

York Region Information Technology Services
Standards and Guidelines



Corporate ITS Cabling & Wiring Standard

Current Published Version

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Document History

Revision & Schedule History

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2.6	Orville Pitter	December 19, 2020	April, 2021
2.7	Simon Yates	March 25, 2020	April, 2021
2.8	Orville Pitter	April 21, 2020	April, 2021

Change Summary

Date	Summary
July 28, 2016	Minor grammar and syntax updates. Fax Lines Requirement – Deleted. Appendix D & E updated.
January 9, 2017	Replaced must with shall, and added Document Changes table to document history.
August 28, 2017	Changed cabling 6A to 6A F/UTP or 6A UTP.
April 24, 2018	Changed in-building renovations in scope, multimode optical fibre to OM4, added appendix B, changed BAS, Security Panel (Honeywell), rack cabinet installation, and applied new corporate writing style.
May 9, 2018	Updated contact information.
June 28, 2018	Added Appendix K.
January 22, 2019	Updated technical specifications.
December 19, 2019	Renamed from Cabling and Wiring for Voice and Data Communications to Corporate ITS Cabling & Wiring Standard. Updated network equipment.
March 25, 2020	Formatting, grammar, spelling updates.
April 21, 2020	Updated Appendix 2, and general requirements for network equipment.

Consulted Organizations

The following individuals and groups were consulted in the formation of this standard.

Organization Consulted	Division	Branch	Date
Ministry of Government Services	Infrastructure Technology Services	Corporate Architecture Branch	April 2011

Committee or Working Group Consulted	Date
Enterprise Architecture	March 2012
Infrastructure and Operations	March 22, 2011
ITS Branch Review	April, 2012

Enforcement Language

The meaning of the words shall or should or must and recommend are clearly define here:

- Shall: this word, or the terms required or must, means that the statement is an absolute requirement.
- Should: this word, or the adjective recommended, means that there may exist valid reasons in particular circumstances to ignore the recommendations, but the full implications must be understood and carefully weighed.

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Introduction

Background & Purpose

This standard defines the design minimum technical and quality requirements for wiring of voice and data communications rooms in all buildings that are managed by, or on behalf of The Regional Municipality of York.

In addition, coverage of this standard includes new developments, revisions, and updates in cabling plant such as Power over Ethernet (PoE) data centre specific standards, cabling for wireless access points and the administration standard for cabling plant management.

This standard includes:

1. Data centres that are managed by or on behalf of the Regional Municipality of York. The purpose of inclusion is to provide requirements and guidelines for the design and installation of a data centre or computer room. These requirements and guidance are found in ANSI/TIA/EIA-942: Telecommunications Infrastructure Standard for Data Centres.
2. The Cabling of buildings for wireless access points. The purpose of inclusion is to provide requirements and guidelines on the installation of a customer premises cabling system infrastructure for an array of coverage areas that form a wireless network grid within a building. These requirements and guidelines are found in CAN/CSA-ISO/IEC TR 24704:06: Customer Premises Cabling for Wireless Access Points and TIA TSB-162-A: Telecommunications Cabling Guidelines for Wireless Access Points.
3. Specific Adherence to the IEEE 802.3at standard for the implementation of Power over Ethernet+ (Plus) within the plant owned by, or managed on behalf of the Regional Municipality of York. The relevant standard is IEEE 802.3at: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specification – Data Terminal Equipment (DTE) Power Via Media Dependant Interface (MDI).
4. Specifies a uniform administration approach to the management of a telecommunications cabling system as found in ANSI/TIA/EIA-606-B: Administration Standard for Commercial Telecommunications Infrastructure.

This standard applies to all new or major retrofit wiring of data and voice communications in existing Regional Municipality of York buildings.

1. Network equipment:

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- a. Project will provide the budget for all network equipment including network switches, wireless access points, wireless controller, uninterrupted power supply, firewalls and any other network equipment that ITS considers mandatory to support the setup and configuration the network to meet ITS standards
 - b. ITS will procure all network equipment including network switches, wireless access points, wireless controller, uninterrupted power supply, firewalls and any other network equipment that ITS considers mandatory to support the setup and configuration the network to meet ITS standards based on the budget.
 - c. Telecom contractor will supply network racks, cables, patch panels, cable trays and any associated supplies for cabling based on ITS Cabling and Wiring Standards.
 - d. Telecom contractor will provide any emulated WIFI surveys with input, review and acceptance for Corporate ITS.
 - e. Telecom will install racks, run network cables and terminate to patch panels, install UPS and WAPS based on instructions provided by Corporate ITS.
2. Network Devices on York Network:
- a. All devices that require that connects to York Network (SCADA, YRT, YKRegion) must the direct network run.
 - b. A list of all devices that will connection to the York Network must be provided to Corporate ITS. The list must include the make, model and specification and function.
 - c. ITS Security must conduct ITS security testing on all devices on the York Region Network
 - d. ITS Security and Enterprise Architecture will review and make recommendations as well as provide a path to ensure that the device is a safe device to be on the York Region network.

Education & Training

Data Centre and technical staff shall be trained and experienced on the technologies used pertaining to structure cabling infrastructure.

Authority, Exceptions and Exemptions

Any change, exception, exemption or deviation from this standard shall be reviewed by the Region's Strategy & Architecture, Technology Planning units and approved by the Technology

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Standards Working Group (TSWG). Any change to this standard shall be submitted to the TSWG.

Terms and Definitions

All terms included in this document are included in a consolidated glossary of terms (eDOCS: 4125188).

Additional Information

Enterprise Architecture manages annual reviews and promotion of the standard.

Contact

This standard is updated frequently. Contact the person below to ensure that you have the most recent version of this document.

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Objectives

The Objectives of this standard are to

1. Provide safe, reliable, uniform and up to date facilities for the convenient connection of telephones, computers, computer terminals and other communications related technologies utilizing cabling and wiring in Regional offices;
2. Achieve significant cost savings in the rearrangement of government offices and the relocation of government services and personnel by uniform and flexibly arranged communications connections; and
3. Increase the value of the investment in the cabling infrastructure by reducing the labour expense of maintaining the system, extending the useful life of the system and providing effective service to users.

Scope

In Scope

- Horizontal and vertical structured cabling platforms
- Data centre structured cabling platforms
- In-building facilities including
 - Main telecommunications room
 - Telecommunications rooms
 - Workstations

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- In-building renovations
 - If cabling is less than CAT6 standard or older than 10 years, must be replaced with current standard including patch panel

Out of Scope

- Hydro and electrical cabling

Codes, Standards and Regulations

All work shall conform to industry accepted practices, manufacturer's component installation guidelines, the Ontario building code, the Canadian Electrical Code, and all applicable standards. The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

Furthermore, compliance with the Ontario Electrical Safety Code will supersede all other specifications.

- Ontario Electrical Safety Code, Section 56 – Optical Fibre Cables.
- Ontario Electrical Safety Code, Section 60 – Communication.

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Technical Specifications

The contractor shall provide a complete and operating Structured Cabling Platform to support existing and future communication systems in Regional facilities. This includes all horizontal cabling for voice and data applications as well as backbone.

If product specifications, design and installation guidelines are not provided or in conflict with references listed below. The more stringent requirement shall apply.

The Horizontal Structured Cabling Platform installed shall meet or exceed the channel requirements for voice and data transmissions as defined by ANSI/EIA/TIA-568-C.2.

Any Structured Cabling Platform installed in a Data Centre or Communications Room shall follow the mandatory requirements, guidelines and best practices for data centre cabling systems, pathways and design considerations found in Regulatory References and Standards: Telecommunications Infrastructure Standard for Data Centres. Category 6A UTP (500MHz) 23AWG cabling shall be used as the minimum rated twisted pair cable. Horizontal cabling should be installed point-to-point, no network consolidation point.

Cables, associated connecting hardware, jumpers, patch cords, equipment cords and zone area cords shall meet all applicable requirements specified in ANSI/EIA/TIA-568-C.2 and ANSI/EIA/TIA-568-C.3.

The recognized media are:

- 100 ohm twisted-pair cable, ANSI/EIA/TIA-568-C.2, Category 6A UTP.
 - Note: patch cables of minimum Category 6A F/UTP 26AWG.
- Multimode optical fibre cable OM4, ANSI/EIA/TIA-568-C.3.
- Single-mode optical fibre cable, ANSI/EIA/TIA-568-C.3.

Regulatory References & Standards

The standard defines specific categories of cabling, components, transmission performance, system models, and measurement procedures. These are needed for verification of cabling performance that shall be used at a minimum for any new or major retrofit wiring of data and voice communications in existing York Region buildings. These are the requirements found in recognized telecommunications industry standards:

Cabling Systems

1. ANSI/TIA/EIA-568-C.0: Generic Telecommunications Cabling for Customer Premises
2. ANSI/TIA/EIA-568-C.1: Commercial Building Telecommunications Cabling Standard
3. ANSI/TIA/EIA-568-C.2: Balanced Twisted Pair & Cabling Components Standard

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4. ANSI/TIA/EIA-568-C.3: Optical Fibre Cabling Component Standard

Spaces and Pathways

5. ANSI/TIA/EIA-569-C: Commercial Building Standard for Telecommunications Pathways and Spaces.

Cabling Administration

1. ANSI/TIA/EIA606-B: Administration Standard for Commercial Telecommunications Infrastructure.

Telecommunications Infrastructure Standard for Industrial Premises

2. ANSI/TIA-1005-A: Telecommunications Infrastructure for Industrial Premises.

Telecommunications Infrastructure Standard for Data Centers

3. ANSI/TIA/EIA-942: Telecommunications Infrastructure Standard for Data Centres.

Wireless Access Points

4. CAN/CSA-ISO/IEC TR 24704:06: Customer Premises Cabling for Wireless Access Points
5. TIA TSB-162: Telecommunications Cabling Guidelines for Wireless Access Points

Power over Ethernet Plus (PoE+)

6. IEEE Standard 802.3at (2009): Standard for Implementing Power Over Ethernet Plus (PoE+)

Networking

1. IEEE Standard 802.3an (2006): Standard for 10GBASE-T

In addition, coverage of this standard includes new developments and updates in cabling plant such as Power Over Ethernet (PoE) data centre specific standards, cabling for wireless access points and the administration standard for cabling plant management.

This standard applies to all new or major retrofit wiring of data and voice communications in existing Regional Municipality of York buildings.

Documentation

Documentation related to the installation, maintenance and disposal of cabling plant shall be created and maintained by the parties responsible for installing and maintaining the cabling infrastructure on behalf of the Regional Municipality of York. This administration of the cabling plant is governed by the mandatory use of Standard Update to Administration for the telecommunications infrastructure; and the labelling convention described in Regulatory References and Standards under Cabling Administration.

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The following line items describe individual requirements that are to be applied to all Communications Cabling projects. The line items are meant to serve as a guideline for the Regional requirements.

All horizontal cabling shall be installed from the workstation location, or on modular patch panels installed into racks or cabinets. For small sites, the customer can specify wall-mounted patch panels in lieu of racks.

Allowances

Devices, racks, cabinets, backboards or outlets may be relocated, prior to installation, from the location shown on the contract drawings, to a maximum distance of 3.05 meters (10 feet) without adjustment to the contract price.

Waste Management & Disposal

The cabling contractor shall remove and dispose of all inactive horizontal voice, data and coaxial cabling. If the cabling contractor is unsure of the status of the cables, they shall confirm the removal with the project manager prior to performing the work.

Testing & Commissioning

Provide two copies of testing and commissioning documentation for all items and their related components to the project manager prior to the completion of the project or at the project manager's request. Include maintenance manuals, operating instructions for the Region's staff.

Warranty

The structure cabling platform in each individual building or site shall be manufactured and warranted by a single manufacturer for all components of the structured cabling platform including backbones.

The successful bidder shall install a complete structured cabling platform that is manufactured and warranted by a single vendor. The successful bidder shall be authorized by the cable vendor to install and warranty the system. If a sub-contractor is used for the installation, it is mandatory that the sub-contractor be currently authorized to install and warranty the system.

Product Specifications

Backbone Cabling

Optical Cabling Backbone

OM4 fibre backbone shall adhere to ANSI/EIA/TIA-492AAAC: detailed specification for 50.0-mm core diameter/125-mm cladding diameter class 1a multimode, graded-index optical waveguide fibres.

Each Fibre backbone shall have a minimum of 12 strands OM4 distribution type fibre. The OM4 distribution type fibre will perform as per industry standards over the required distance defined for the site.

Conduits

Conduits should never be more than 50 percent full.

Backbone Interconnect

1. If there is a requirement for interconnection between wiring closets on the same floor or multiple floors, it shall be interconnected with minimum of six fibre Duplex Multimode 50/125 (OM4) rated fibre optic backbone terminated with.
 - 1U x 19" rack mounted fibre panel
 - Minimum OM4 LC connectors
 - ¾" fibre optic inner duct FT rating for plenum ceiling
 - Soft bends, 40 degrees
2. Distances over 100 meters require multi-mode fibre.
3. All connectors for the termination of the fibre optic backbone cable shall be duplex LC connectors.
4. Fibre optic enclosure shall meet the following requirements:
 - Enclosure shall include a slide-out drawer for front access of the terminations.
 - Enclosure shall support LC connectors.
5. For multimode fibre optic terminations inside access closets fibre patch panels the connectors shall be preloaded adapters configured with LC duplex multimode adapters.
6. Provide duplex 50/125 (OM4) fibre optic patch cables LC to LC.

Termination Hardware

Horizontal cables

All horizontal cables are to be terminated on eight pin UTP modules, inserted into 24/48 port modular patch panels, and placed in the telecommunications room for that floor. The 24/48 port modular patch panel should minimise the rack space used, it cannot exceed three rack units in height.

Fibre Patch Panels

If required, the number of strands to be supplied and installed is a minimum of 12 (24 preferred). The project manager, in consultation with the Region, will finalize quantity and type of fibre to be installed.

All Fibre backbone is to be terminated using a fibre patch panel on a communications rack. The 12 strands of fibre shall be installed in the fibre patch panel and placed in a rack in the telecommunications room for that floor. The fibre patch panel should minimize the rack space used, it cannot exceed three rack units in height. The fibre patch panel shall be serviceable from the front by allowing the fibre patch panel to slide or pivot away from the rack. The fibre patch panels are to be mounted at the upper most position on the racks of each floor.

Provide all necessary accessories for a complete fibre patch panel including, but not limited to: clear cover plates, mounting brackets and hardware, LC duplex fibre bulkheads, LC connectors and fibre cable management.

The physical fibre optic cabling topology and the type of fibre connectors shall be determined and finalised during design build of project.

Connectivity

Cross Connect Wire

Supply and install ANSI/EIA/TIA-568-C.2 compliant cross-connect jumper wire for voice equipment fields to the distribution fields.

The cabling contractor shall provide a complete end to end mapping of all connectivity at the end of each phase in both hard and soft copy format.

Category Patch Cords

Three patch cords per drop shall be provided on site, two for the IP phone/desktop connectivity, and one for the patch panel to network switch. The patch cords will be eight pin modular/eight pin modular patch cords. The patch cords are to be Category 6A F/UTP and have 26AWG stranded copper conductors, straight through mapping, consisting of four pairs that are twisted to form a cable core. The patch cords are to be CMR rated FT4 and stamped accordingly. The

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eight-pin modular/eight pin modular patch cords are to be consistent with the grade and manufactured of the cable that is being warranted.

The project manager shall determine the modular patch cord lengths.

Fibre Patch Cords

All fibre patch cords shall be connected to the customer supplied active equipment using LC duplex zip cords. The fibre patch cords are to be CMR rate FT4 and stamped accordingly. LC duplex zip cords are to be consistent with the grade and manufacturer of the fibre cable that is being warranted.

Communications Racks & Cabinets

All racks and cabinets to be supplied and installed to be free standing, 19" floor mounted with 44U of rack mounting space. Both racks and cabinets shall be tapped (both front and back) with mounting holes as per EIA-310-C, size 10-32, as well as include a ground lug to accept a #6 AWG grounding wire.

In addition to the specifications above cabinets should include:

- Minimum dimensions of: 30"W x 42"D x 84"H
- Front and rear rails (back rails moveable for depth to accommodate various equipment)
- Two 4" cable managers
- Two Power Distribution Units
- Ventilated and reversible front & rear doors

Unless otherwise specified all indoor enclosures containing network components are to be installed in a 2-post, 4-post open rack frame or cabinet. The type for installation to be determined by York Region ITS.

Vertical Cable Managers

Network cabinet shall come complete with two vertical cable managers installed (one mounted on each side). The vertical cable managers shall run the full height of the rack mounting space and provide four inches wide x four inches deep of cable management space. Network rack cable managers shall be 7.5 inches width by six inches deep. The vertical cable manager shall have hinged front door(s), back and side cut outs to allow for Patch Cords. It shall also have lancets along the back of the cable manager to allow for the fastening of the horizontal cable to the outside of the manager itself. Higher density drops may require vertical cable management with increased width and depth.

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Overhead Cable Managers & Chimneys

Each cabinet and rack shall come complete with a hinged overhead cable manager installed, with minimum dimensions of eight inches wide by two inches deep. Where racks are ganged, the overhead cable manager is to be continuous across the gang of racks; both ends of the ganged racks are to be completed with end caps. At the right side of each rack a cable management chimney shall be installed. They shall extend from the top of the overhead cable manager to the underside of the ladder tray/ceiling tile above.

Equipment Shelves

Each cabinet and rack is to be supplied with, at a minimum, one equipment shelf if requested; this is to be installed at the direction of the Customer. The equipment shelf is to be centre mounted and have a minimum of 18 inches of depth.

Vertical Switched Zero PDU

Each cabinet and rack is to come complete with two vertical switched Zero U PDU mounted to the back of the rack. Each PDU is to have a minimum of eight outlets rated at 110V, 15A. The power bars are to have a minimum power cord length of six feet. The power bars are not to have reset breakers or an on/off switch.

The Customer may require additional power requirements over and above what is detailed above. It is the responsibility of the Project Manager to provide these requirements to the Cabling Contractor.

Wall Outlets & Floor Boxes

All horizontal cabling installed using wall outlets and floor boxes are to use single gang, or double gang if required, and they are to match the decora straps. Each decora style strap is to have a minimum of two positions for communications modules. Each outlet is to be equipped with the appropriate modules. Any unused communication positions in wall outlets shall be filled with a blank. The colours of the UTP modules and furniture adapter plates may be changed at the discretion of the project manager.

Product Specification

Fibre Optic Cable

1. Provide all fibre optic cable, connectors and appurtenances that make up the backbone cable segments.
2. The fibre optic backbone cable segments shall meet the requirements of the TIA/EIA-568-C specification for 50 micron, multi-mode fibre and single-mode fibre.
3. Multi-mode fibre optic backbone cable shall meet or exceed the following minimum requirements:
 1. Minimum 12 fibres per Cable
 2. Indoor/Outdoor Rating
 3. Core-locked, tight-buffered
 4. 50/125 micron Core/Cladding
 5. 1500 MHz-km Bandwidth at 850 nm wavelength
 6. 500 MHz-km Bandwidth at 1300 nm wavelength
 7. Riser-Rated (FT4) inner and outer PVC jackets
4. Single mode fibre optic backbone cable shall meet or exceed the following minimum requirements:
 1. Minimum 12 fibres per Cable
 2. Indoor/Outdoor Rating
 3. Core-locked, tight-buffered
 4. Riser-Rated (FT4) inner and outer PVC jackets

Fibre Optic Connectors

1. All connectors for the termination of the fibre optic backbone cable shall be duplex LC connectors.
2. For multimode fibre optic terminations inside the access closet Fibre Patch Panels, the connectors shall be preloaded adapters configured with LC duplex multimode adapters fitted with a phosphor bronze split sleeve.
3. For single-mode fibre optic terminations inside the access closet Fibre Patch Panels, the connectors shall be preloaded adapters configured with LC duplex single-mode adapters fitted with a zirconia ceramic split sleeve.
4. For multimode fibre optic terminations inside the Network Core Switch Fibre Patch Panel Closets the connectors shall be preloaded adapters configured with LC duplex multimode adapters fitted with a phosphor bronze split sleeve.

5. For single-mode fibre optic terminations inside the Network Core Switch Fibre Patch Panel Closets, the connectors shall be preloaded adapters configured with LC duplex single-mode adapters filled with a zirconia ceramic split sleeve.

General Enclosure Requirements

1. Unless otherwise specified, all indoor enclosures containing network components are to be installed in a two-post, four-post open rack frame, or cabinet.
2. All screws, bolts, fasteners etc. are to be corrosion resistant stainless steel.
3. All wall-mounted panels are to be separated from the wall by stainless steel spacers or galvanised steel struts.
4. Doors are to have continuous hinges with removable pin and oil resistance cellular neoprene gasket secured by gasket retainers. Door handles shall be recessed type (freestanding enclosures) or three-point external latch (wall mount), complete with key locks. All key locks are to be identically keyed. The key number shall be provided to the Contractor during construction.
5. Cable bundles shall be neatly laced, run in ducting or approved cable managers and secured to 19-inch rack or mounting back-panel.
6. All enclosure doors shall open through 180 degrees without restriction.
7. Enclosure layout and equipment spacing shall be constructed to allow for device removal, calibration and maintenance without disassembly of adjacent devices.
8. All freestanding, floor-mounted enclosures shall have removable CSA eyebolts to facilitate sling handling of each enclosure. Eyebolt mounting shall be a part of the structural support bracing to distribute stresses and enclosure weight while sling handling enclosures during installation.
9. All enclosures shall have sufficient structural reinforcements to ensure a limited plane surface vibration and to provide rigidity during shipment, installation and operation without distortion or damage to the enclosure, mounting panel or mounted instruments.
10. All enclosure seams shall be continuously welded and ground smooth to be undetectable after painting.
11. Devices shall be installed on the enclosure back-panel or 19 inch rack.
12. There shall be no devices installed on the side plates of the enclosure.

Enclosure Wiring

1. All enclosure wiring shall run through cable management. All cabling is managed, protected, and enclosed.

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2. Cable managers shall not be filled to more than 50 percent of their volume upon initial installation.
3. All wires and cables, including spares, shall be identified at each end and at any connection. Use durable non-fading sleeve type wire markers to identify all network cables as follows:
 - a. Labels for cabling shall be laser printed, self-laminating, adhesive, polyester (indoor/outdoor).
 - b. Hand-written labels will not be accepted.
 - c. Lettering shall be black on a white background. Characters shall be a minimum of four millimetre high.
 - d. Wire markers are required on each conductor in panel board gutters, and at load connections. The identification shall include branch circuit or feeder number for power and lighting circuits, and control wire numbers for control wiring.
 - e. All field wires and cables terminated within enclosures shall be identified at each termination with a marking that corresponds with the drawings and supporting documentation.
 - f. Power wiring insulation shall be rated at 600 volts at 90 C and be type RW 90 THHN. Conductors shall be stranded copper. No wire smaller than 12 AWG shall be used for power wiring, unless noted otherwise on the drawings.

Rack/Cabinet Installation

1. All cable is to enter through the bottom or top of the cabinets. If coring of the floor is required for the passage of cable the Contractor is to X-Ray the floor in accordance with Division 1.
2. Provide cable tray (12" wide minimum) segregated for power, fibre and horizontal UTP cables for overhead cabling as shown on the Contract drawings. Cable management is to be provided from the cable tray to the enclosure to ensure that the minimum bend radius for each cable is maintained and the cable is rigidly supported.
3. Electrical
 - a. Provide the electrical distribution for each Core and Server Closet as per the related Electrical Distribution drawings and relevant standards.
 - b. Provide each core and server closet with required number of duplex 15A, 120 VAC.
 - c. The project manager will provide UPS Receptacle specification to the Contractor, typically one of the following which will be dependent on Load/Runtime requirement or if building Generator/UPS is in scope.

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UPS Receptacle Option	UPS Series	Input Power
Option 1	APC UPS 1500	NEMA 5-15R
Option 2	APC UPS 2200	NEMA 5-20R
Option 3	APC UPS 3000	NEMA L5-30R
Option 4	APC UPS 5000	NEMA L6-30R

- d. Secure each rack/cabinet to ground.
- e. The duplex receptacles shall be mounted in such a manner as not to interfere with access to or removal of other equipment within the enclosures.
- f. Power distribution within the enclosure shall be via vertically mounted power bars.
- g. Redundant power supplies, within the same device, shall not be connected to the same UPS circuit.

Network Access Closet (NAC) Sizing

1. Network Access Closets shall be large enough to accommodate all of the equipment and wiring that will be placed in it, and include extra space to accommodate any future growth.
2. As per the Regulatory Reference and Standards, Commercial Building Standard for telecommunications pathways and spaces specifies that each floor shall have a minimum of one NAC and additional wiring NAC should be provided when horizontal cabling distance exceeds 90m.
3. Minimum closet size is 10 foot by 10 foot with an eight-foot ceiling. Doors should be a minimum of 36 inches wide and seven feet tall, and swing into closet space.

Environmental Specifications

1. Shall satisfy environmental requirements that include, but not be limited to power supply, heating, ventilation, and air conditioning.
2. NAC should maintain a room temperature between 19 to 23 degrees Celsius for the cold zone with the assumption that air flow is from front to back (cold to hot) when all LAN equipment is in full operation and a relative humidity of between 30 to 50 percent.
3. There should be no water or steam pipes running through or above the room, with the exception of a sprinkler system, which may be required by fire codes.
4. The wiring closet cannot double as a storage area for cleaning products, chemicals, equipment, cardboard or furniture. The wiring closet shall be kept clean and free of any debris.
5. There should be at least one duplex power outlet positioned every 1.8 meters along each wall of the room, and should be positioned 15 cm above the floor. A wall switch that controls the room's main lighting should be placed immediately inside the door.
6. UPS plug type and BTU for equipment to be provided by York Region ITS.

Cable Access and Support

1. If data closet serves as a Main Distribution Facility/Facilities (MDF), all cables running from it, to Intermediate Distribution Facility/Facilities (IDF), computers and communications rooms on other floors of the same building should be protected by a four inch conduit or sleeved core.
2. The exact amount of conduit that is required is determined by the amount of fibre optic, UTP, and STP cable that shall be supported in each NAC.

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3. Cabling should be run through four-inch sleeves that are placed above the door level. To ensure proper support, the cable should be run from the sleeve directly onto a 12-inch ladder racked in the room.
4. Supply and install all horizontal wiring, jack boxes, raceway, wall plates, telephone punch-down blocks and identification labels.
5. Identify all wiring at both ends, at the jack end and in wiring closet.
6. Terminate, test and certify all installed wiring in accordance with industry standards.
7. Care should be taken to include additional lengths of conduit in order to provide for future growth.

Security Panel (Honeywell)

1. Honeywell Security and Building Solutions is a requirement for all new and existing sites. CCTV system is a requirement for facilities accessed by the general public (examples. Court Services, YRT, ENV and Corporate Sites). This will include an onsite video server, ups back-up and the DMV application.
2. Security patch panels when required, shall be placed in the NAC or Electrical room, and will require a standard wall space of four feet high by eight feet wide. This may increase depending on the size of the facility and requirements for Card Access and Panic Alarms.
3. In addition, the following requirements shall be adhered to:
 - Shall have 32 square feet of wall space
 - Eight-inch in depth, and require an additional 28 inches of clearance for a total of three feet
 - Panel area should be situated 3 feet vertically from the floor and panel should be installed on fire retardant backboard
 - Security panels should not be placed in mechanical room, or general areas opened to staff or other personal
4. CAT6A UTP cable, Purple in color should be used for interconnectivity and patching.
5. Facilities with on-site security guards will require an EBI PC workstation (*2 monitors*) to be located in the security office.

Building Automation System (BAS)

1. Building automation equipment may be located in various locations including but not limited to the following areas.
 - NAC
 - Ceiling
 - Mechanical Room
 - Electrical Room
2. Typical cabinet size that would be expected to be located in NAC.
 - Two feet wide by three feet high and six inches in depth with a door swing of two feet, seven inches
 - Eighteen inches wide by 18 inches high and six inches in depth with a door swing of 19 inches
 - Quantity maybe one to three depending on number of points
 - Panels should be situated three feet vertically from the floor and panel should be installed on fire retardant backboard
3. There could be a four feet wide by six UTP inches high by six inches in depth raceway that joins the larger cabinets.
4. CAT6A cable, orange in color should be used for interconnectivity and patching.
5. All BAS CAT6A drops shall be terminated to a patch panel in the network rack.
6. Requirement of five data jacks located beside one of the two-foot by three-foot cabinets.
7. If placed in the vicinity of a network racks, there should be an additional two feet of clearance.

Enclosure Wiring

1. All enclosure wiring shall run through cable management. All cabling is managed, protected, and enclosed.
2. Cable managers shall not be filled to more than 50 percent of their volume upon initial installation.
3. All wires and cables, including spares, shall be identified at each end, and at any connection. Use durable non-fading sleeve type wire markers to identify all network cables as follows:

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4. Labels for cabling shall be laser printed, self-laminating, adhesive, polyester (indoor/outdoor).
5. Hand-written labels will not be accepted.
6. Lettering shall be black on a white background. Characters shall be a minimum of four millimeters high.
7. Wire markers are required on each conductor in panel board gutters, and at load connections. The identification shall include branch circuit or feeder number for power and lighting circuits, and control wire numbers for control wiring.
8. All field wires and cables terminated within enclosures shall be identified at each termination with a marking that corresponds with the drawings and supporting documentation.
9. Power wiring insulation shall be rated at 600 volts at 90 C and be type RW 90 THHN. Conductors shall be stranded copper. No wire smaller than 12 AWG shall be used for power wiring, unless noted otherwise on the drawings.

UTP, STP & Fibre Patch Panels

York Region UTP, STP and fibre patch panels identification shall follow the standards outlined below. Any exceptions to the following requirements shall be approved by the Region's project manager.

1. Labels for patch panels shall be laser printed, self-laminating, adhesive, and polyester or polyolefin. Hand-written labels will not be accepted.
2. Lettering shall be black on a white background. Characters are a minimum of six millimetres high.
3. Labels shall be applied to patch panels in such a manner as to be readily visible and not obscured by structured cabling or patch cords.
4. The tagging convention for network closet, patch panels will employ a six character alphanumeric tag. The first three characters will indicate location (floor and access closet identifier). The last three characters will be a unique number incrementing with each drop within each closet.

UTP Patch Panel Termination Point

York Region UTP patch panel termination point identification shall follow the standards outlined below. Any exceptions to the following requirements shall be approved by the Region's project manager.

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1. Labels for faceplate shall be laser printed, self-laminating, adhesive, and polyester or polyolefin. Hand-written labels will not be accepted.
2. Lettering shall be black on a white background. Characters are a minimum of four millimetres high.
3. A label shall be applied to the top of each faceplate indicating the destination of the faceplate.

Fibre Optic Patch Panel Termination Point

York Region fibre optic patch panel termination point identification shall follow the standards outlined below. Any exceptions to the following requirements shall be approved by the Region's project manager.

1. Terminate all fibres of each fibre optic cable in either 36/72 Fibre Enclosures (access closet) or 36/72/144 Fibre Enclosures (Core Closet).
2. The ordering and colour of individual fibres will be the same for each fibre cable and compliant with ANSI/EIATIA-568-C.
3. Labels shall be laser printed, self-laminating, adhesive, and polyester or polyolefin. Hand-written labels will not be accepted.
4. Lettering shall be black on a white background. Characters are a minimum of four millimetres high.
5. A label shall be applied to the top of the fibre duplex adapter modules associated with a single fibre cable indicating the destination of the cable.

Network Cable Identification

York Region network cable identification shall follow the standards outlined below. Any exceptions to the following requirements shall be approved by the Region's project manager.

1. Use durable non-fading sleeve type wire markers to identify all network cables.
2. Labels for cabling shall be laser printed, self-laminating, adhesive, polyester (indoor/outdoor). Hand-written labels will not be accepted.
3. Lettering shall be black on a white background. Characters shall be a minimum of four millimetres in height.
4. Fibre Optic Backbone Cables
 - a. All fibre optic backbone cables are to be labelled at both ends of the cable.
 - b. The fibre backbone cables are to be labelled at each transition. A transition is defined as: a change in ducting (e.g. cable tray to conduit), a change in direction

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of more than 45 degrees, or an entrance and exit of ducting through a wall or floor.

- c. If the fibre cable is run in conduit, then the transition labels shall be applied to the conduit.
 - d. The tagging convention for identification of fibre optic backbone cables shall indicate the source and destination of the cable.
5. Horizontal Cables
- a. As a minimum, all horizontal Category 6A UTP cable is to be labelled at both ends of the cable.
 - b. The tagging convention for identification of horizontal cables shall indicate the drop sequence and telecommunications room (TR) of the cable.

Execution

1. Provide all components and appurtenances necessary to ensure that the network closets are functional and meet the intent of this specification.
2. Locate work area outlets where the length of the horizontal cable runs from the access closet interconnect to the work area outlet shall be less than 90 meters. For work area outlets where this proves impossible the Contract Administrator will authorize in writing an exception if the link still meets the performance requirements of this specification.
3. The Contract Administrator reserves the right to relocate access closets and work area outlets within three metres of the locations identified in the Contract Drawings at no additional cost to the Region.
4. The Contractor's is responsible to size all power supply cables to meet the requirements of the Ontario Hydro Safety Code based on field verified length of cable run and power supply load.
5. Cable and Conduit
 - a. Provide one CAT 6A UTP, horizontal cables to each work area outlet from an access closet in a Electric Magnetic Tube (EMT) conduit, sized to accommodate quantity of cabling and a minimum size of 35 millimetres (1 ¼").
 - b. Conduit carrying horizontal cables shall enter the work area outlet through the top or bottom.
 - c. Conduit shall be Electric Magnetic Tube conduit (EMT). Corrosive environments will be noted on the access closet Installation drawings. Conduit running through corrosive environments shall be Rigid PVC.

Work Area Outlets

1. Work Area Outlets
 - a. Provide one one-port, single-gang, metal work-area outlets, connectors and appurtenances for termination of the horizontal CAT 6A UTP cables. If four CAT 6A UTP cables are consolidated at the Work Area Outlet, then one four-port work-area outlet is required. If eight CAT 6A UTP cables are consolidated at the Work Area Outlet, then one eight-port work-area outlets is required.
 - b. Each work-area outlet will be associated with a one-port, snap-in faceplate installed in the access closet or Core Closet patch panel.
 - c. All Category 6A UTP (CAT 6A UTP) connectors shall be modular jacks and wired for a T568A wire-map.

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- d. All Category 6A UTP (CAT 6A UTP) shielded connectors shall be bonded to ground.
2. UTP Patch Cords
 - a. Supply quantity three Category 6A F/UTP patch cords for each work area outlet. Total quantity and length to be determined by York ITS. The Contractor will supply the patch cords to the Region for free-issue to others for installation.
 - b. Certify in writing that the patch cords supplied under this Contract meet or exceed the requirements for CAT 6 F/UTP 26 AWG.

Horizontal Cable Installation

1. Run horizontal cables connecting access closets to work area outlets in EMT conduit sized to accommodate quantity of cabling and a minimum size of 35 millimetres (1 ¼”).
2. For horizontal cabling runs in corrosive environments shielded twisted pair (STP) CAT 6A UTP cable will be used. The CAT 6A UTP STP cable will be installed in rigid PVC conduit and shall be properly grounded.
3. The bend radius for horizontal cable shall not be less than the manufacturer's recommended minimum bend radius.
4. Horizontal cables within the network core may be run in cable tray or through the plinth but shall be segregated from power distribution cable.
5. Labeling
 - a. Use durable non-fading sleeve type wire markers to identify all network cables.
 - b. Apply the tagging convention described in this specification for all horizontal cables.
 - c. As a minimum, label both ends of the horizontal cable.

Fibre Optic Cable Installation

1. Installation of the fibre optic backbone cable shall comply with section 56 (Optical Fibre Cables) of the Ontario Electric Safety Code and the EIA/TIA-568-C Telecommunications Building Standard.
2. Each fibre backbone segment shall be a continuous run (no splices) from the Network Core Closet to the target access closet.
3. The fibre optic backbone cable shall be installed as per the *Campus Layout – Cable Routing Schedule*. For steel conduit installations, the fibre optic backbone cable shall be installed in 27 millimetres (one inch) galvanized rigid-steel conduit unless the environment is corrosive. Corrosive environments will be noted on the Campus Layout –

Cable Routing Schedule. Conduit running through corrosive environments shall be Rigid PVC. For HDPE (high density polyethylene) conduit installations, the fibre optic backbone cable shall be installed in 50.8 millimetres (two inch) orange coloured corrugated HDPE conduit.

4. HDPE conduit shall meet or exceed the following minimum requirements:
 1. Corrugated
 2. Orange Coloured
 3. 50.8 mm (two inch) Minimum ID (inner diameter)
 4. 53.34 mm (2.1 inch) Average OD (outer diameter)
 5. ASTM D-3350 for cell classification 334470 C
5. The fibre optic backbone cable shall be installed in HDPE conduit in all electrical duct bank vaults. HDPE conduit shall be supported by guide wires and supported every one meter.
6. HDPE conduit shall be inserted 0.6 metres (24 inches) into all electrical duct transition points.
7. Rigid PVC, Rigid Steel or Corrugated HDPE installations:
 1. Install conduit into the walls, ceilings or floors as required on the Contract Drawings. The actual route of the conduits to be selected to avoid beams, columns and other obstructions, provided permission has been granted by the Contract Administrator.
 2. Conduit shall not interfere with other trades and shall be mounted over other piping where possible in parallel rows, parallel or perpendicular to walls and ceilings. Bends and offsets shall be uniform and symmetrical. The use of conduit bends shall be kept to a minimum.
 3. Conduit and cables shall be installed to avoid proximity of water and heating pipes. In no case shall they run within 75 millimetres of such pipe except where crossings are unavoidable in which case, they shall be kept at least 25 millimetres from the covering of pipe crossing.
 4. For wall, ceiling or floor installations, HDPE conduit to be anchored every meter.
8. A one-meter loop shall be used for every 100 meters of cable length, shall be left at the end of each fibre optic backbone cable, and housed in the network access closet.
9. The bend radius for fibre optic backbone cable shall not be less than the manufacturer's recommended minimum bend radius.

10. The tensile load for fibre optic backbone cable shall not exceed the manufacturer's recommended maximum tensile load.
11. To prevent micro-bends, the Contractor shall not use nylon cable-ties. The Contractor shall use straps to secure or collate fibre optic backbone cable.
12. Individual fibre backbone segment lengths are shown in the Campus Layout. Segment lengths are estimates calculated from the Campus Layout for each plant. The Campus Layouts provided are Reasonably-To-Scale (RTS). Contractor is to field verify cable lengths. The recommended fibre route to the access closets is provided in the Campus Layout drawing.
13. Labeling
 1. Use durable non-fading sleeve type wire markers to identify all network cables.
 2. Apply the tagging convention for all Fibre Optic cables.
 3. As a minimum, label both ends of the fibre optic backbone cable.
 4. In addition, label the fibre optic cable every 20 meters from the Network Core and at all major transitions. Major transitions are defined as: the entrance and exit of a wall or floor, a change in method of ducting, or a change in direction of more than 45 degrees.

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Appendix A – Horizontal Cable Labelling Format

First Floor with one data closet

D1-0000 to D1-nnnn

First Floor with multiple data closets

D1A-0000 to D1A-nnnn

D1B-0000 to D1B-nnnn

Second Floor with one data closet

D2-0000 to D2-nnnn

Second Floor with multiple data closets

D2A-0000 to D2A-nnnn

D2B-0000 to D2B-nnnn

Multiple Floors with multiple data closets

Increment the 2nd position of the format above for each floor.

Appendix B – Surface Mount Modules



NK4BXWH-AY | Panduit



NK2BXIW-A | Panduit

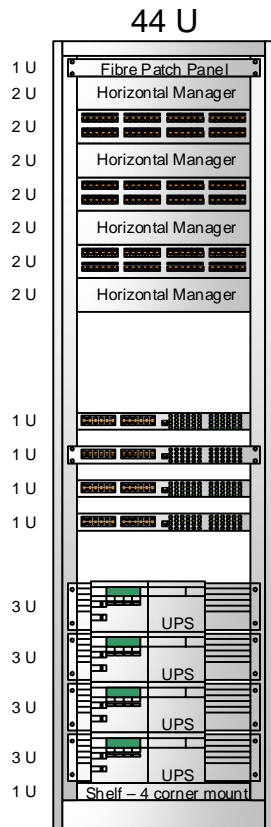
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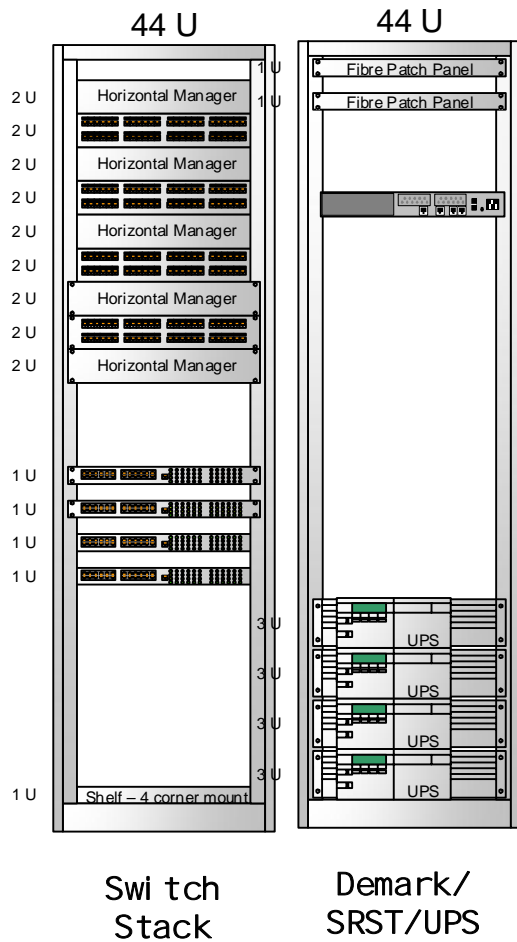
Appendix C – Network Rack/Cabinet Layout (Single)

Single Network rack/cabinet layout.



Appendix D - Network Rack/Cabinet Layout (Dual Rack)

Dual Network rack/cabinet layout.



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Appendix E – CableTalk Network Cabinet

30"x 42"x 83" - 44U

CTC3-3042K-03PF-B		
CTC3-3042K-B	Cabinet Frame 30"x 42"x 83" - 44U	1
CTC3-30-05-PF-B	Perf Lockable Front Door	1
CTC3-30-03-PF-B	Perf Lockable Split Door	1
CTC3-42-11-B	Solid Side Panels	2
CTC3-MA-16L-B	19" EIA Mounting Angles - Tapped 10/32	2
CTC3-CMS-11-B	Vertical Cable Management	1
CTPBV-1277-B	12 Outlet 15A PowerBar	2

30"x 36"x 83" - 44U

CTC3-3036K-03PF-B		
CTC3-3036K-B	Cabinet Frame 30"x 36"x 83" - 44U	1
CTC3-30-05-PF-B	Perf Lockable Front Door	1
CTC3-30-03-PF-B	Perf Lockable Split Door	1
CTC3-36-11-B	Solid Side Panels	2
CTC3-MA-16L-B	19" EIA Mounting Angles - Tapped 10/32	2
CTC3-CMS-11-B	Vertical Cable Management	1
CTPBV-1277-B	12 Outlet 15A PowerBar	2

Wall Mount Cabinet 11U

CTCWH-2524-DSO-B		
CTCWH-2524-DSO-B	Commercial Wall Mount Cabinet 11U	1
CTPBH-069-B	6 Outlet 15A Powerbar	1
CTC-FS-2	2 Fan Assembly	1

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Appendix F – CableTalk 4-Post Open Frame Cabinet

30"x 36"x 83"

CTC3-3036-03-B		
CTC3-3036K-B	Cabinet Frame 30"x 36"x 83" - 44U	1
CTC3-MA-16L-B	19" EIA Mounting Angles - Tapped 10/32	2
CTC3-CMS-11-B	Vertical Cable Management	1
CTPBV-1277-B	12 Outlet 15A PowerBar	2

30"x 42"x 83"

CTC3-3042-03-B		
CTC3-3042K-B	Cabinet Frame 30"x 42"x 83" - 44U	1
CTC3-MA-16L-B	19" EIA Mounting Angles - Tapped 10/32	2
CTC3-CMS-11-B	Vertical Cable Management	1
CTPBV-1277-B	12 Outlet 15A PowerBar	2

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Appendix G – HP Server Rack

HP 42U 600mm x 1075mm Enterprise Pallet Rack		
HPE-P9K37A	HPE 42U 600x1075 Ent G2 Pallet Rack	1
HPE-P9L15A	HPE G2 Rack 42U 1075mm Side Panel Kit	1
Option - Shelves for HP		
234672-B21	HP 100Kg Sliding Shelf (Sliding)	1
253449-B21	HP Mon/Utl Shelf (Fixed)	1

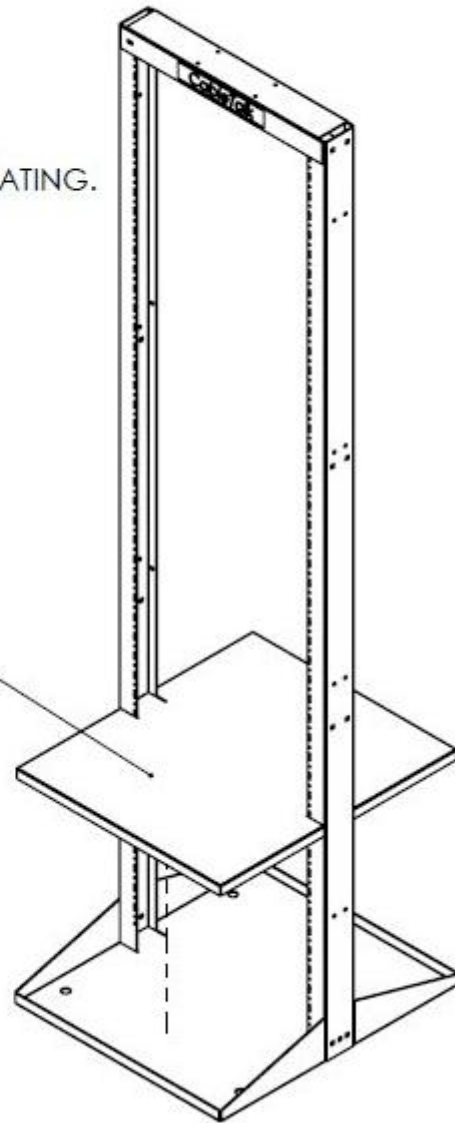
Appendix H – CableTalk 2-Post Rack

Please see <http://www.cabletalk.com/eng/index.php> for options and accessories.

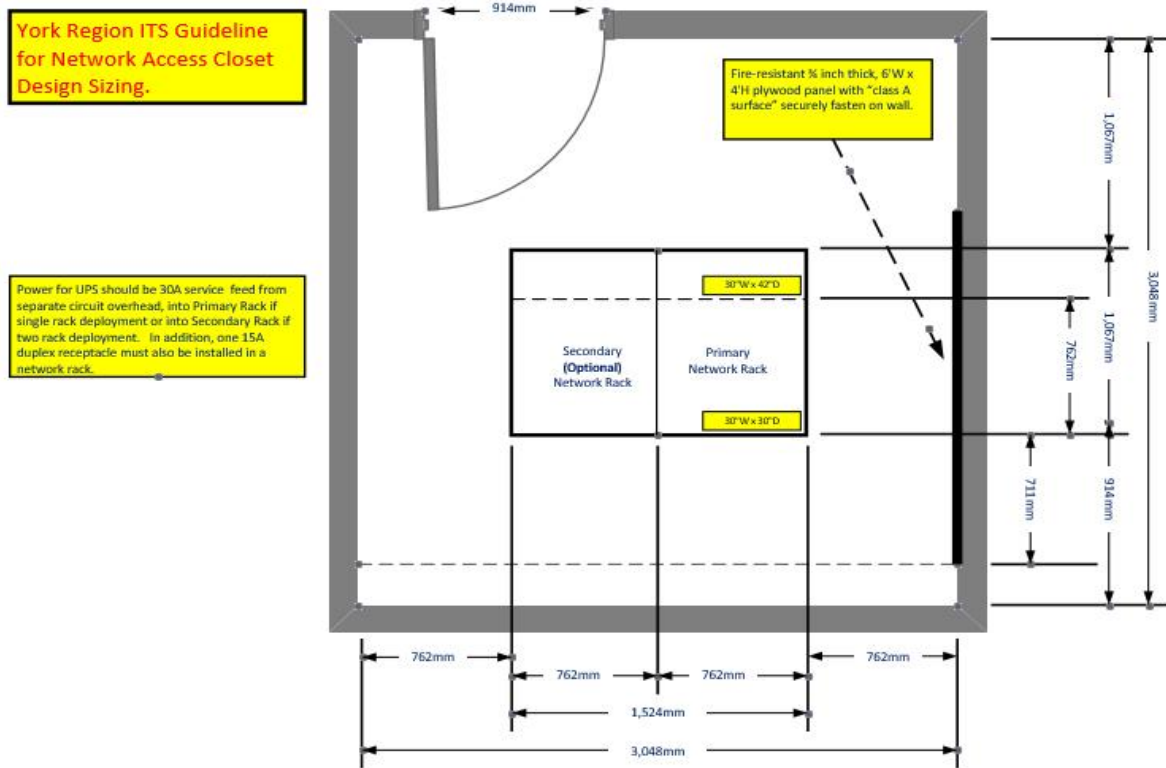
CTR-1977-PL PRACTICAL LINE RACK

- MILD STEEL WELDED CONSTRUCTION
- PAN-STYLE FOOT PLATE
- 19" EIA MOUNTING FRONT SIDE ONLY
- 10-32 TAPPED MOUNTING FACE
- 45 U-SPACE
- PAINTED BLACK TEXTURE POWDERCOAT
- LOAD RATING OF 550 LBS. LOAD TESTED TO 4X RATING.
- CSA AND UL CERTIFICATION UNDERWAY

DROP IN INSTALLATION.
NO TOOLS REQUIRED.



Appendix I – Guideline for Network Closet Sizing



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Appendix J – FAX Lines

BIX Punch Down (QCBX1A4) for Analog



Patch Panel Termination for Analog

Appendix K – Naming Convention for Wi-Fi Access Point (AP)

Staff Wi-Fi

1. AP should be labelled: **Site_FL-RM_AP#**. Where Site is Site Name, FL is the floor, RM is the Network Closet Room Number, AP# is the number of AP on that floor and numbering should restart on each floor.
 - a. le: AP number 16 on the first floor in the Annex that is cabled back to room 1-006 would be labelled as follows: ANNEX_1_1-006_AP16
2. Data Jack labelling: **RM_AP#**
 - a. le: data jack that is used for AP number 16 on the first floor of the Annex that is cabled back to room 1-006 would be labelled as follows: 1-006_AP16
3. Patch Panel should be labelled: **AP#**
 - a. le: patch panel that is used for AP number 16 on the first floor of the Annex that is patched back to room 1-006 would be labelled as follows: AP16

Public Wi-Fi

4. Public AP should be labelled: **PUB_FL-RM_AP#**. Where PUB represents Public WIFI, FL is the floor, RM is the Network Closet Room Number, AP# is the number of AP on that floor and numbering should restart on each floor.
 - a. le: Public WIFI AP number 16 on the first floor in the Annex that is cabled back to room 1-006 would be labelled as follows: PUB_1_1-006_AP16
5. Data Jack labelling: **PUB_RM_AP#**
 - a. le: data jack that is used for Public WIFI AP number 16 on the first floor of the Annex that is cabled back to room 1-006 would be labelled as follows: PUB_1-006_AP16
6. Patch Panel should be labelled: **PUB_AP#**
 - a. le: patch panel that is used for Public AP number 16 on the first floor of the Annex that is patched back to room 1-006 would be labelled as follows: PUB_AP16
7. Cabling for Public WIFI must on a separate patch panel from the York Region internal network.

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References

York Region Transit local area network eDocs: 1027531
 American National Standards Institute <http://www.ansi.org>
 Canadian Standards Association <http://www.csa.ca>
 Construction Specifications Institute/Construction Specifications Canada
<http://www.masterformat.com>
 European Committee for Electrotechnical Standardization (ECES)
<http://www.cenelec.eu/Cenelec/Homepage.htm>
 International Electrotechnical Commission (IEC) <http://www.iec.ch>
 International Organization for Standardization
<http://www.iso.ch/iso/en/ISOOnline.frontpage>
 Internet Engineering Task Force <http://www.ietf.org>
 IEEE <http://www.ieee.org>
 Ontario Realty Corporation <http://www.orc.on.ca/site3.aspx>
 Telecordia Technologies Inc. <http://telecom-info.telecordia.com>
 Telecommunications Industry Association <http://www.tiaonline.org>
 Underwriters Laboratories Inc. <http://www.ul.com>

Standard	Title
ANSI/EIA/TIA/ICEA	
ANSI-J-STD-607-A-2002	Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
ANSI/EIA/TIA-455-B	Fibre Optic Test Procedures
ANSI/EIA/TIA 455-34-2002	Fibre Optics-Interconnection Device Insertion Loss Test
ANSI/EIA/TIA-472C000-B-2005	Standard for Optical Fibre Premises Distribution Cable
ANSI/EIA/TIA-472D000-B-2009	Standard for Optical Fibre Outside Plant Communications Cable
ANSI/EIA/TIA-492AAAA-B-2009	Detail Specification for 62.5-mm Core Diameter/125-mm Cladding Diameter Class 1a Graded-Index Multimode, Optical Fibres.
ANSI/EIA/TIA-492AAAB-A-2009	Detail Specification for 50.0-mm Core Diameter/125-mm Cladding Diameter Class 1a Graded-Index Multimode, Optical Fibres.
ANSI/EIA/TIA-492BAAA-98	Detail Specification for Class IVa Dispersion-Unshifted Singlemode Optical Waveguide Fibres Used In Communications Systems.
ANSI/EIA/TIA-568-C.0-2009	Generic Telecommunications Cabling for Customers Premises
ANSI/EIA/TIA-568-C.1-2009	Commercial Building Telecommunications Cabling Standard
ANSI/EIA/TIA-568-C.2-2008	Balanced Twisted-Pair & Cabling Components Standard
ANSI/EIA/TIA-568-C.3-2008	Optical Fibre Cabling Component Standard
ANSI/EIA/TIA-569-B-1-2009	Addendum 1 – Temperature & Humidity Requirements for Telecommunications Spaces.
ANSI/EIA/TIA-598-C (2005)	Optical Fibre Cable Color Coding
ANSI/EIA/TIA-570-B (2004)	Residential Telecommunications Wiring Standard.
ANSI/EIA/TIA-604-3-B (2004)	FOCIS 3 Fibre Optic Connector Internatibility Standard
ANSI/EIA/TIA-606-A (2007)	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

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ANSI/EIA/TIA-942-2 (2010)	Telecommunications Infrastructure Standard for Data Centers, Addendum 2 – Additional Media and Guidelines for Data Centers
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