

APPENDIX H

Peel Regional Police Cabling Specifications

Peel Regional Police Network Cabling Specifications

12th of February 2019



**Peel Regional
Police**
A Safer Community

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Specification Version History

Version #	Implemented	Revision	Approved	Approval	Reason
1	Brad Masterson C.E.T.	1.1			

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I. General

A. Purpose of Document

1. This document is to provide a standard defining the structured communications cabling systems to be installed within Peel Regional Police facilities. It is geared toward leveraging our legacy cabling infrastructure while upgrading to more recent technologies in new installations. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards, and industry best practices.
2. Within this document, the facilities owner is Peel Regional Police, and shall be referred to as such, or as Information Technology Services. Bidding low-voltage installers shall be referred to as “Installer” or “Contractor”.
3. It is the responsibility of the installing Contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of Peel Regional Police any design directions that may be improved. All such changes shall be approved in writing from Information Technology Services.
4. This specification defines quality standards and practices common to all Peel Regional Police network cabling upgrades and Greenfield (new) projects. The system offered and quoted, shall incorporate all features and facilities listed in this specification.
5. In addition to this cabling standard, individual projects will also have associated documentation such Requests for Proposals (RFP), facility drawings, and project schedules pertaining to that particular job. Such collateral will be referred to in this document as “Project-specific Documentation”, “Project Documentation”, or simply “Construction Documents”. Many of the requirements described herein may be detailed or expanded upon by such project-specific documents.
6. Any conflict between this general specification and any project-specific documentation shall be brought to the attention of Peel Regional Police and will be resolved by Peel Regional Police in writing.
7. Note that while many portions of this specification are addressed to “The Contractor”, these requirements apply equally to architects, engineers, project managers, planning, or anyone doing network cabling and infrastructure work within Peel Regional Police facilities, whether those persons are outside contractors or persons directly employed by Peel Regional Police.

B. Scope of Work – Typical

1. Contractor shall be solely responsible for all parts, labor, testing, documentation, and all other processes and physical apparatus necessary to turn over the completed cabling system and associated infrastructure fully warranted and operational for acceptance by Peel Regional Police.

2. This specification includes structured cabling for the production Ethernet network, but may address other systems that have converged onto Ethernet-style cabling. These associated systems may include VoIP, Building Automation Systems (BAS), Building Access Control, Security Cameras and Audio Visual Systems.
3. The following cabling subsystems will be defined:
 - a. Cabling Subsystem 1 – Horizontal Copper Cabling
 - b. Cabling Subsystem 2 – Intrabuilding Fiber Backbone Cabling OM4 or OS1
 - c. Cabling Subsystem 3 – Interbuilding Fiber Backbone Cabling OS2
 - d. Racks and Cable Management
 - e. Bonding and Grounding
 - f. Cable Pathways
 - g. Network Labeling
 - h. Cabling Accessories
 - i. Cabling Subsystem 1 – Horizontal Copper Cabling
 - j. Cabling Subsystem 2 – Intrabuilding Fiber Backbone Cabling OM4 or OS1
 - k. Cabling Subsystem 3 – Interbuilding Fiber Backbone Cabling OS2
 - l. Racks and Cable Management
 - m. Bonding and Grounding
 - n. Cable Pathways
 - o. Network Labeling
 - p. Cabling Accessories
4. In the event that requirements of the project documents cannot be met during design or installation, a written description of the need for variance will be submitted to the Peel Regional Police Project Manager for review by the Information Technology Services Team.

C. General Guidelines

1. All voice telephony systems shall be VoIP unless otherwise specified in the project-specific documentation.
2. Any copper or fiber patch cords shall be factory terminated. Hand terminated patch cords will not be accepted.
3. All Greenfield (new) projects shall use Cat 6 cable or better.

4. On Brownfield (existing) installations, Contractor shall consult project documentation for guidance on the current Category of copper cable to be installed.
5. Any deviation from Cat 6 cabling shall be approved in writing by Brad Masterson C.E.T..
6. Wiring configuration on Cat 6 systems shall be T568A.
7. Any communications/IT consulting engineers retained by Peel Regional Police shall be at the sole discretion of Information Technology Services.

D. Terminology from TIA 569

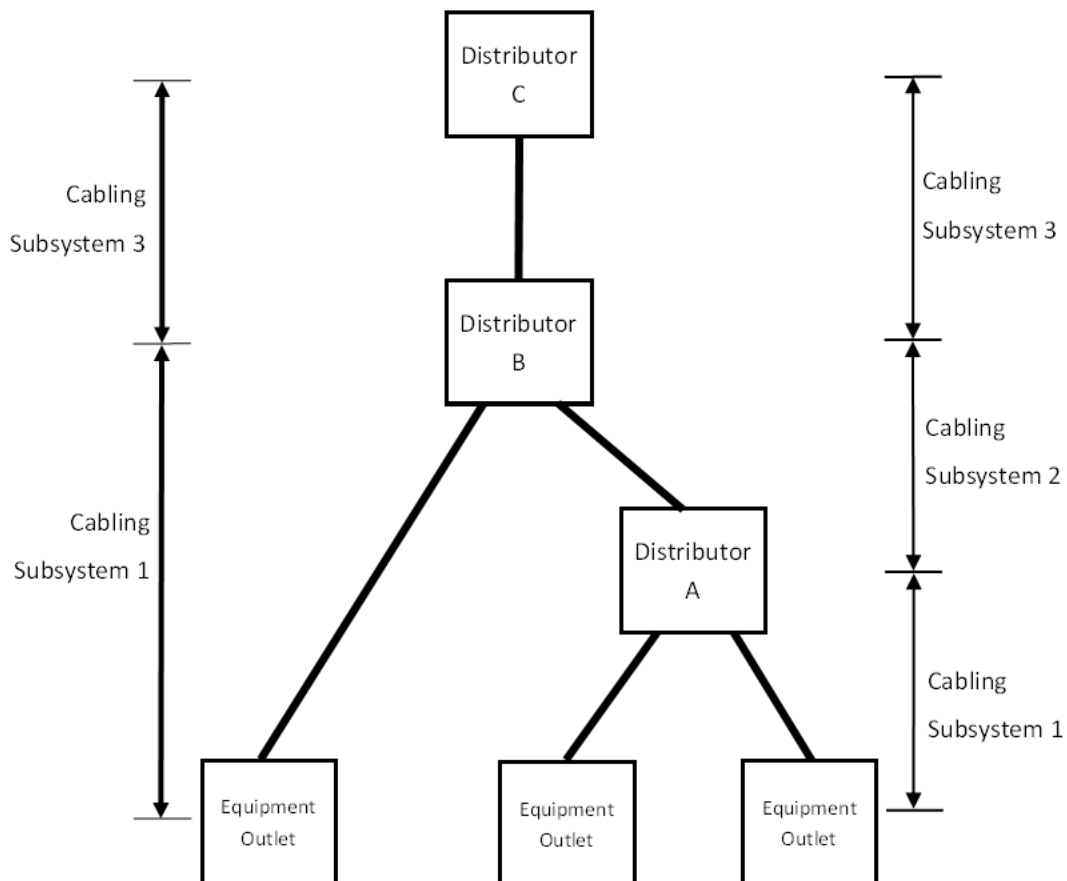
1. New Terms for Telecommunications Spaces (Rooms)

- a. This section reviews some of the current terminology for communications rooms and spaces as defined in TIA 569-D (April 2015).
- b. Awareness of these new terms is important for communicating accurately and for clearly understanding language used in specifications and other documents.
- c. This specification will use both new and old terms side-by-side for clarity.
- d. The table below shows some of the most important new terms and how they relate to traditional terminology:

Old Term(s)	New Term
Entrance Facility.	Entrance Room
Telecommunications Room, Equipment Room.	Distributor Room
Telecommunications Room, Equipment Room.	Telecommunications Space
Cross-connect, Patching System, Optical Enclosure.	Distributor
Horizontal Cross-connect. Usually copper patch panels in enterprise installations.	Distributor A
Intermediate Cross-connect, Intermediate Distribution Frame. Usually multimode optical enclosure in enterprise installations. Can apply to intra and interbuilding fiber cabling subsystems.	Distributor B
Main Cross-connect, Main Distribution Frame. Usually singlemode optical enclosure in enterprise installations. Can apply to intra and interbuilding fiber cabling subsystems.	Distributor C
Faceplate, Surface Box, Work Area Appliance.	Equipment Outlet
Work Area.	Equipment Outlet Location
Horizontal Cabling. Extends from Equipment Outlet to Distributor A, B, or C depending on size of cable plant. Usually balanced twisted pair cable in enterprise installations.	Cabling Subsystem 1
Extends from Distributor A to Distributor B or C, depending on size of cable plant.	Cabling Subsystem 2

Old Term(s)	New Term
Usually 50-micron intra-building backbone fiber cable in enterprise installations. But may be singlemode fiber.	
Connects Distributor A to Distributor B. In enterprise installations, this is usually singlemode fiber between buildings.	Cabling Subsystem 3

Example of a logical cabling topology with the new terminology see illustration below:



E. Applicable Regulatory References

1. Contractor is responsible for knowledge and application of current versions of all applicable standards and codes.
2. ANSI/TIA:
 - a. ANSI/TIA 568 series, most recent revisions, addenda and systems bulletins. All applicable
 - b. ANSI/TIA-569 Telecommunications Pathways and Spaces, most recent revision including all relevant addenda and systems bulletins
 - c. ANSI/TIA-606 Administration Standard for Telecommunications Infrastructure, most recent revision including all addenda and systems bulletins
 - d. ANSI/TIA-607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises, most recent revision including all addenda and systems bulletins
 - e. ANSI/TIA-862 Structured Cabling Infrastructure Standard for Intelligent Building Systems, most recent revision including all addenda and systems bulletins
 - f. ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centers, most recent revision including all addenda and systems bulletins
 - g. ANSI/TIA-1179 Healthcare Facility Telecommunications Infrastructure Standard, most recent revision including all addenda and systems bulletins
 - h. ANSI/TIA-4966 Telecommunications Infrastructure Standard for Educational Facilities, most recent revision including all addenda and systems bulletins
 - i. TIA-TSB-162 Telecommunications Cabling Guidelines for Wireless Access Points, most recent revision including all addenda and systems bulletins
3. BICSI – Building Industry Consultative Services International – Manuals
 - a. Telecommunications Distribution Methods Manual, most recent edition
 - b. Information Transport Systems Installation Methods Manual (ITSIMM), most recent edition
4. National Electric Codes – all applicable
5. OSHA Standards and Regulations – all applicable
6. Local Codes and Standards – all applicable
7. Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the CEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either
8. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense

F. Peel Regional Police Substitution Policy

1. This is a performance-based specification developed from the experience of the Peel Regional Police Information Technology Services in providing exceptional solutions for all our facilities and departments. As such, substitution of specified products or systems named in this document is highly discouraged.
2. Any Contractor wishing to offer substitutions for any part of the systems specified herein shall be responsible for proving equivalency and shall follow the procedure below:
 - a. Contractor shall submit a request for product substitution to Peel Regional Police in writing no less than one week in advance of bid.
 - b. Contractor shall provide three (3) each samples of the product being offered for evaluation by Peel Regional Police
 - c. Samples of products offered for substitution shall be accompanied by product drawings, specification sheets and engineering documents proving equivalency in transmission performance (where applicable) and mechanical function.
 - d. Category Cat 6 cable and components offered in substitution to those specified shall be accompanied by third party test reports proving equal or better channel performance. Such test reports shall name exact products by part number and state channel results in worst-case connector links of maximum length that include both cross-connect and consolidation points.
3. Equivalent product acceptance must be received from Peel Regional Police in writing.
4. Contractor shall be responsible for and assume all costs for removal and replacement of any substituted product installed without prior written approval from Peel Regional Police. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

G. Contractor Qualifications

1. General
 - a. Contractor shall be a current Panduit OneSM Partner that has completed the Structured Cabling Deployment training (Panduit Certified Installer). A copy of the corporate Panduit manufacturer certification shall be included with all quotes.
 - b. Contractor shall have at least 5 years documented experience installing and testing structured cabling systems of similar type and size.
 - c. Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD) to sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.
 - d. Contractor shall have all necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.



- e. At least 30 percent of the technicians installing low-voltage copper systems on the job shall have a current Panduit Certified Copper Technicians certificate or equivalent to be approved by Peel Police IT Services.
- f. At least 30 percent of the technicians installing any Fiber Distribution Systems shall have a current Panduit Certified Fiber Technicians certificate or equivalent to be approved by Peel Police IT Services..
- g. The Telecommunications contractor shall provide a Project Manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:
 - Initiate and coordinate tasks with the Peel Regional Police Project Manager and others as specified by the project schedule.
 - Provide day-to-day direction and-site supervision of Contractor personnel.
 - Ensure conformance with all contract and warranty provisions.
 - Acknowledge and remediate findings of Peel Regional Police weekly site project meetings.
 - This individual will remain Project Manager for the duration of the project. The contractor may change Project Manager only with the written approval of Peel Regional Police.
- h. Contractor Project Manager on site shall have completed the Panduit Structured Cabling Deployment training and hold certificates for both copper and fiber.

2. References and Response Times

- a. Communication Contractor shall provide with bid, a list of four (4) reference accounts where similar Data, Voice, Fiber Optic Cable, and related equipment installation work was performed within the last year (twelve-month period).

3. Termination of Services

- a. Peel Regional Police reserves the right to terminate the Communication Contractor's services if at any time it is determined the Communication Contractor is not fulfilling their responsibilities as defined within this document and all associated project documentation.
- b. Upon termination, the Communications Contractor shall be restricted from the premises and compensated for the percentage of work completed satisfactorily.
- c. Contractor's appearance and work ethic shall be of a professional manner. Dress shall be appropriate to the work being performed.
- d. Conduct on Peel Regional Police property will be professional in nature.
- e. Any person in the Contractor's employ working on a Peel Regional Police project considered by Peel Regional Police to be incompetent, disorderly, or for any other reason unsatisfactory or undesirable to Information Technology Services, such person shall be removed from the Peel Regional Police project.

4. Other Contractor Responsibilities

- a. Confirmation of Pathway and Cable Manager sizing:



- Wherever cabling pathways or managers are installed, it is the Contractor's responsibility to confirm pathway or manager sizing to represent no more than 25% fill upon installation according to manufacturer's fill tables.
- Pathways deemed overfilled upon installation will not be accepted and shall be remedied at Contractor expense.
- b. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job.
- c. All work areas will be cleaned at the conclusion of the workday and no tools or materials shall be left in a manner as to pose a safety hazard.
- d. Projects are not considered finished and will not be paid by Peel Regional Police until all debris, dust, etc. has been cleaned and removed to the satisfaction of Peel Regional Police.
- e. Contractor shall remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors shall consider this when placing bids.
- f. Contractor shall abide by all Peel Regional Police Security Policies pertaining to access and conduct while on Peel Regional Police property.
- g. Contractor shall obey all posted speed limits and parking regulations at the Peel Regional Police facilities where the work is being performed.
- h. Contractor understands that illegally parked vehicles will be towed and Contractor is responsible for and will assume all costs associated with towing.

H. Warranty

1. Contractor shall provide a 25 year PanNet® System Warranty on all copper and fiber links and/or channels.
2. PanNet® System Warranty shall meet the following criteria:
 - a. A 25-year guarantee that the installed cabling system will pass the Commercial Building Telecommunications Standards cited in this document.
 - b. This warranty will cover all registered links and/or channels.
 - c. Contractor shall indicate in warranty documentation whether registered links are to be link or channel.
 - If links are covered, this warranty may be invoked only if the links are comprised entirely of Panduit components and cable.
 - If channels are covered, this warranty may be invoked only if entire channel links are comprised of continuous Panduit components and patch cables.
 - d. The communications Contractor will correct any problems and malfunctions that are warranty-related issues without charge for the entire warranty period.



- e. If the PanNet® System Warranty is needed by Peel Regional Police within the warranted period and the original installer is no longer in business, Panduit shall find a substitute Panduit ONESM (certified) contractor and assume costs to fulfill the obligations of the warranty.
- f. Upon acceptance of the warranty paperwork and test results from the Contractor, Panduit will mail a notification letter to the installer and a notification letter with warranty certificate to Peel Regional Police.
- g. The warranty period shall commence following the final acceptance of the project by Peel Regional Police and written confirmation of warranty from Panduit.

<END OF SECTION>

II. Subsystems and Components

A. Cabling Subsystem 1 – Horizontal Copper Cabling System

1. See Appendix A for Part Numbers
2. Installation Guidelines
 - a. Installation of horizontal cabling shall be compliant with most recent versions of all applicable standards, national and local codes, as well as the local Authority Having Jurisdiction (AHJ).
 - b. The cabling system and support hardware shall be installed so as not to obscure any valves, fire alarm conduit, boxes, or other control, security or life safety devices.
 - c. Contractor shall use the same Category of performance for both cable and connecting hardware through the entire horizontal channel.
 - d. Anywhere there is a conflict between standards, codes, installation specifications or project specific documentation contractor shall default to the most stringent.
 - e. If clarification is needed, contractor shall submit a written request for clarification to Peel Regional Police. Response from Peel Regional Police shall be in writing.
 - f. All cable pulled and terminated shall be Cat 6 unless specified otherwise in the project documentation.
 - g. Contractor is responsible for maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods required by cited standards, as well as manufacturer's recommendations and industry accepted best practices.
 - h. Contractor shall use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.
 - i. Bundles of cable shall be pulled using pulling socks to distribute the tensile force over all cables in the bundle.
 - j. Contractor shall take care not to knot, snag or otherwise deform the cable while pulling. The jacket on installed cable shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections. Damaged or deformed cable shall be removed and replaced at no cost to Peel Regional Police.
 - k. Bend radius on 4 pair cable shall never be below 4 times the cable outer diameter, or manufacturer's requirements, whichever is most stringent.
 - l. Cables shall not be attached to lighting support wires nor touch the drop-ceiling assembly. Any portion of the communications cabling making contact with ceiling structures shall be remedied at Contractor expense.
 - m. Cables shall be kept as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as practical and in shall in no cases pass closer than recommended in cited TIA standards.



- n. When using miniature horizontal cable or small diameter patch cables, the channel length shall be derated per manufacturer's recommendations.
- o. Contractor shall take care to never deform the cable by over cinching with cable ties. All cable ties shall be cinched firmly, but not so firmly that the tie cannot be rotated or moved on the bundle by hand.
- p. Cable bundles in telecom spaces (rooms) shall be dressed using only hook and loop style cable ties. Plastic ties shall not be used in Peel Regional Police telecom rooms and shall be removed and replaced with hook and loop ties at Contractor expense.
- q. Cable ties on all cable bundles shall be applied at random intervals to avoid harmonic effects.
- r. All horizontal cabling installed shall include a cable slack loop of not less than 12 inches at the Equipment Outlet and not less than 36 inches in the horizontal telecom room.
- s. Equipment outlet cable slack shall be stored in the box behind the faceplate if there is room to do so without violating the bend radius of the cable according to manufacturer's recommendations.
- t. Contractor may affix 12 inch slack loop above ceiling using hook and loop cable ties if allowed in the project specific documentation or otherwise in writing from Peel Regional Police. Cable loops touching the drop ceiling shall not be accepted.
- u. Service loops in the telecommunications room may be wall mounted or contained in pathways or racking systems if done according to manufacturer and industry best practices.
- v. All terminations on new (Greenfield) Peel Regional Police projects shall be terminated using the T568A pin-out (wire map).
- w. All terminations in existing Peel Regional Police facilities (Brownfield), shall match the pin-out and Category of the legacy cable plant, unless otherwise specified in the project documentation.
- x. Contractor shall terminate twisted pairs so that the last twist is never more than ½ inch from the point of termination (insulation displacement clip). Maintaining the last twist closer than ½ inch is preferred.
- y. Contractor shall maintain the cable jacket as close as possible to the connecting hardware. Twisted pair conductors deemed by Peel Regional Police to be unnecessarily exposed shall be re-terminated at Contractor's expense.
- z. Contractor shall be responsible for using plenum cable, ties and appliances in any air-return (plenum) spaces as required by applicable codes, standards, and the local AHJ (Authority Having Jurisdiction).

3. Copper Horizontal Cable

- a. Copper cable shall have the following attributes:
 - Panduit Category 6 cable shall meet ANSI/TIA-568-C.2
 - IEC 61156-5 Category 6 standards
 - Conductors shall be 23 AWG
 - Construction with FEP/polyolefin (CMP)

- Plenum – NFPA 262 and CSA FT-6
- PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications
- Cable diameter: 0.203 in. (5.2mm) nominal
- Color Blue

4. Equipment Outlet Copper Connectors (Jacks)

a. Copper Connectors shall have the following attributes:

- Category 6/Class E, 8-position, UTP jack module shall terminate 4-pair, 22 – 26 AWG
- 100-ohm unshielded twisted pair cable and shall not require use of a punchdown tool
- PoE & PoH compliance: Rated for 2500 cycles with IEEE 802.3af / 802.3at and proposed 802.3bt type 3 and type 4. Supports Power over HDBaseT up to 100 watts
- Operating Temperature: -10°C to 65°C (14°F to 149°F)
- Wire cap compatible with 22 – 26 AWG solid or stranded cable with conductor insulation diameters of 0.060 in. max. and overall cable O.D. 0.200 in. to 0.330 in
- Color: Blue for work station and end-point devices such as printer or others
- Color: Yellow for Security cameras and related devices

5. Equipment Outlet Appliances – Faceplates

a. Faceplates shall have the following attributes:

- 2 ports decora
- Color White

6. Equipment Outlet Appliances – Surface Mount Boxes

a. Surface Mount Boxes shall have the following attributes:

- 2 ports
- Color White

7. Copper Horizontal Patch Panels (Distributor A)

a. Patch panels shall have the following attributes:

- 24 ports 1RU and 48 ports 2RU
- Modular accept Mini Com copper connectors
- Color Black



8. Copper Patch Cords – Work Area

- a. Copper patch cords shall have the following attributes:
 - Category 6, 24 AWG UTP patch cord with TX6™ Modular Plugs on each end.
 - Color Blue for workstation and other end-point devices
 - Color Yellow for Security cameras and other related devices

9. Copper Patch Cords – Telecom Room

- a. Copper patch cords shall have the following attributes:
 - Category 6, 28 AWG UTP patch cord with TX6-28™ Modular Plugs on each end.
 - Color blue for Workstation and other end-point devices
 - Color Yellow for Security cameras and other related devices

B. Cabling Subsystem 2 – Intrabuilding (Within Building) Fiber

1. See Appendix A for Part Numbers

2. Installation Guidelines (Applies to all Fiber Trunks)

- a. Fiber terminations shall be done according to recommendations of TIA, manufacturer's requirements, and accepted industry best practices.
- b. Fiber optic cabling system additions and upgrades to existing facilities (Brownfield) shall match the fiber type (OM/OS designation) of the system to which it is being installed. Contractor shall under no circumstances mix different OM/OS classes of cable or termination devices (connectors) within the same channel unless specifically instructed to do so within the project specific documentation.
- c. When installing fiber cable, Contractor shall maintain a minimum bend radius of 20 times the outer diameter of the cable when it is under load (being pulled).
- d. Fiber service loops shall be stored to maintain a minimum bend radius of 10 times the outer diameter of the cable.
- e. Optical fiber shall only be pulled using its internal strength member in conjunction with a properly rated multi-weave mesh grip and swivel pulling eye.
- f. All unjacketed fiber shall be contained within appropriate fiber enclosures. Exposed tight-buffered, fan-out or loose-tube strands will not be tolerated and shall be remedied at Contractor's expense.
- g. Direct connection of terminated fiber backbone links to equipment is not allowed. All fiber connections shall go through a fiber enclosure interconnect and connect to active equipment via fiber jumpers.
- h. Contractor shall perform fiber testing of all strands according to guidelines in the "Testing and Acceptance" section of this document.



- i. Service loop (slack) in telecommunications rooms shall be at least 3 meters. Consult project documentation for length of service loops and storage method within a specific telecom room or space.
- j. Slack shall be stored per manufacturer instructions inside the enclosure, or stored outside the enclosure using appliances built for that purpose. Consult project documentation for details on storage of service loops.
- k. Fiber pulls using multiple pull points shall use the “figure-8” technique any time excess cabling is piled on the floor as slack to supply the next pull-point.
- l. Cable shall be rolled off the spinning cable reel, not pulled off the end.
- m. During all fiber cable pulls Contractor shall have one person at each end of the pull to ensure proper cable pay out and pile up without damage to the fiber.
- n. Fiber backbone cables shall be installed separately from horizontal distribution cables. Under no circumstances may copper and fiber cables be pulled in common bundles.
- o. In pathways containing both fiber and copper cables, the fiber cable must either be of armored construction, or segregated in innerduct.
- p. Where cables are housed in sleeves or conduits, the backbone and horizontal cables shall be installed in separate conduits or the fiber segregated in separate innerduct within the conduits.
- q. Fiber shall be segregated within racks and patching systems unless instructed otherwise in the project documentation.
- r. Where possible fiber enclosures shall be mounted at the top of equipment racks and the fiber cable kept separate from copper cable.
- s. Contractor shall inspect fiber end faces with a fiber scope and clean the connectors (if needed) whenever plugging in a fiber connector.

3. Fiber Between Telecom Rooms

- a. Backbone fiber cable between telecoms rooms on the same floor within building shall have the following attributes:
 - 9um OS2 Singlemode
 - Minimum 12 Fiber Indoor Distribution Cable
 - Plenum (OFNP), 900um Buffered Fibers

4. Fiber Connectors

- a. Intrabuilding fiber connectors shall have the following attributes:
 - LC Cam-Style OptiCam® Connectors
 - 9/125µm OS1/OS2
 - Ferrule type: Zirconia ceramic with a pre-polished fiber stub



- Insertion loss: Ceramic: 0.3dB average (multimode and singlemode)
- Fiber cable size: 1.6mm – 2.0mm and 3.0mm jacketed cable with optional boots

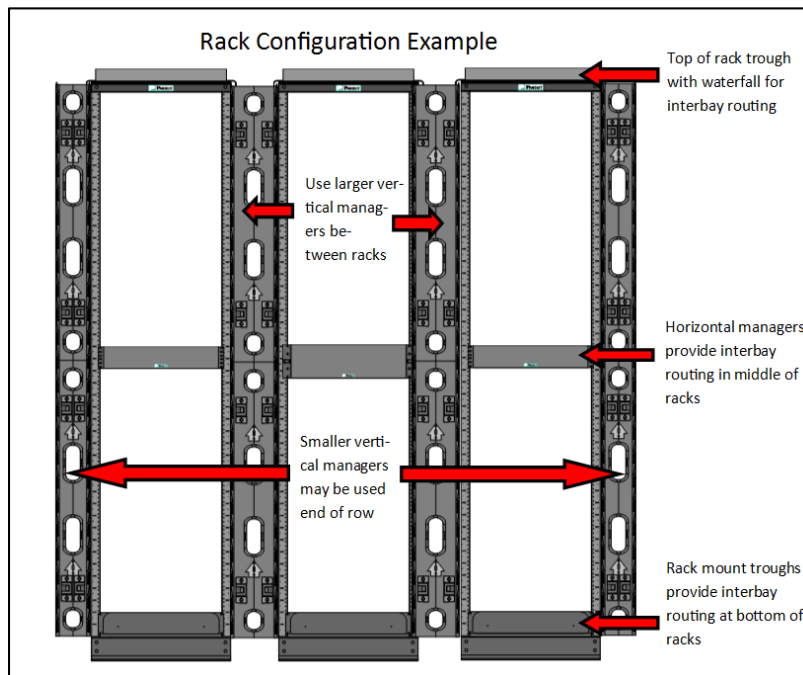
5. Fiber Enclosures

- a. Fiber enclosures shall have the following attributes:
 - Rack mount fiber enclosures shall house, organize, manage and protect fiber optic cable, terminations, splices, connectors and patch cords.
 - Enclosure shall accommodate all Panduit trunk cables, connectors, patch cords, fiber adapter panels (FAP) and fiber mount panels (FMP)
 - Fiber optic enclosures shall be constructed of steel material.
 - Molded front and back doors shall be removable for cabling and connector installation
 - 1 RU and 2 RU enclosures shall provide full front and rear access with a drawer that slides forward and backward.
- b. Fiber Adapter Panels shall have the following attributes:
 - Zirconia ceramic: OS1/OS2 singlemode adapters.
 - Snap quickly into Opticom® Fiber Adapter Patch Panels and Enclosures
- c. Fiber patch cords (jumpers) for shall have the following attributes:
 - SINGLEMODE
 - 1.6mm DUPLEX LC/LC
 - STANDARD IL

C. Racks, Cabinets, and Cable Management

1. See Appendix A for Part Numbers
2. Installation Guidelines
 - a. Racks shall be securely attached to the concrete floor using appropriate mounting hardware.
 - b. All racks shall be grounded to the telecommunications ground bus bar in accordance with cited standards the bonding and grounding section of this document.
 - c. Rack mount screws (#12-24) not used for installing fiber panels and other hardware shall be bagged and left with the rack upon completion of the installation
 - d. In telecommunications rooms with multi-bay rack rows, Contractor is responsible to include in design interbay routing pathways at the top, middle, and bottom of each rack to provide efficient and neat patch routing between any two points within rack rows.

- e. See the 2-post rack configuration example below for general guidelines for pathways between ganged racks:



- f. For bottom-of-rack interbay routing where cable quantities exceed capacity of interbay troughs, Contractor should substitute 4RU troughs.
- g. All racks shall be outfitted with a vertical grounding busbar along one rail, with all equipment bonded to ground according to the Bonding and Grounding Standards cited in this document. See Bonding and Grounding section of this document for details.
- h. Cabinets should be positioned to create aisle widths able to accommodate the movement and installation of the largest equipment anticipated.
- i. Minimum aisle width is 3 feet clearance in the front of the cabinet and not less than 2 feet of clearance in the rear. Consult project documentation for clearance requirements on a specific job.
- j. Cabinets shall be secured to the building structures according to the manufacturer's instructions and in compliance with applicable codes, standards, and the requirements of the local AHJ. Please also refer to project-specific documentation as appropriate.
- k. Racks and cabinets shall be individually electrically bonded to the communications earthing system according to the manufacturer's instructions and in compliance all applicable standards, codes and the requirements of the local AHJ.
- l. All cabinets shall be clearly identified at both the top and bottom of the in both the front and back of each cabinet with a large label (not less than 1" in height). Labels must be visible with the cabinet doors open or closed.



- m. Empty horizontal spaces in cabinets in equipment rooms may be blanked with panels or blanking shades to facilitate hot/cold aisle cooling strategies. Consult project documentation for blanking requirements.
- n. Cable entrances in tops of cabinets shall be sealed using preinstalled brushes or using the appropriate sized Panduit cool boot seals.

3. Two-Post Communications Racks

- a. Two-post communications racks shall have the following properties:
 - 16 gage steel, black powder coat finish
 - #12-24 threaded equipment mounting rails
 - 84.0"H x 20.3"W x 3"D, 45 RU
- b. Four-post communications racks shall have the following properties:
 - 16 gage steel, black powder coat finish
 - #12-24 threaded equipment mounting rails
 - 84.0"H x 20.3"W x 30.0"D, 45 RU

4. Rack-mounted Cable Management – Vertical Managers

- a. Contractor shall size vertical cable managers to represent not more than 25% fill by manufacturer tables based on worst cast density estimates.
- b. Contractor shall use larger vertical cable managers between racks as described elsewhere in this section.
- c. Rack-mounted cable management – vertical managers shall have the following properties:
 - The vertical cable manager shall consist of a metal backbone with cable management fingers that align with EIA rack spacing
 - The fingers shall be molded out of plastic and provide integral bend radius control throughout the entire length.
 - The backbone shall have pass through holes for front to back cabling, with the option to blank off with a plug
 - The manager shall accept a metal, hinged, push-to-close door that can open to the right or left.
 - The door support brackets shall be integrated into the manager with no assembly required

5. Rack-mounted Cable Management – Horizontal Managers

- a. Contractor shall size horizontal cable managers to represent not more than 25% fill by manufacturer tables based on worst cast density estimates.

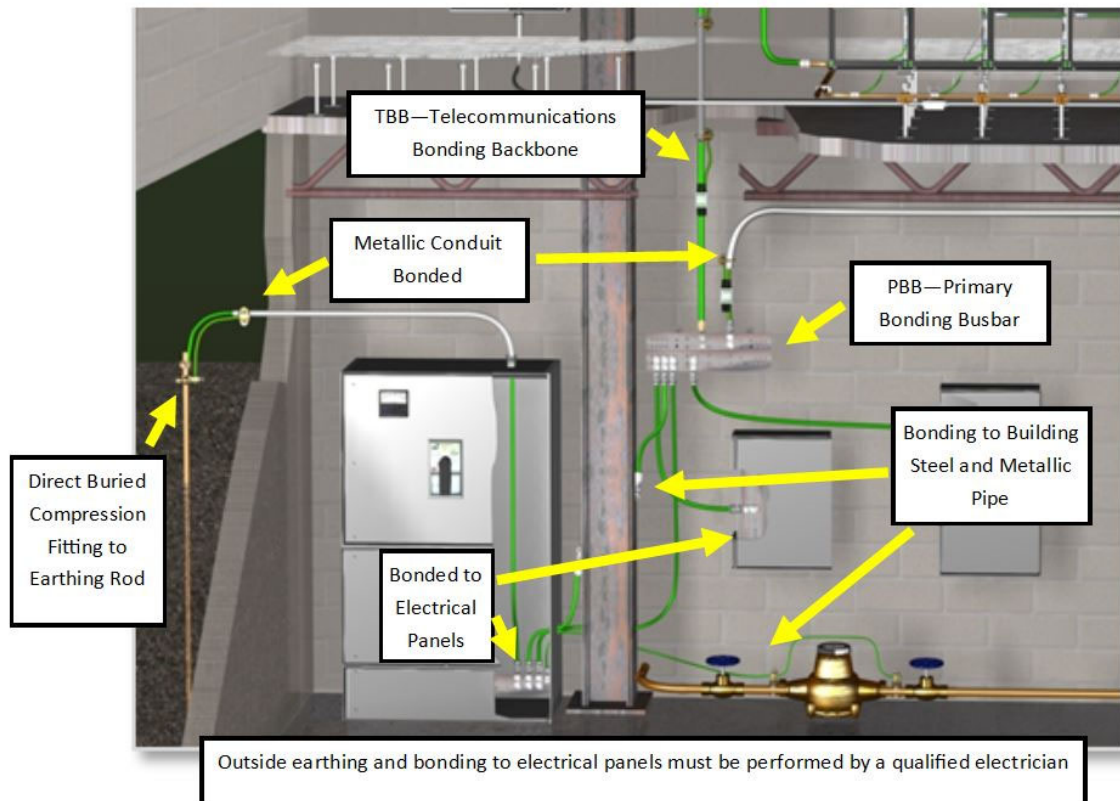


- b. Rack-mounted cable management – horizontal managers shall have the following properties:
 - The high capacity horizontal cable managers shall be capable of managing high performance cable on the front and rear of any 19" EIA rack
 - Inset fingers Fingers slope inward offering greater access to network cabling for easier moves, adds, and changes
 - Available in 1RU, 2RU, 3RU and 4RU

D. Communications Grounding Network

1. See Appendix A for Part Numbers
2. Installation Guidelines
 - a. Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA Standards.
 - b. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the entrance facility or distributor (telecom) rooms shall be grounded to the respective PBB (Primary Bonding Busbar otherwise known as TMGB – Telecommunications Main Grounding Busbar) or SBB (Secondary Bonding Busbar otherwise known as TGB – Telecommunication Grounding Busbar) using a minimum #6 AWG stranded copper bonding conductor and compression connectors.
 - c. Metallic panels attached to the rack or cabinet shall be bonded to the rack or cabinet using a green thread forming screw.
 - d. The copper conductor size shall be upgraded based on the largest power conductor feeding any rack-mount equipment.
 - e. All jacketed wires used for telecommunications grounding purposes should be identified with green or green with yellow stripe insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape.
 - f. All cables and busbars shall be identified and labeled in accordance with the labeling standards cited in the Regulatory References section of this specification.
 - g. The TBB (Telecommunications Bonding Backbone) shall adhere to the recommendations of the ANSI/TIA grounding and bonding standards cited in the Regulatory References section of this document and shall be installed in accordance with cited standards and best industry practices.
 - h. Installation and termination of the main bonding conductor to the building service entrance ground shall be performed by a licensed electrical contractor.
3. Entrance Room

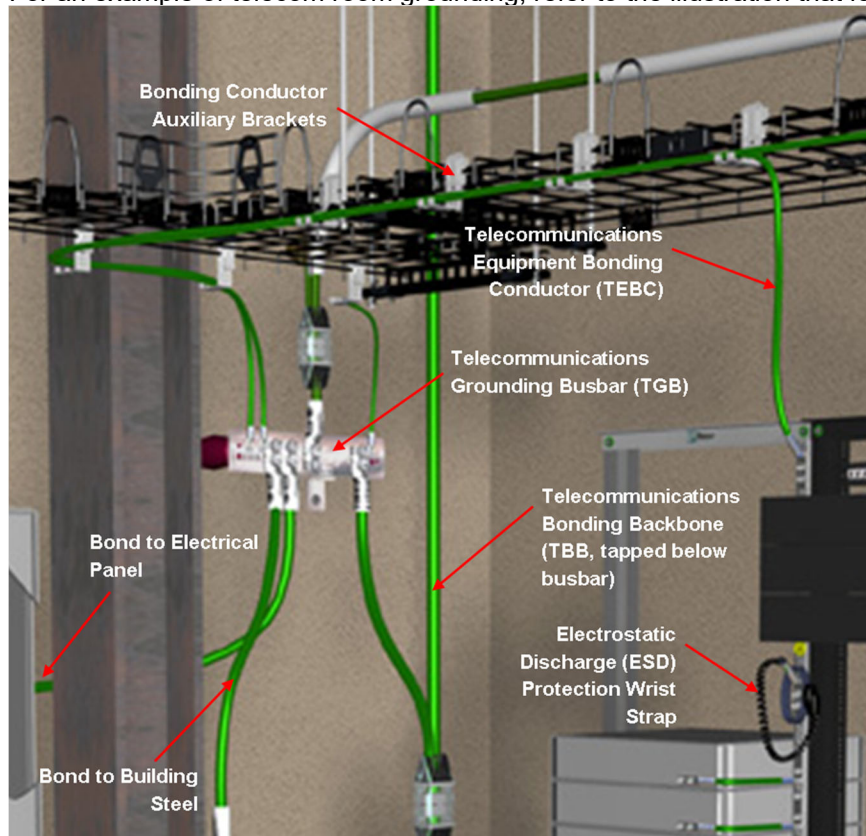
- a. The following figure illustrates the grounding in an Entrance Room.



4. Distributor (Telecommunications) Rooms

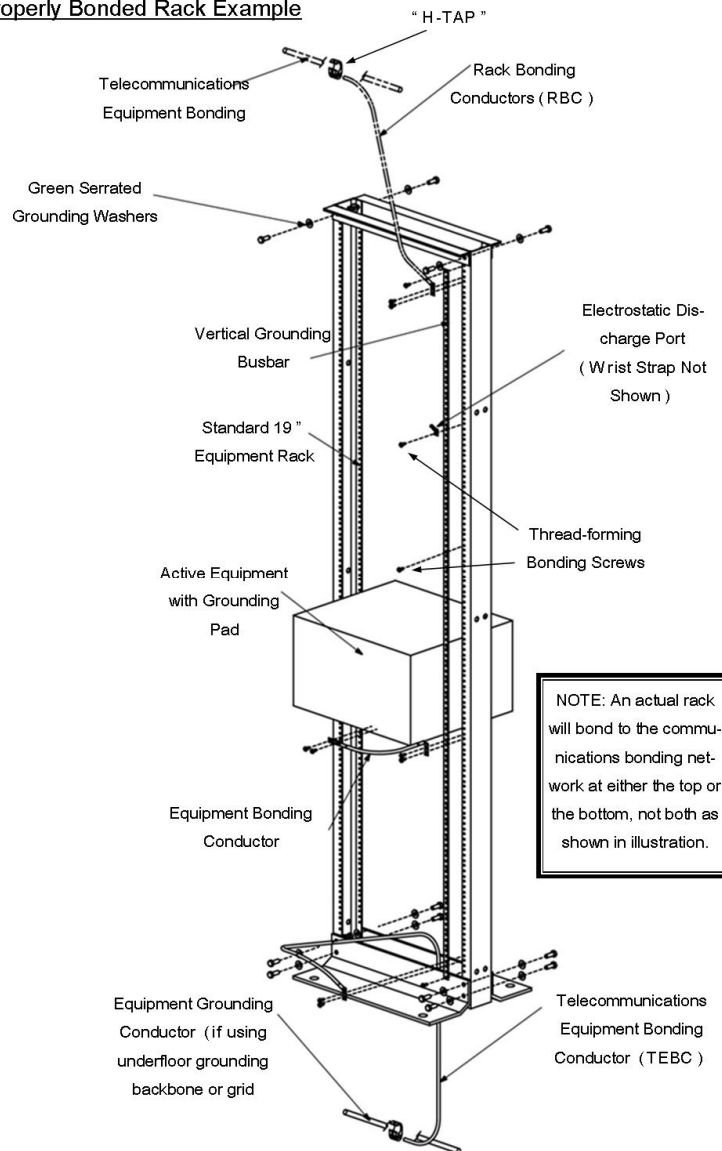
- Within the telecommunications rooms and data centers all pathways and racks shall be grounded and bonded as indicated in the diagram below.
- Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding them to the wall mounted busbars as described in the TIA 607 series of standards.
- All newly installed racks and cabinets shall have installed a Panduit vertical strip mounted along one equipment rail to serve as a clean, low-resistance bonding place for equipment grounding jumpers used to bond equipment such as chassis switches, that come equipped with a designated grounding pad, back to the rack.
- Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.
- Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.

- f. Contractor shall take care to clean (wire brush, Scotch Brite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.
- g. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.
- h. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.
- i. Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.
- j. A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets these ESC ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.
- k. Armored cables shall be properly bonded to the earthing system on both ends with a kit built to that purpose.
- l. For an example of telecom room grounding, refer to the illustration that follows:

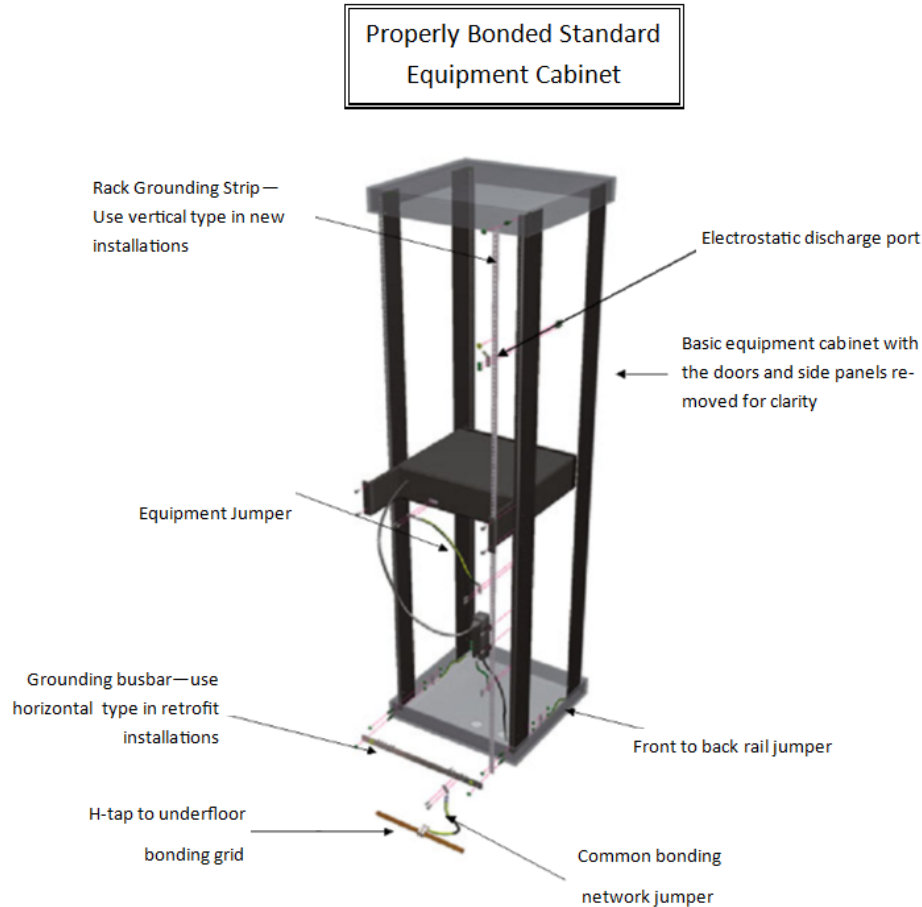


- m. For an example of proper rack grounding, see the illustration below:

Properly Bonded Rack Example



- n. For an example of proper cabinet grounding, see the illustration below:



E. Network Infrastructure Labeling

1. See Appendix A for Part Numbers
2. Installation Guidelines
 - a. Questions or comments regarding labeling strategies at Peel Regional Police may be sent to Brad Masterson C.E.T. at Peel Regional Police.
 - b. Contractor shall, wherever possible, pre-print labels using Panduit Easy-Mark software and desktop printer.
 - c. The Panduit PanTher LS8E (or equivalent) hand-held thermal transfer printer shall be used onsite to print labels that were unanticipated, or that become damaged in application.
 - d. Labels shall be legible and placed in a position that insures ease of visibility.
 - e. All newly installed cables shall be labeled within 3 inches at both ends using a permanent self-laminating cable labels built to that purpose and designed to outlast the cable to which they attach.



- f. Contractor is responsible for ordering the correct self-laminating cable labels appropriate to the cable outer diameter.
- g. Each end of the cable shall have the same label.
- h. The same identifier shall be contained in one line and repeated to be visible from all sides without having to rotate the cable to read it.
- i. All labels shall be machine printed, bold font and centered at the highest point that can fit all characters legibly. Hand written labels will not be accepted and shall be remedied at Contractor's expense.
- j. This labeling strategy shall, at a minimum, clearly identify all components of the system: racks, cables, panels and outlets, grounding, pathways and spaces like telecommunications rooms.
- k. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure.
- l. All test documents shall accurately reflect the labeling scheme.
- m. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.
- n. Machine-generated labels shall be installed behind the clear lens or cover on any device that provides such an option.
- o. All labels will be permanently affixed to installed cables, patch panels, racks, cabinets, and enclosures.
- p. Conduit shall be marked indicating the identification of the cable within.
- q. Consult project specific documentation for the labeling scheme for a particular project.

3. Communication and Systems Elements Requiring Labeling

- a. The following communications elements shall be labeled:
 - Equipment outlets – faceplates
 - Equipment outlets – surface boxes
 - Copper horizontal cable
 - Copper patch panels
 - Communications patch cords
 - Zone boxes (MUTOAs or consolidation points)
 - Equipment racks
 - Communications cabinets
 - Telecommunications rooms – (closets)
 - Fiber backbone cable
 - Fiber enclosures
 - Fiber optic patch cords (jumpers)

4. Other Systems Requiring Labeling

- a. The following systems shall be labeled:
 - Communications conduit and pathways
 - Firestopping locations
 - Grounding busbars
 - Grounding backbone

5. Labeling Records

- a. Contractor shall provide a spreadsheet showing link records that list all labeled elements, including jack numbers, patch ports and telecom space identifiers.
- b. All labeling information shall be recorded on the as-built drawings, and cross-reference sheets as described in project documentation.

F. Cabling Accessories

1. Refer to Appendix A for Part Numbers

2. Physical Security Devices

- a. Some portions of Peel Regional Police networks require additional physical security devices. These take three forms:
 - Devices that block-out copper and fiber ports in patch fields and faceplates that require a special tool for removal.
 - Devices that lock-in copper patch cords and require a special tool for removal of those patch cords.
 - Devices that temporarily or permanently block USB ports on laptops and computers.
- b. Areas where such devices are required will be called out in the project documentation.

G. Rack Power Distribution Units

1. Vertical Intelligent Power Distribution Unit

a. Plug Type

- i. NEMA L21-30P

b. Receptacle Type

- i. IEC C13, IEC C19, NEMA 5-20R

c. Plug & Play Sensors:



- i. Digital sensors not only allow for multiple sensors on the same bus; but also identify themselves to the controller to simplify setup & commissioning.
- d. Operating Temperature:
 - i. 60°C ambient at full load for operational reliability in high temperature areas
- e. 1GB Ethernet:
 - i. The 1G controller is compatible with the new Data Center Network switches being deployed - reducing special network configurations/resources required to support the iPDU

<END OF SECTION>

III. Testing and Acceptance

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.
2. All copper pairs or optical fibers of each installed cable shall be tested and verified prior to system acceptance.
3. Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.
4. All cables shall be tested in accordance with this document, the ANSI/TIA Standards, the Panduit warranty guidelines, and industry best practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Channel Testing

1. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA for the appropriate Category of cabling installed using a test unit meeting a minimum IEC IIIe level of accuracy.
2. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is more stringent.
3. Contractor shall set references according to manufacturer's recommendation prior to each day's testing and reset references anytime the tester unit shuts down due to inactivity.
4. Resetting references shall also be done whenever test results become sporadic or the tester demonstrates a consistent deterioration of test measurement performance.
5. Testing of any links that include field-terminated plugs shall follow the procedure outlined in Panduit document #PN614, available from the Panduit representative, or downloadable from www.panduit.com.

C. Fiber Testing

1. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA standards cited in this document.
2. For horizontal cabling system using multimode optical fiber, attenuation should be measured in at least one direction, according to customer requirements, at either 850 nm (nanometer) or 1300 nm using an appropriate light source and power meter.
3. Fiber testing must be performed using reference grade test leads. Test results from tests using test leads that are not reference grade will not be accepted and must be retested at the Contractor's expense.

4. Backbone multimode fiber cabling should be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.
5. Test set-up and performance shall be conducted in accordance the Method B (One Jumper Method).
6. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. Only basic link loss testing (OLTS) is required, not OTDR testing. OTDR testing is optional as a secondary test method but, by itself, is not a valid means by which links or channels can be certified.
7. The contractor can optionally install Panduit patch cords to complete the circuit and then test the entire channel, though Panduit currently issues only a link warranty, not a channel warranty. The test method shall be the same used for the test described above.
8. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.
9. Qualification of the reference cords shall be completed after each reference and the insertion loss of the reference connectors shall be saved and presented as part of the testing documentation.
10. Panduit highly recommends utilizing the practice of individual end face inspection, cleaning if necessary then re-inspection before connecting any fiber end faces together in a link. This complete process should be performed BEFORE any OLTS testing takes place. For further process clarification, refer to Panduit Visual Inspection and Cleaning Best Practices #FS061.
11. Contractor shall further inspect, clean and re-inspect the Reference Lead connector end faces anytime testing shows inconsistent results. If this does not correct accuracy, contractor shall re-certify (test) the reference leads and replace them if necessary.

D. System Documentation

1. Documentation During Installation Phases
 - a. Peel Regional Police will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information and returned to Peel Regional Police.
 - b. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. The Contractor shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form.
 - c. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

- d. It is mandatory that the test results from each phase be delivered in the tester native format. At the request of the Peel Regional Police project lead, the telecommunications contractor shall provide copies of the original test results.
- e. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided.

2. Documentation at Project Completion

- a. A final, complete set of all documentation shall be provided in electronic format within three weeks after the completion of the project.
 - b. The testing results shall also be provided to Panduit in raw data format (native tester format), along with all associated warranty paperwork for evaluation and issuance of warranty.
 - c. All documentation shall be clearly marked with the words "Project Test Documentation" plus the project name, and the date of completion.
 - d. The test documentation shall detail the test methods used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
 - e. The test results shall further include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s).
 - f. The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document.
3. Unless the manufacturer specifies a more frequent calibration cycle, an annual factory calibration is mandatory on all test equipment used for the installation.
4. The project lead from Peel Regional Police may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above.
5. If retest findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Project Lead, including a 100% re-test. This re-test shall be at no additional cost to Peel Regional Police.

E. Inspection and Acceptance

1. During Installation

- a. The Peel Regional Police Project Lead will make periodic inspection of the project in progress.
- b. One inspection will be performed at the conclusion of cable pulling, prior to closing of the drop ceiling, to inspect the method of cable routing and support, and the firestopping of penetrations.

- c. A second inspection will be performed at completion of cable termination to validate that cables were dressed and terminated in accordance with ANSI/TIA recommendations for jacket removal and pair untwist, compliance with Manufacturer's minimum bend radius, and that cable ends are dressed neatly and orderly.

2. Final Inspection

- a. Upon completion of the project, the Peel Regional Police Project Lead will perform a final inspection of the installed cabling system with the Contractor's project foreman.
- b. The final inspection will be performed to validate that all horizontal and backbone cables were installed as defined in the drawing package, and that the installation meets the technical performance and aesthetic expectations of the Peel Regional Police.

3. Live System Performance Verification

- a. During the three-week period between final inspection and delivery of the test and as-built documentation, Peel Regional Police will activate and validate operation of the cabling system.

4. Final Acceptance

- a. Final acceptance is possible after completion of the installation, in-progress and final inspections, receipt of the test results, receipt of the as-built documentation, and receipt of the manufacturer's system performance warranty and successful performance of the system for a three-week period.
- b. Acceptance of the installed system by Peel Regional Police must be in writing to be valid

F. Post Installation Maintenance Agreement

- 1. The Contractor shall furnish an hourly rate with the proposal submittal which shall be valid for a period of one year from the date of acceptance.
- 2. This rate will be used when cabling support is required to do moves, adds, and changes (MACs) to the system.
- 3. MACs shall not void the Contractor's nor Manufacturer's warranty.



IV. Project Scope of work

A. Scope of Work

Here place general synopsis for scope of work

1. Requirements

a. Attribute

b. Attribute

<END OF SECTION>



V. Appendix A – Materials List

Product Category	Part Number	Manufacturer	Part Description
Copper Cabling Products			
	PUP6C04BU-F	Panduit	Category 6 copper cable, 4-pair, 23AWG, U/UTP, CMP, Blue 1000 feet in a carton.
	CJ688TGBU	Panduit	The Category 6, RJ45, 8-position, 8-wire, UTP Mini-Com® universal jack module has TG-style termination and is blue
	CJ688TGYL	Panduit	Category 6, RJ45, 8-position, 8-wire universal module. Yellow.
	CFG2WH	Panduit	Mini Com rectangular adapter, mounts behind standard GFCI faceplates, accepts two Mini-Com® Module, White.
	CBX2WH-AY	Panduit	Mini-Com® surface mount box accepts two Mini-Com® Modules. Includes built-in removable blank. Supplied with mounting screws, adhesive backing and cable tie. White.
	CPPL48WBLY	Panduit	Mini Com 48-port modular patch panel with faceplates in black, with label and label covers, (2RU).
	CPPL24WBLY	Panduit	Mini Com 24-port modular patch panel with faceplates in black, with label and label covers, (1RU).
	UTPSP10BUY	Panduit	Category 6, UTP patch cord with TX6™ PLUS Modular Plugs on each end, 10 ft. Work Station
	UTP28SP7BU	Panduit	Category 6 Performance, 28 AWG UTP patch cord with TX6™ Modular Plugs on each end. Blue, 7 ft. Telecom room
	UTPSP1YLY	Panduit	Category 6, UTP patch cord with TX6™ PLUS Modular Plugs on each end. Yellow, 1 ft. Security camera
	UTP28SP7YL	Panduit	Category 6 Performance, 28 AWG UTP patch cord with TX6™ Modular Plugs on each end. Yellow, 7 ft. Telecom room
Fiber Cabling Products			
	FSDP912Y	Panduit	9um OS2 12 Fiber Indoor Distribution Cable, Plenum (OFNP), 900um Buffered Fibers



Product Category	Part Number	Manufacturer	Part Description
	FRME1U	Panduit	Rack Mount Fiber Enclosure ensures network reliability by housing, organizing, managing and protecting up to 72 fiber optic cable, terminations, splices, connectors and patch cords using up to 3 FAP or FMP adapter panels or FOSM splice modules.
	FAP6WBUDLCZ	Panduit	LC OS1/OS2 FAP loaded with six LC duplex singlemode fiber optic adapters (Blue) with zirconia ceramic split sleeves.
	FLCSSCBUY	Panduit	Pre-Polished LC Simplex OptiCam Style OS2 Connector, Natural Housing with 900um Blue Boot
	F92ERLNLNSNM003	Panduit	OS2 Singlemode Riser (OFNR) LC Duplex patch cord
Racks, Cabinets, and Cable Management			
	R2P	Panduit	The Panduit Two-post Rack System provides a reliable foundation for mounting telecommunication and data center equipment. Aluminum, 45 RU, #12-24 Threaded Mounting Holes, Black, 1pc + hardware kit and paint piercing bonding kit.
	PR2VFD06	Panduit	Patchrunner® 2 Vertical Cable Manager combines high-density capability and versatility, freeing up valuable floor space. The fully pre-assembled manager lowers overall costs and sets the standard for the entire cable management industry. Single-sided, Steel, 45RU, Black, 1pc, Includes one full-length metal, dual-hinging, push-to-close door.
		Panduit	
		Panduit	
Bonding and Grounding			
	RGRB19U	Panduit	Grounding busbar, 19" (483mm) length, tin-plated, twenty holes arranged for flexibility in mounting with twenty #12-24 x 1/2" hex head screws installed, mounting hole sets have 5/8" (15.9mm) spacing, provided with two each #12-24 x 1/2", M6 x 12mm thread-forming screws, and two #12 flat washers for mounting.
	RGTBSG-C	Panduit	Green thread-forming bonding screw, #12-24 x 1/2".



Product Category	Part Number	Manufacturer	Part Description
	RGCBNJ660P22	Panduit	#6 AWG (16mm ²) jumper, 60 (1.52m) length, 45° bent lug on grounding strip side, provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2, M6 x 12mm, #10-32 x 1/2 and M5 x 12mm thread-forming screws and a copper compression HTAP
Network Labeling			
	Labels	Panduit	See Panduit web site for options click here
Rack Power Distribution Unit			
	P30D02M	Panduit	SmartZone™ G5 Monitored Input (MI Series) Rack PDU, 30 A 3-Phase, 120/208V, (18) C13, (6) C19 and (6) 5-20R receptacles, NEMA L21-30P plug and measures 68.898"L x 2.047"W x 2.1"D (1750.1mm x 50.8mm x 53.3mm). Color: Black

<END OF APPENDIX A>

<END OF DOCUMENT>