, duplex	2	Ea	Yellow	1.2m
32	FEWLCLC42-JXF007	CS Systimax Patch Cord SM-LC-LC, duplex	2	Ea	Yellow	2.1m

Building Distributor (BD) & Floor Distributor (FD) Fibre (suite)						
Item #	Syrtimax Part ID	Description	Fiber Count	UOM	Colour	Misc. Info
33	FEWLCLC42-JXF015	OS Syrtimax Patch Card SM-LO-LO, duplex	2	Ea	Yellow	4.5m
34	FEWLCLC42-JXF020	OS Syrtimax Patch Card SM-LO-LO, duplex	2	Ea	Yellow	6m
35	FEWLCLC42-JXF025	OS Syrtimax Patch Card SM-LO-LO, duplex	2	Ea	Yellow	7.6m
36	760034181	OS Syrtimax LC Connector MM100-pack, MFC-LCR-09-BG	1	Ea	aqua	MM
37	760034199	OS Syrtimax LC Connector SM. SFC-LCR-09-BL	1	Ea	Blue	SM

Building Distributor (BD), Floor Distributor (FD) and TO (Terminal Outlet)						
Item #	Syrtimax Part ID	Description	Fiber Count	UOM	Colour	Misc. Info
38	700211964	OS Syrtimax 1071E Cat-6 Cable CMR	FT4, 4pr	M	Blue	Box
39	700208093	OS Syrtimax 2071 Cat-6 Cable CMP	FT6, 4pr	M	Blue	Box
40	760049452	OS-SYRTIMAX VP360-12U-96P Patch panel 96 ports	Metal/Plastic	Ea	Ivory	Complete Kit
41	760060327	OS Syrtimax ViraPatch® 360 19 In. Rack Mounting Bracket	Metal	Ea	Grey	For Rack Mount
42	396654	OS Syrtimax 360-PM-GS 3-24 Port Patchmax Panel	Metal	Ea	Black	Cat 6
43	760117366	OS Syrtimax 360-PM-GS 3-48 Port Patchmax Panel	Metal	Ea	Black	Cat 6
44	700206667	OS Syrtimax Cat 6 RJ45 connectors	MGS 400	Ea	Black	MGS 400
45	108615204	OS Syrtimax Stainless steel faceplate	Metal	Ea	S.S	4 ports
46	108333170	OS Syrtimax Designer Faceplate 4 ports	Plastic	Ea	Grey	4 ports
47	107067951	OS Syrtimax Faceplate Dustcover	Plastic	pkg	Grey	pkg 100
48	107984023	OS Syrtimax M101SMB-B-270, 1-port surface mount box unloaded	Plastic	Ea	Grey	1 port SMB
49	760057364	OS Syrtimax M202SMB-270, 2-port surface mounted box	Plastic	Ea	Grey	2 ports
50	107952467	OS-Syrtimax 4-port surface mount box unloaded grey	Plastic	Ea	Grey	4 ports SMB
51	CPC3312-03F008	OS Syrtimax Cat-6 Patch Card Grey	GS8E	Ea	Grey	8 ft
52	CPC3312-03F010	OS Syrtimax Cat-6 Patch Card Grey	GS8E	Ea	Grey	10 ft
53	CPC3312-03F015	OS Syrtimax Cat-6 Patch Card Grey	GS8E	Ea	Grey	15 ft
54	CPC3312-03F020	OS Syrtimax Cat-6 Patch Card Grey	GS8E	Ea	Grey	20 ft

Building Distributor (BD), Floor Distributor (FD) and TO (Terminal Outlet) (suite)						
Item #	Systimax Part ID	Description	Fiber Count	U/M	Colour	Misc. Info
55	CPC3312-03F025	CS Systimax Cat-6 Patch Cords Grey	GS8E	Ea	Grey	25 ft
56	CPC5312-03F004	CS Systimax Patch Cord VP-RJ45 Grey	VisiPatch	Ea	Grey	4ft
57	CPC5312-03F007	CS Systimax Patch Cord VP-RJ45 Grey	VisiPatch	Ea	Grey	7ft
58	CPC5312-03F010	CS Systimax Patch Cord VP-RJ45 Grey	VisiPatch	Ea	Grey	10ft
59	CPC5312-03F015	CS Systimax Patch Cord VP-RJ45 Grey	VisiPatch	Ea	Grey	15ft
60	CPC5312-03F020	Patch Cord VP-RJ45 Grey	VisiPatch	Ea	Grey	20ft
61	CPCF312-03F010	CS Systimax VP360-RJ45 patch cord Grey	VisiPatch	Ea	Grey	10ft
62	CPCF312-03F015	CS Systimax VP360-RJ45 patch cord Grey	VisiPatch	Ea	Grey	15ft
63	CPCF312-03F020	VP360-RJ45 patch cord Grey	VisiPatch	Ea	Grey	20ft
64	CPCF312-03F025	CS Systimax VP360-RJ45 patch cord Grey	VisiPatch	Ea	Grey	25ft
65	CPC5412-03F015	CS Systimax Pig Tail VP Connector to Unterminated, Grey	VisiPatch	Ea	Grey	15ft
66	CPC5412-03F020	CS Systimax Pig Tail VP Connector to Unterminated, Grey	VisiPatch	Ea	Grey	20ft

COPPER - VOICE BACKBONE & PIGTAIL TERMINATION						
Item #	Systimax Part ID	Description	Fiber Count	U/M	Colour	Misc. Info
67	107287484	CS Systimax 1061 Cat-5E 25pr	FT4/CMR	M	Grey	PVC
68	466590/10	CS Systimax 24-4P UTP SOL, BC, CAT 6 OUTDOOR CABLE	Outdoor	m	black	PE/PE
69	105597199	CS Systimax Cat-5 Cross Connect Wire 4pr	Carton	Ea	Blue/white	Y-BL/BI-Y
70	107058919	CS Systimax 110AB2-100FT Wiring Block 4 pair C4	Plastic	Ea	Ivory	100 pair
71	107058943	CS Systimax 110AB2-300FT Wiring Block 4 pair C4	Plastic	Ea	Ivory	300 pair
72	107058901	CS Systimax 110AA2-100FT Wiring Block 5 pair C5	Plastic	Ea	Ivory	100 pair
73	107058935	CS Systimax 110AA2-300FT Wiring Block 5 pair C5	Plastic	Ea	Ivory	300 pair
74	107831133	CS Systimax 110A3 Troughs	Plastic	Ea	Ivory	3U
75	107214405	CS Systimax 110A2 Distribution Ring	Plastic	Ea	Ivory	N/A
76	106657216	CS Systimax 110WB2 Labels	5 sheets/pkg	pkg	Various	White

15 DEFINITION OF TERMS

Administration – the method for labeling, identification, documentation and usage needed to implement moves, additions, and changes of the telecommunications infrastructure.

Alien crosstalk (ATX) – is electromagnetic noise that can occur in a cable that runs alongside one or more other signal-carrying cables.

Backbone – a facility (e.g. pathway, cable, or conductor between telecommunications rooms, entrance facilities, equipment rooms within or between buildings.

Building backbone cabling – cable that connects the building distributor to a floor distributor.

Cabinet – see Enclosure.

Cable tray – a type of raceway.

Cabling – a combination of all cables, wire, cords, and connecting hardware.

Campus – the building and grounds of a complex.

Campus backbone cabling – cable that connects the campus distributor to the building distributor(s).

Campus Distributor – (CD) distributor from which the campus backbone cabling starts

Carrier – this may for the purposes of this document mean the University's backbone network or a carrier under the Telecommunications Act such as Telstra, AMCOM, etc.

Category 5E – a performance standard for cable and equipment in ANSI-EIA-TIA-568-C.

Category 6 (Cat 6) – a performance standard for cable and equipment in ANSI-EIA-TIA-568-C.

Channel – end-to-end transmission path connecting two pieces of application specific equipment.

CMP – Communication Plenum, fire rating for cables (similar to CMP) use in air return plenum.

CMR – Communication Riser, fire rating for cables (CMR) use in non air return plenum.

Communications grounding system – a system of grounding using common elements to provide earthing (grounding) facilities for electrical and communications equipment within a premises.

Conduit – a raceway of circular cross-section of the type permitted under the electrical code.

Consolidation Point – connection point in the horizontal cabling subsystem between a floor distributor and a telecommunications outlet.

Contractor – is used within this document to indicate the party(s) responsible for the supply, installation, testing and warranty of cabling systems.

Consultant – is used within this document to indicate the party(s) responsible for the documentation and design of cabling systems.

Cords – telecommunications, a cable using stranded conductors for flexibility, as in patch cords.

Cross-connect – a facility enabling the termination of cable elements and their interconnections, and/or cross-connection, primarily by means of a patch cord or jumper.

Cross-connection – a connection scheme between cabling runs, sub-system, and equipment using patch cords or jumpers that attach to connecting hardware on each end.

Distributor – the term used for a collection of components (such as patch panels, patch cords) used to connect cables.

Duct – a single enclosed raceway for wires or cables.

Enclosure – Housing for accommodation of equipment and cabling that includes mounting rails and protective panels.

FD – Floor distributor, same as access room, telecommunications room (TR)

Horizontal cabling – cables connects the floor distributor (FD) to the telecommunications outlets.

Interconnection – a connection scheme that provides for direct connection of a cable to another cable or to equipment cable without a patch cord or jumper.

Modular jack – a telecommunications female connector.

Modular plug – a telecommunications male connector.

Multimode optical fibre – an optical fibre that will allow many bounds modes to propagate.

Patch cord – a length of cable with connectors on one or both ends used to join telecommunications circuits/links at the cross-connect.

Patch panel – a cross-connect system of mate able connectors that facilitates administration.

Pathway – a facility for the placement of telecommunications cable.

Permanent link – transmission path between the telecommunications outlet and the floor distributor.

Pull tension – the pulling force that can be applied to a cable without affecting specified characteristics of the cable.

Raceway – any channel designed for holding wires, cables, or bus bars, and unless otherwise qualified in the rules of the CE Code, the term includes conduit (rigid and flexible, metallic and non-metallic), electrical metallic and non-metallic tubing, under floor raceways, cellular floors, surface raceways, wire ways, cable trays, bus ways, and auxiliary gutter.

Rack – see Enclosure.

RJ45 - Registered Jack 45 –an 8-position modular connector. In this document RJ45 shall mean a modular 8-pin connector wired according to T568-A.

Single-mode optical fibre – an optical fibre that will allow only one mode to propagate.

Site – means a facility owned or occupied by the University and includes the buildings and grounds in which a cabling system would be installed.

Space, telecommunications – an area used to house the installation and termination of telecommunications equipment and cable, e.g., (FD), (BD), service tunnels.

Structured cabling system – set of cabling and connectivity products that are constructed according to standardized rules to facilitate integration of voice, data, video, and other signals.

TR – telecommunications room (FD) or access room, an enclosed space for housing telecommunications equipment, cable terminations, and cross-connect cabling. This room is the recognized location of the cross-connect between the backbone and horizontal facilities.

University – in this document shall mean Carleton University abbreviated to CU.

Work area – work station, a building space where the occupants interact with a workstation device.

16 ABBREVIATIONS

10GbE - 10 Gigabit Ethernet
ANSI - American National Standards Institute
AP - Access Point (wireless)
B.A.S – Building Automation System (BAS)
BD - Building Distributor (see DR)
BCC - Building Code of Canada
CAD - Computer Aided Design
CD - Campus Distributor (see PoP, MDF)
CEC - Canadian Electrical Code
CES - Communications Earth System
CP - Consolidation Point
CSA - Canadian Standard Association
CU ITS - Carleton University Information Technology Services
DR - Distribution Room (see BD)
D.U.S.T.S – Department of University Safety Technical Services
EIA - Electronic Industries Alliance
EMC - Electromagnetic Compatibility
EMI - Electromagnetic Interference
EPR - Earth Potential Rise
ESA – Electrical Safety Authority
FD - Floor Distributor (see TR)
FMP - Facilities and Management, Carleton University
GbE - Gigabit Ethernet
GPO - General Purpose Outlet
HVAC – Heating Ventilation Air-Conditioning
IDC - Insulation Displacement Connection
IEEE - Institute of Electrical and Electronic Engineers
I.M.S – Instructional Media Services
IP - Internet Protocol
ISO - International Organization for Standardization
ITS - Information Technology Services
LAN - Local Area Network
LASER - Light Amplification by Stimulated Emission of Radiation
LC - A small form factor optical fibre connector
LED - Light Emitting Diode
MCC – Maintenance Control Centre
MDF - Main Distribution Frame (see CD, PoP)
MMOF - Multi-mode Optical Fibre
MUTO - Multi-user Telecommunications Outlet
NEMA - National Electrical Manufacturers Association
PoE - Power over Ethernet
PoP - Point of Presence (see MDF, CD)
PSE - Power Sourcing Equipment
RFI - Radio Frequency Interference
RJ45 - Registered Jack 45 (USOC reference)
RU - Rack Units (1RU = 44.5mm)
SCS - Structured Cabling System
SFF - Small Form Factor (connector)

SFP - *Small Form factor Plug*
SMOF - *Single-mode Optical Fibre*
STP - *Shielded Twisted Pair*
TE - *Terminal Equipment*
TIA - *Telecommunication Industry Association*
TO - *Telecommunications Outlet*
TR - *Telecommunication Room (FD), access room*
TRC - *Telecommunications Reference Conductor*
UPS - *Uninterruptible Power Supply*
UTP - *Unshielded Twisted Pair*
VoIP - *Voice over Internet Protocol*
WLAN - *Wireless Local Area Network*