



City of Ontario Communications Infrastructure Planning and Design Performance Standards

5/24/2024

SECTION 1 GENERAL REQUIREMENTS

1.01 Objective

- A. The purpose of this performance standards document is to enable consistency in planning, design, and installation of structured cabling systems for the City of Ontario facilities. Having consistent infrastructure at all our facilities that meet our goals and objectives for bandwidth, capacity and scalability is critical to the Information Technology Agency's strategic plan to support the mission of the City.
- B. The City of Ontario will own the facilities being developed for their entire life cycle. They must provide an appropriate setting for their respective business purpose for decades. These facilities need to be built to minimize the total cost of ownership, and not simply the lowest initial cost.
- C. Design and installation of industry standard high-performance cabling systems and technologies during building construction or renovation is significantly more cost-effective and less disruptive than after the building is occupied. The City of Ontario buildings undergo many changes during their lifetime. The flexibility to incorporate change needs to be built into the project.
- D. Telecommunications design for renovation and new construction projects must be founded on standards-based principals and on an infrastructure distribution plan that will support changes and upgrades over the life of the facility. Program needs, space assignments, and the need for leading-edge technology environments and services drive renovation and reconfiguration needs. Information and communications technology (ICT) systems should be designed for efficient operation and configured to be accessible for maintenance with minimal disturbance to occupied spaces.
- E. This specification document will define the systems, products, installation practices and warranty support required of all Information Technology Structured Cabling Systems. This document is to provide guidelines to all Architects, Engineers, Consultants, Contractors, and Project Managers pertaining to the construction design, review, comments, and approval procedures for ICT infrastructure as required by the City of Ontario Information Technology (IT) Agency.
- F. The Performance Standards are to be used for development of communications specifications for Contract Documents. The Design Professional shall be responsible for assuring the specifications are compatible with the overall design and are coordinated with all other sections.
- G. Product specifications, general design considerations, and installation guidelines are provided in this written document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types for a specified City of Ontario facility will be provided as a separate submission for each specific project.
- H. The City of Ontario Information Technology Agency shall review all technology designs at Schematic Design (SD), Design Development (DD) and Construction Documentation (CD) to ensure facilities will meet the City of Ontario IT Agency goals and objectives. All submittals for the IT Systems must be approved by the City of Ontario Information Technology Agency prior to procurement of materials and any work commencing – these reviews include but not limited to:

1. A responsibility matrix provided by the contracted firm shall be reviewed and agreed upon by the City of Ontario IT and stakeholders.
2. All product datasheet submittals affecting the Technology Systems.
3. Value Engineering (VE) Proposals affecting the Telecommunications Structured Cabling System (SCS).
4. Any RFI or change to the agreed project design affecting the SCS. Any product substitutions must be approved prior to install.
5. Conduit/tray fill calculations need to be submitted to the City of Ontario IT Agency to confirm fill ratios prior to ordering.
6. Shop drawings of Telecommunications Spaces including dimensions, elevation drawings, wall/rack mounting details, and TR (Telecommunication Room) layouts.
 - a. Backbone and Horizontal Pathways
 - b. Bonding and Grounding Riser Diagrams
7. Labeling scheme details that meet the City of Ontario IT requirements and telecom room signage. All labeling details for faceplates, patch panels, surface mount boxes, etc. must be submitted for approval.
8. Any product substitutions that may affect SCS system warranties.
9. Proof of all design and installer certifications from BICSI (RCDD, OSP, DCDC, RTPM, INST1, INSTC, INSTF, TECH), Leviton Authorized Installers and other manufacturer's that may be working on the SCS for the City of Ontario as detailed further in this performance specification.
10. The design architect/engineer must provide a summary sheet detailing the telecom cable quantity schedule for the project. The schedule should include information such as telecom outlet counts, jack counts, cable types, device types, etc. Information should be listed by level and floor serving TR.

1.02 KEY CONTACTS

A. Client Contacts

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2. Jerrod Lee, IT Manager at City of Ontario, jlee@ontarioca.gov

B. Leviton Contacts

1. John Cleary, Partner, WestCal Technologies, jcleary@westcaltech.com, M 909-717-7461
2. Larry Gillen, Leviton Network Solutions, Specification Engineer, larry.gillen@leviton.com, M 909-202-2031

1.03 CODES AND STANDARDS COMPLIANCE

- A. All materials shall comply with the applicable sections of all Local building codes, fire safety codes, amendments, and ordinances for installation of telecommunications cabling.
- B. All materials shall comply with the applicable sections of the following Codes for installation of telecommunications cabling:
 - 1. California Building Code
 - 2. National Electrical Code – NFPA 70 (NEC)
 - 3. National Fire Alarm and Signaling Code – NFPA 72
 - 4. Federal Communications Commission (FCC) Part 15 and Part 68
 - 5. National and Local Codes, amendments, and ordinances.
- C. All materials and installation practices shall comply with the most current version of the applicable sections of the following Telecommunications Industry Standards and Manuals as appropriate.
- D. Telecommunication Industry Association (TIA)
 - 1. ANSI/TIA-568.0-E Generic Telecommunications Cabling for Customer Premises
 - 2. ANSI/TIA-568.1-E Commercial Building Telecommunications Cabling Standard
 - 3. ANSI/TIA-568.2-D Balanced Twisted-Pair Telecommunications Cabling and Components Standards
 - 4. ANSI/TIA-568.3-E Optical Fiber Cabling and Components Standard
 - 5. ANSI/TIA-568.4-E Coaxial Components
 - 6. ANSI/TIA-569-E, Telecommunications Pathways and Spaces.
 - 7. ANSI/TIA-526-7-A, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 - 8. ANSI/TIA-526-14-D, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 - 9. ANSI/TIA-606-D, Administration Standard for Commercial Telecommunications Infrastructure.
 - 10. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
 - 11. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard
 - 12. ANSI/TIA TSB-162-B Telecommunications Cabling Guidelines for Wireless Access Points
 - 13. ANSI/TIA-862-B, Structured Cabling Infrastructure Standard for Intelligent Building Systems
 - 14. ANSI/TIA-942-B, Data Center Cabling
 - 15. ANSI/TIA-5017, Telecommunications Physical Network Security Standard
 - 16. ANSI/TIA TSB-162-B Telecommunications Cabling Guidelines for Wireless Access Points
 - 17. ANSI/TIA-1152-A, Requirements for Field Test Instruments and Measurements for Balanced Twisted Pair Cabling

18. TIA TSB-184-A Power Delivery (4-pair)
- E. BICSI
1. Telecommunications Distribution Methods Manual (TDMM), 15th Edition
 2. Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition
 3. Outside Plant Design Reference Manual (OSPDRM), 6th Edition
 4. ANSI/BICSI 002-2019- Data Center Design and Implementation Best Practices
 5. ANSI/BICSI 007-2020: Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises
 6. ANSI/BICSI 008-2018: Wireless Local Area Network (WLAN) Systems Design and Implementation Best Practices
 7. ANSI/BICSI N1-2019: Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure
 8. ANSI/BICSI N2-2017: Practices for the Installation of Telecommunications and ICT Cabling Intended to Support Remote Power Applications
 9. ANSI/BICSI N3-2020: Planning and Installation Methods for the Bonding and Grounding of Telecommunication and ICT Systems and Infrastructure
- F. This document does not replace any Code, local or otherwise. The contractor must be aware of local Codes that may impact this project. It shall be the responsibility of the installing contractor to verify the applicable code version for all work performed with the authority having jurisdiction (AHJ).
- G. All work shall comply with the latest revision of the codes, regulations or standards. When conflict exists between local or national codes, regulations or standards, the most stringent codes, regulations or standards shall be followed.
- H. CONFLICTS:
1. Drawings and specifications are to be used in conjunction with one another and to supplement one another. In general, the specifications determine the nature and quality of the materials and tests to give characteristics of performance that should be adhered to in the installation of the communications system components, the drawings establish the quantities and details of installation.
 2. If there is an apparent conflict between the drawings and specifications, between specification sections, or between the City of Ontario Standards, the Contractor and City of Ontario representative shall jointly resolve any work that is in apparent conflict with applicable codes.
 3. Clarification with the City of Ontario IT Agency Representative about these items shall be made prior to ordering and installation of components.
 4. All materials, installation and workmanship shall comply with the most recently approved applicable reference standards and codes addressed within each specification document.

1.04 CONTRACTOR QUALIFICATIONS

- A. The Contractor shall be a company specializing in the installation of Telecommunications Structured Cabling Systems.
- B. The Contractor shall have total responsibility for the coordination and installation of the work shown and described in the Drawings and these Specifications.
- C. The Contractor shall demonstrate the following qualification requirements:
 - 1. Demonstrate that they have a minimum of 5 years experience installing structured cabling for telecommunications.
 - 2. Reference list of at least 5 previous successful projects of this scope, size and nature; including names and location of projects, description of work, time of completion and names of contact persons for reference.
 - 3. Demonstrate that they are a current Leviton Network Solutions Manufacturer Certified Contractor.
 - 4. Installers/technicians working on this project will be able to produce documentation from the Leviton Network Solutions indicating that they have successfully completed the appropriate Copper and Optical Fiber Communications Cabling System training courses.
 - 5. The Contractor must have a current BICSI certified Registered Communications Distribution Designer (RCDD) on staff as a full-time employee – copy of RCDD certificate required. It is the Owner's discretion, on a project by project basis, an RCDD consultant may be hired by the Owner to inspect work during and after completion. Based upon inspection by Owner's hired RCDD consultant or IT Staff the Contractor will be responsible for correcting any work that does not meet requirements detailed in this document.
 - 6. The Contractor must have a supervisor on premises with the authority to act for the Contractor. The supervisor must be a current Leviton Network Solutions Certified Installer. Copy of certificate required.
- D. Bidding Contractor shall be licensed to install telecommunications systems in the locale where work will be performed.
- E. Bidding Contractor shall be able to provide insurance in the types and values requested by the owner.
- F. Bidding Contractor shall be able to procure bonding in the type and values as required by the owner.

1.05 QUALITY ASSURANCE

- A. The specifications contained herein are set forth as the minimum acceptable requirements of the Contractor's Quality Assurance Program. The Contractor is responsible for executing any other Quality Assurance measures necessary to ensure complete and fully functioning systems within the scope of this project.

1.06 ADMINISTRATIVE REQUIREMENTS

A. SCHEDULING AND COORDINATION WITH OTHER TRADES

- 1. The Contractor shall coordinate Structured Cabling Systems work with that of other trades as required ensuring that the entire communications work will be carried out in an orderly, complete and coordinated fashion.
- 2. Contractor shall attend project coordination meetings as necessary.

3. Upon contract award Contractor shall provide a detailed construction schedule with hard dates for completion of cable placement, terminations, and testing and submit to Owner's Project Manager for approval.
4. Cabling schedule submittals shall be in a format as designated by the Owner's Project Manager.
5. Inform General Contractor and Owner's Project Manager immediately of any delays or potential delays related to material procurement, delivery or labor related issues.
6. Include premium time required to comply with the project scheduling and phasing.

B. PROJECT MANAGEMENT

1. The Project Manager shall abide by these standards and allow no deviations without the consent of the City of Ontario IT Agency. All consultants shall incorporate this information into the design for all City of Ontario projects.
2. City of Ontario IT Agency and the City of Ontario Police Department shall be involved in the planning and design of all applicable security systems.
3. City of Ontario IT Agency shall be involved in the planning and design of all Audio-Visual systems

C. SITE INVESTIGATION

1. Prior to submitting bids for the project, and where practicable, contractor shall visit the work site to become aware of any conditions that may affect the cost of the project.
2. Contractor shall obtain a complete set of Project Drawings and Specifications for coordination and to determine the full scope of work.
3. The Contractor shall submit the appropriate cabling, connectivity, materials, equipment, enclosures, and all structured cabling components for a complete and operational system for the interior and exterior environmental conditions of the project.

D. TELECOMMUNICATIONS SELECTIVE DEMOLITION

1. Any project requiring demolition of existing systems or protecting in-place existing systems (selective demo) shall develop specifications on procedures for the telecommunications demolition work, specifically applicable to Division 27 sections, coordinated with all other sections and the documentation required for the project.
2. Include all labor, materials, services, equipment, and appliances required for completion of tasks as indicated on the drawings or in the standards or as inherently necessary to prepare spaces and systems for new installations.
3. The Contractor shall verify that field measurements and all telecommunications equipment are as shown on the drawings.
4. The Contractor shall verify that abandoned wiring and equipment serves only abandoned telecommunications facilities.
5. The Contractor shall verify that live low-voltage wiring and equipment serves only active telecommunications facilities.

6. The Contractor shall report discrepancies between the drawings and actual field conditions to the Project Manager, City of Ontario IT Agency, and the Engineer of Record before disturbing any existing telecommunications infrastructure.
7. Beginning of demolition means the Contractor accepts existing conditions.
8. Before disruption of the existing telecommunications systems, the Contractor shall prepare and submit for approval a plan to City of Ontario IT Agency and the Engineer of Record identifying all services that may be disrupted by the demolition. This plan shall also include any items or equipment that is to be returned to the City of Ontario.
9. The Contractor shall remove all abandoned and/or obsolete lead cables, copper cables, fiber optic cables, coaxial cables, terminating blocks, and any other equipment deemed by the IT Agency no longer required, unless otherwise noted.

E. PERMITS

1. Contractor shall obtain all permits and required inspections for the installation of this work and pay all charges associated.
2. Deliver to the Owner all certificates, permits and inspection reports issued by authorities having jurisdiction (AHJ).

F. DELIVERY, STORAGE, AND PROTECTION

1. Materials and equipment furnished shall be delivered in new condition and be of current production lots.
2. Contractor shall ensure that material deliveries to work site shall be coordinated with construction manager responsible for materials distribution to all trades. Handle in accordance with Manufacturer's recommendations and instructions to avoid damaging equipment, installed devices and finish.
3. Contractor is responsible for all materials, tools and vehicles left on the job site.
4. Contractor shall coordinate for the removal of all rubbish and packing materials produced by the Contractor's activities during the project.
5. Contractor shall ensure materials are stored according to Manufacturer's recommendations. In addition, materials must be stored in a location protected from vandalism and weather.
6. Inspect and report concealed damage to carrier within specified time.

G. PROJECT CONDITIONS

1. Environmental Requirements
 - a. Contractor shall ensure that any rubbish produced by the structured cabling work is disposed of in accordance with site, local, state or national regulations.
 - b. It is preferred that the Communications Contractor recycle any used or un-used components during the course of the construction project.
2. Telecommunications Bonding and Grounding System
 - a. Contractor shall confirm with electrical engineer on project that a Telecommunications Grounding and Bonding System meeting industry standards has been provided.

- b. All relevant telecommunications equipment installed must be bonded to the Telecommunications Grounding and Bonding System per industry standards and Manufacturers recommendations.

1.07 SUMMARY OF WORK

- A. Examine construction documents to determine the scope and extent of each technology infrastructure project. Technology infrastructure projects may include the following work:
 - 1. Pathways: Backbone, Conduit, Handholes/Pull Boxes/Manholes as shown on drawings.
 - 2. Applicable Service Providers should be provided plans to their engineering group to review for service entrance conduit and equipment mounting requirements.
 - 3. Backboards: $\frac{3}{4}$ " thick x 4' x 8' plywood, treated, flame resistant paint in a white light color. If $\frac{3}{4}$ " fire rated plywood is used, fire-rated stamping should be kept visible but rest of board to be painted to match adjacent surface. Each board shall have its own stamp. Cover as much available wall-to wall space as possible in Main Equipment Rooms and Telecom Rooms.
 - 4. Building entrance protectors, 110 block input/output, with 5-pin protector modules (gas or solid-state) with 26 AWG 18-in fuse link for added protection. As applicable to the project site.
 - 5. Ladder Rack/Cable Tray: A system of ladder rack and/or cable tray shall be installed to bring incoming cables from the conduits and sleeves entering Telecom Rooms to the backboard and to the racks and cabinets that they serve.
 - 6. Enclosures, Equipment Racks and Wire Management: Enclosures and equipment racks to facilitate the mounting of the technology equipment and termination shall be anchored accordingly to the project's respective seismic zone. Wire management, vertical and horizontal, shall be implemented in each project.
 - 7. Conduit, Cable Trays, Sleeves and J-Hooks to distribute the structured cabling system throughout the building.
 - 8. Firestop, smoke, and acoustical ceiling protection system.
 - 9. Inter and Intra Building Cabling: Furnish and install Category 6A rated copper cable, multi-pair copper cable, optical fiber cable (OS2/OM4) and specialty cable for systems such as Electronic Safety and Security (access control, controllers, detectors/sensors, monitoring equipment, recorders/storage, video surveillance (CCTV), Audio Visual Systems (A/V), PoE/IoT Technology devices, life safety, mass notification, paging, cellular, radio and broadband/TV systems (Coaxial systems). All pairs are to be terminated on contractor-provided hardware or City of Ontario IT Agency furnished products as detailed in the construction documents. Review all project specifications and construction documents for the various cabling systems required for a full functional and complete installation.
 - 10. All construction projects shall include assessment of existing outside plant infrastructure and include the expansion of all telecom utilities in all areas and along all routes end-to-end that may currently be at capacity.
 - 11. Work Area Outlets: Furnish and install all copper and fiber optic termination points in walls, ceilings, floor boxes, poke-thrus, office furniture, and other areas as noted on the construction documents.

12. Furnish and install appropriately sized category 6A and fiber optic patch cords in the Equipment/Telecom rooms, at the work area outlets, wireless access points, IP Cameras and other IoT devices.
 13. Furnish and install all splicing and termination materials, frames, plates, cable supports, termination blocks, termination modules, wiring devices, wire management, labeling, and any other accessories or consumables needed for a complete and fully functional technology infrastructure.
 14. Testing: Performance Certification Testing of Twisted-Pair Cables: (Note: Permanent Link Test results are recommended and are the expected norm). Test 100 percent of all cable runs for defects in installation and verify cabling system performance under installed conditions in accordance with most current ANSI/TIA-568 Series, BICSI TDMM, manufacturer's recommendations, and best industry practices.
 15. Operations and Maintenance Manuals to be supplied to the City of Ontario IT Agency for all the Technology systems implemented.
 16. Training: Owner/City of Ontario IT Agency provided training for various installed technology systems for full function and operation as indicated in the Construction Documents.
- B. The Architect, Engineer, Consultant, Project Manager and/or Contractor shall provide City of Ontario IT Agency and the Low Voltage contractor a location no smaller than 10' x 8' Telecommunications Room (TR) for IT equipment. Physical location, City requirements and/or specific use conditions may easily increase this requirement. Augment the room size as needed for all additional third-party vendors that require space to install other equipment such as Access Control, CCTV Systems, Alarm Systems, Audio Video Systems (A/V) and/or other technology services if the design includes equipment in the same space.
1. An additional telecommunications room must be provided if the floor area to be served exceeds 10,000 square feet.
 2. An additional telecommunications room must be provided if the 295-foot (90m) cable maximum distance is exceeded on a particular floor.
 3. Multi-Story buildings shall have telecom rooms (TR's) stacked one above the other.
 4. Multiple TRs on the same floor shall be interconnected with a minimum 4" conduit or equivalent pathway. See drawings for pathway specifications.
 5. Telecommunication rooms should be centrally located and planned average distance 250 feet or less.
- C. The Architect, engineer, consultant, contractor, and/or project manager shall involve City of Ontario IT Agency in the programming of telecom outlet locations during the planning and design phases of the project.
- D. Site and floor plans of the property shall be provided to City of Ontario IT Agency for mark-up of the required wiring locations prior to walls being closed and to coordinate with the Low Voltage contractor that installs and terminates the network cabling.
- E. City of Ontario IT Agency shall conduct progress site assessments during construction and utilize a Quality Inspection Report for all Telecom Rooms, Telecom Enclosures, Pathways & Spaces, Work Areas Horizontal (copper/fiber optic cables), and Backbone (copper/fiber optic) installations. See City of Ontario IT Agency Quality Inspection Report template for more details in Section 3 of this document.

1.08 SUBMITTAL REQUIREMENTS

- A. Contractor shall submit with bid for approval, specification sheets for all products to be furnished. Work shall not proceed without the Owner and/or the Project Manager's approval of the submitted items.
 - 1. Contractor shall submit an accurate Bill of Materials (BOM) to ensure the correct quantities and products are acquired and delivered for each construction project.
 - 2. Contractors wishing to approve a structured cabling solution or other products other than those specified in this document will be required to perform the following:
 - a. Provide system performance specifications, data sheets for each individual product and specification section being addressed for all components for the new proposed solution/systems and/or products.
 - b. Provide an itemized comparison to each of the solution/system functions as described in this specification. Include in the document how the proposed system compares to the specified system described in this document on a line by line basis, using one of the following three criteria:
 - 1. "Exceeds"
 - 2. "Equal"
 - 3. "Unequal"
 - c. All products specifically addressed in the bid documents that the Contractor is seeking approval for substitution must be received by the Owner and/or Owner's Representative for evaluation no later than 15 business days prior to bid date. All Owner approved equals will be published in addendum prior to the bid date.
 - d. All proposed documentation must be sent to the Owner and/or Owner's Representative for evaluation.
- B. In addition to individual product specification sheets Contractor shall submit Manufacturers Systems Data Sheets detailing overall systems performance.
- C. Any materials and equipment submitted that are not in accordance with this specification may be rejected.
 - 1. Failure to receive written approval for products installed that deviate from the performance specifications and/or drawings will result in the Contractor replacing the unapproved materials and equipment with the originally specified products at no additional cost to the Owner.
- D. Successful contractor shall generate shop drawings for approval prior to commencement of work. Shop drawings shall include cable routes, conduit penetration locations, elevation drawings of equipment racks, patch panels, termination blocks, connection details, rack mounting details and other relevant details not included in the project drawings.
- E. Upon completion of project, the contractor shall modify initially reviewed and accepted shop drawings to include revisions based upon change orders and approved field conditions and submit a final drawing as an as-built submittal.

1.09 END-TO-END SYSTEMS REQUIREMENT

- A. All cables, connectors, patch panels, and patch cords provided must be manufactured by a single company to provide for a complete end-to-end solution. Mixed manufacturer

solutions will not be accepted. High pair count copper cable is excluded from this requirement.

1.10 WARRANTY

- A. Contractor warrants to the end-user that their installation practices and workmanship will adhere to all standards and Manufacturers requirements. Contractor shall fix or repair any installation faults at their own cost. Should a defect or problem occur with any Manufacturers product the item(s) will be replaced by the certified contractor or a contractor approved by Manufacturer to perform warranty repair work.
- B. A Leviton Limited Lifetime Product and Performance Warranty shall be obtained by the Contractor on behalf of the Owner covering all applicable structured cabling components of the installed system. It is the responsibility of the contractor to provide all forms/documents necessary to obtain the system warranty. Evidence of such warranty will be provided by Contractor as part of their contractual obligation and final retainage payments are contingent upon delivery to Owner of Manufacturer's site warranty certificate.
- C. System performance margin guarantees must be representative of the specific components and topologies listed in this document.
- D. The Low Voltage Contractor is responsible for documenting workmanship that adheres to the Standards and Manufacturer requirements to ensure that other Trades have not compromised their installation.

1.11 BACKBONE CABLING

- A. A minimum of 24 Strands OS2 single-mode fiber optic cable shall be installed for LAN backbone applications. See specific site requirements to confirm fiber type and strand count.
- B. Each Telecommunications Room (TR) shall be cabled to the MER with a minimum of 12 Strands of OS2 single mode and 12 Strands OM4 multimode fiber optic cabling.
- C. The fiber optic cable shall be terminated in rackmount fiber optic patching enclosures located in cable racks at there respective TR. Fiber strands shall be terminated with LC duplex connectors mounted into LC duplex shuttered splice modules and shuttered adapter plates installed in the fiber enclosures.
- D. Fiber optic cable terminated in wall mount enclosures must be confirmed with owner prior to ordering and installation.

1.12 HORIZONTAL CABLING

- A. All Wireless Access Points (WAP's), Security Cameras, Access Control devices, etc shall be cabled with a minimum of (2) Category 6A UTP horizontal cables or as indicated on the communications plans.
- B. All Workstations shall be cabled with a minimum of (3) Category 6A UTP horizontal cables or as indicated on the communications plans.
- C. Three horizontal cables terminated onto Category 6A jacks shall be run to each endpoint (faceplate, modular furniture faceplate, surface mount block, ..etc.) unless indicated otherwise in this document and/or on the communication project plans.
- D. All offices must be equipped with a minimum of two telecommunications outlet locations preferably on opposite walls and near electrical outlets.

1. Larger offices and open suite areas should have multiple technology telecommunication outlets at every other electrical outlet.
- E. Modular Furniture Requirements:
 1. Planning, design, and installations shall take into consideration the need to link the modular furniture to the distribution system and support ongoing moves, adds, and changes (MACs).
 2. Modular furniture layouts that conflict with telecommunications outlets and furniture feeds shall include an access panel that provides clear and unobstructed on-going access to the wall where the serving telecom facility is located.
- F. Conference Rooms:
 1. Conference Rooms smaller than 12' by 12' should be equipped with a telecommunications outlet on each wall and at a minimum two video outlets on opposite walls.
 2. Larger Conference Rooms should be equipped with one or more floor outlet boxes that provide power and a minimum of two 1-¼" conduit pathways (one pathway is for connection to the building network and the other for room control equipment).
 3. Separate lighting controls should be provided upon the entry to conference rooms and at the front of the room (presentation area) to provide presenter with task lighting control and an AC power outlet.
- G. Horizontal Cables shall be terminated with their respective Category 6A UTP RJ45 connector modules installed at the appropriate wall-plate or surface mount box (SMB) at the equipment outlet location and in Angled 48-port 2RU, field configurable QuickPort, 19" rack mounted patch panels located in the Telecommunications Room (TR) or Telecommunications Enclosure (TE).
 1. Each floor shall have its own dedicated Angled 48 port field configurable QuickPort patch panel(s) with adequate room for growth within racks or enclosures.
 2. No mixing of floors on the same Angled 48-port field configurable QuickPort patch panels is allowed.
 3. If a TR serves multiple floors, each floor shall have its own dedicated 2-post rack and dedicated patch panels.
- H. Category 6A UTP cable jacket color shall match the RJ45 connector modules. Any deviations shall be approved by City of Ontario IT.
 1. Data Workstations – Blue
 2. Wireless Access Points – Yellow
 3. Security Cameras – White
 4. IOT – Red
- I. Telecommunications signal and power needs and distribution methods must be coordinated with the selected furniture layout.

1.13 AUDIO VISUAL TECHNOLOGY REQUIREMENTS

- A. Coordinate with IT Agency for Audio Visual design requirements for each project.

1.14 ELECTRONIC SAFETY AND PHYSICAL SECURITY REQUIREMENTS

- A. Coordinate with IT Agency and reference the City of Ontario “Physical Security Standards Document” to meet the Electronic Safety and Physical Security requirements to ensure effective surveillance, security, and safety of all premises.
 - 1. The design, implementation and changes shall be approved by and coordinated with the IT Agency.
 - 2. At a minimum, every project shall account for the installation and integration of all security infrastructure including pathways and cable necessary to support the security system as defined in this document and the “Physical Security Standards Document”.
- B. The City of Ontario Electronic Safety and Physical Security Standards are based on the DORI standard for cameras and incorporate the use of Axis cameras for surveillance and HID Signo readers for access control.
- C. All camera systems are managed via Genetec Omnicast, and all access control systems are managed via Genetec Synergis, ensuring seamless operation and advanced functionality.
- D. Compliance with local building codes is essential to ensure safety and regulatory adherence.
- E. Due to the evolving nature of technology, all requirements are subject to change without notice and shall be verified with all parties prior to procurement and installation on all projects.
- F. Physical Security Definitions
 - 1. Detect: Ability to notice something without being able to detail what it is.
 - 2. Observe: Ability to see the activity of interest.
 - 3. Recognize: Ability to distinguish a person or object within a general category.
 - 4. Identify: Ability to clearly identify a person or an object in detail.
- G. General Requirements
 - 1. All security cameras installed must be from Axis Communications, equipped with the latest Axis chipset featuring AI capabilities to ensure compatibility and standardization.
 - a. All Security Camera Locations shall have a single 1-¼ ” conduit, homerun directly to a telecommunications space, cable tray or main cable pathway is required for each safety camera location. Each location shall have a 5S by 3” deep gang box terminating the conduit. The box shall be mounted to support the weight of the camera.
 - b. Affix label to camera housing. Label to match serving telecom outlet label.
 - 2. All access control systems must use HID Signo readers and integrate with the Genetec security system via Synergis Cloud Link G2 to ensure seamless operation and advanced functionality.
 - a. Fully functional system will include card readers, electrified door hardware, door controllers, integrated wired/wireless locks, and a server to audit and control the system.
 - b. Related accessories and system components may include conduit, raceways, cables, back boxes, ID badge, and access cards, alarm contacts,

help buttons, local exit alarm, local door propped alarms, and electrified locking door hardware.

- c. At a minimum, card access systems will include conduit infrastructure and back boxes for perimeter doors and Telecom Rooms for future use.
 - 1. Interior door conduit infrastructure shall be determined during project planning.
 - 2. All planned systems shall be wired.
 - 3. No wireless systems shall be allowed for new construction unless otherwise noted.
 - 4. Minimum pathway requirements shall include conduit from the ceiling space to the center hinge, conduit and back box to card reader location and conduit to the top frame for door contacts.
 - 5. Conduits should be consolidated in ceiling space with an appropriately sized junction box. The junction box should have a min. 1-¼" pathway to the nearest Telecom Room.
- 3. All cameras and access control systems must support high-definition video recording and encrypted communication capabilities for secure data transmission and low-light conditions.
- 4. All installations must comply with local building and safety codes to ensure the integrity and legality of the installation.
- 5. Electronic Safety and Physical Security Equipment should be purchased at the last responsible moment, which is typically during the later stages of Construction. This will avoid choosing part numbers too early in the project and equipment installed at end of life or when newer models are available.

H. Camera Standards

- 1. The total number of surveillance cameras and their locations cannot be finalized until a security analysis has been conducted and approved by the IT Agency and/or Owner's Security Integrator.
- 2. Perimeter Doors
 - a. Location: All entrances/exits around the perimeter.
 - b. DORI Standard: Identify Level
 - c. Description: Cameras must be able to identify individuals clearly. This requires cameras with high resolution, facial recognition capabilities, and adequate frame rates to capture clear images of any individual entering or exiting the premises.
 - d. Installation: Cameras should be mounted at a height that captures face-level imagery, typically between 2.5 to 3 meters.
- 3. Parking Lots
 - a. Location: All parking areas.
 - b. DORI Standard: Recognize Level
 - c. Description: Cameras installed must provide coverage sufficient to recognize individuals and vehicle details. Additionally, all entrances and

exits from the parking area should be equipped with LPR cameras from Flock Safety to monitor and record all vehicle traffic.

d. Installation

1. LPR Cameras: Positioned to capture clear images of license plates on vehicles entering and exiting the parking lots.
2. Non-LPR Cameras: Strategically placed to cover the entire parking lot area, ensuring there are no blind spots. These cameras should be positioned at high vantage points to provide wide coverage and capture activities throughout the parking area. Placement should allow for overlapping fields of view to ensure comprehensive surveillance.

4. Exterior Building Coverage

- a. Location: All exterior sides of the building.
- b. DORI Standard: Recognize Level
- c. Description: Cameras must be capable of providing a continuous and clear view of all exterior building surfaces. The objective is to recognize any unauthorized individuals or activities surrounding the facility. The cameras should be capable of handling varying light conditions and weather.
- d. Installation: Cameras should be mounted to cover every side of the building without blind spots, with special attention to potential entry points and vulnerable areas.

5. Public Interior Areas

- a. Location: All publicly accessible interior areas including lobbies, hallways, and main corridors.
- b. DORI Standard: Identify Level
- c. Description: Cameras in these areas must be capable of clearly identifying individuals. High-resolution cameras with facial recognition capabilities are required to capture detailed images that allow for clear identification of faces and other identifiable markers.
- d. Installation: Cameras should be strategically placed at key points within these areas to ensure comprehensive coverage, particularly in high-traffic zones.

6. Exterior Gathering Locations

- a. Location: Courtyards, gardens, and other designated outdoor gathering areas.
- b. DORI Standard: Observe Level
- c. Description: Cameras should provide a general observation of the area to monitor activities and gather situational awareness. This level allows for the monitoring of crowd movements and behaviors without the need for individual recognition.
- d. Installation: Cameras should be positioned to cover large fields of view, including entrances and central areas where gatherings are likely to occur.

I. Access Control Standards

1. Exterior Building Doors

- a. Door Type: All exterior building doors.
- b. Access Control: HID Signo Readers with Keypads
- c. Description: All exterior building doors should utilize HID Signo readers equipped with keypads to enhance security. These readers offer versatile, powerful technology and advanced security features, suitable for exterior door security.
- d. Additional Components
 1. Door Contact Sensors: Installed to monitor the open/close status of doors.
 2. Request-to-Exit Switches or Sensors: Installed to allow for the safe and secure egress of individuals.
- e. Installation: Ensure that the readers, door contact sensors, and request-to-exit switches or sensors are positioned at an optimal height and location for easy access while maintaining security.

2. Interior Doors (Public to Non-Public Areas)

- a. Door Type: All interior doors leading from public to non-public areas.
- b. Access Control: HID Signo Card Readers
- c. Description: These doors should utilize HID Signo card readers to control access. These readers provide a secure and efficient way to manage entry into restricted areas, ensuring that only authorized personnel can access sensitive locations.
- d. Additional Components
 1. Door Contact Sensors: Installed to monitor the open/close status of doors.
 2. Request-to-Exit Switches or Sensors: Installed to allow for the safe and secure egress of individuals.
- e. Installation: Install readers, door contact sensors, and request-to-exit switches or sensors at appropriate positions to facilitate quick and secure access verification.

J. Installation Requirements

1. Cameras and access control systems must be installed by certified technicians to ensure they meet operational requirements and standards.
2. All installations must comply with local building and safety codes to ensure the integrity and legality of the installation.

K. Adherence to Standards

1. Adherence to these standards is mandatory for all current and future installations of security cameras and access control systems. This will ensure that the surveillance system is effective in identifying potential security threats and in enhancing the overall safety of the premises.

1.15 IN-BUILDING CELLULAR AMPLIFICATION SYSTEM

- A. Coordinate with IT Agency for In-Building Cellular Amplification System design requirements for each project.

1.16 PATHWAYS

- A. Horizontal Pathways and Cable Runway – Telecommunication Rooms: Within the TR's, cable runway shall be mounted both horizontally and vertically to form a continuous runway from all pathways entering the space, to all equipment racks. All cable runway is grounded as specified in ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises and ANSI/BICSI N3-20: Planning and Installation Methods for the Bonding and Grounding of Telecommunications and ICT Systems and Infrastructure.
 - 1. Every TR must provide a minimum of twice the amount of horizontal pathway access as is required to support the initial installation.
 - a. Conduit/cable tray fill calculations need to be submitted to City of Ontario IT Agency to confirm fill ratios during design phases of the project and prior to ordering and install.
 - b. When determining pathway sizing, it is important to note that there is a difference between calculated fill and actual fill. Calculated fill assumes all space is used (i.e. – no space between adjacent cables) and cables are routed perfectly parallel. There is always space between cables and cable lay is typically random along the pathway. For example, a calculated fill ratio of 50% for a cable tray can be expected to fill physically and visually 100% of the entire cable tray due to spaces between cables and random placement.
 - 2. Any outlet separated from the main horizontal support system (such as cable tray) by a fire or smoke partition must have a rated pathway, such as a sleeve that can be fire-stopped after cable is installed or an enclosed conduit or raceway directly from the outlet to the tray side of the partition.
 - 3. Every room must be provided a specific pathway (i.e., sleeve, minimum 4" inside diameter) from the false ceiling area (used to access user jack locations) to the main horizontal distribution pathway (such as the cable tray).
 - 4. Inaccessible ceiling areas, such as lock-in ceiling tiles, drywall, or plaster, shall not be used as a horizontal or backbone cable support system pathway.
 - 5. All station conduits, except as otherwise specified, must be at least 1-¼" diameter.
 - 6. All station conduits are to have no more than 180-degrees of bend before the placement of a pull box.
 - 7. Unless specifically allowed by City of Ontario IT Agency, on a case-by-case basis, non-continuous support (J-Hooks, Bridle Rings, and Saddles) are not allowed in new construction and open ceiling environments.
 - 8. Open ceiling environments require cable tray or conduit, and no j-hooks are allowed.
- B. Horizontal Pathways – Cable Tray & J-Hooks: The main horizontal pathways shall be Cable Tray. Where the cable bundles branch off the main tray, corridor or "main-run", J-Hooks on 3-5' centers may be used in the ceiling, where accessible. J-Hooks may be used for all types of horizontal cabling. J-Hooks are only allowed with small cable bundles (less than 25 cables) in accessible ACT ceilings (drop ceiling, push-out, T-bar, etc.). The intent of the design and build is to not have visible cable in line of site.

1. Where cable tray is placed in open ceiling construction, a solid bottom insert with sides shall be used.
 2. J-Hooks are not allowed in open ceiling construction.
- C. Horizontal Pathways - At a minimum, conduit pathway infrastructure shall be installed for door access control systems with or without a specified access control system.
1. Coordinate specific requirements with City of Ontario IT Agency and Security Representatives.
- D. Horizontal Pathways – Conduit to Backbox: Conduit is used where the cable is permanent or is run in an area that will not be accessible (hard lid). Additionally, conduit is used from inside the wall, from the work area outlet to the cable tray, J-hook bundle, or nearest accessible ceiling. No station conduit is less than 1-¼" diameter unless otherwise specified for a specific application.
1. Division 26 specifications shall match Division 27 specifications for conduit sizing and backboxes for voice and data cables.
 - a. Minimum conduit size is 1-¼" for voice and data cables unless specifically noted otherwise in these documents.
 - b. Minimum backbox size is 5S by 3" deep for all voice and data cables unless specifically noted otherwise in these documents.
 2. All Cat 6/6A runs require a pull string remain in the conduit.
- E. Roof Entrance Pathway - A minimum of two 4" conduits from the roof to the upper TR-Telecommunications Room shall be provided for satellite and other aerial communications services within each building.
- F. All low voltage conduit sleeves shall be a minimum of 4" inside diameter.
1. All other non-IP based low voltage systems shall have their own sleeves and pathways.
 2. All conduits leaving the Telecom Space for other portions of the building shall be fire-stopped after the installation of cable.
- G. Backbone (Inter-building) Conduits: Minimum of four (4) to twelve (12) four-inch conduits are required to feed typical buildings depending upon size and functionality.
1. Pathways must be designed with no more than two (2) ninety (90) degree bends, with a maximum distance between pull boxes of 100 feet.
 2. Pull boxes must be located to provide free and easy access, in straight sections of conduit only (pull boxes should never be used for a right-angle bend) and must be installed to allow cable to pass through from one conduit to another in a direct line.
 - a. Pull boxes must have a length at least eight (8) times the trade-size diameter of the largest conduit.
 3. Entrance conduits should enter the entrance facility space either directly from outside, perpendicular to the outer wall at a level above 8-feet, or through the floor, parallel with the outer wall (keeping the conduit bend radius greater than 48-inches) sloped away from the structure to prevent water intrusion.
 4. Redundant pathways are required into a building where the building will house a law enforcement facility, a campus data center, or serve as a fiber aggregation point.

5. Minimum number of vertical backbone (riser) conduits between TR's is three (3).
 - a. All new buildings require telecommunications pathways from the ground floor TR to the exterior of the building to allow for expansion of outdoor technologies near and around the new facility.
 - b. See construction drawings site plans, floor plans, and drawing details for pathway requirements.
6. All backbone conduits and sleeves must be four inches in diameter.
7. A plenum-rated pathway is required between all telecommunications spaces within a building.
- H. Conduits for Fiber Optics – Inter-building, underground, conduits carrying the fiber optic backbone cables will contain a multi-cell fabric innerduct – furnish and provide three 3x3 Cell MaxCell fabric innerducts shall be available within each 4" Fiber Optic conduit.
 1. All copper and fiber cabling in tunnel systems shall be supported with wall mount cable racking or cable tray. If existing cable racking and tray are at capacity, new cable racking and cable trays shall be provided as part of the project.
- I. All telecom pathways shall be routed in a logical, shortest distance methodology back to the main cable tray or Telecommunications space.
- J. Telecommunications pathways and spaces are to be designed for the life of the building, not for a specific system or technology.

1.17 TELECOMMUNICATION ROOM REQUIREMENTS

- A. The room shall be permanently located and not subject to change due to building alterations.
 1. There shall be a minimum of one Telecommunications Room per floor.
 2. Telecommunications Rooms shall be designed to accommodate a minimum of 50 percent growth in unused rack space beyond the final building user requirements.
- B. The room shall house only equipment directly related to the telecommunications function and its environmental support systems.
- C. Telecommunications Rooms shall not share spaces with MEP, storage, or custodial services.
- D. The room shall be directly accessible from public corridors and spaces, not through another room, and keyed for unrestricted access by IT personnel.
- E. The space allotted shall be dry and free from the threat of flooding. No means of liquid conveyance or condensation of any kind (e.g., water lines, sanitary or roof drainpipes, thermal pipes, water pipes, condensation lines, refrigerant lines, etc.) shall be present in communication rooms or within adjoining walls.
 1. Exception: Fire Sprinklers shall be installed in Telecommunications Rooms per applicable code.
 2. No drains duct, or clean-outs will be permitted.
- F. General contractor shall be responsible for the provisioning of all walls, flooring, ceiling, lighting, HVAC, fire detection and suppression and related general room ready construction.

1. General contractor shall provide for the installation of AC-rated plywood, fire-retardant treated, ¾-inches by 48-inches by 96-inches (19 by 1220 by 2440 mm) for all open wall fields (sound masking, security, and any additional equipment).
2. The floor must be sealed concrete or anti-static floor tile.
 - a. Provide curbs and drains if threat of water intrusion is possible due to location of Telecom Room.

G. Lighting Requirements:

1. Provide adequate and uniform lighting that provides a minimum equivalent of 50 foot-candles when measured 3 ft. above the finished floor level.
2. Minimum distance between the top of the rack and base of the light fixture shall be 12”.
3. The lighting layout shall be coordinated with the equipment layout and overhead cable tray to ensure the lights are not obstructed and proper lighting is provided at the front and rear of equipment racks.
 - a. Light fixtures shall run parallel with racks, in front and behind.
 - b. No light fixtures installed perpendicular to rack shall be permitted in Telecommunications Rooms.
4. Locate light switches near the room entrance.
5. Emergency lighting should be provided for the space, either operating on trickle-charge storage batteries or emergency generator.
6. Power for the lighting should not come from the same circuits as power for the telecommunications equipment.

H. HVAC Requirements:

1. HVAC system shall be operational 24 hours, 7 days per week, 365 days of the year with any maintenance coordinated with City of Ontario IT Agency. A minimum of one air change per hour shall be provided.
2. HVAC system shall be on emergency back-up power where available.
3. HVAC system shall maintain a temperature between 64- and 75-degrees Fahrenheit. 42 degrees Fahrenheit DP to 59° F DP and 60% RH.
4. A positive pressure differential with respect to surrounding areas should be provided.
5. HVAC sensors should be located 5’ AFF.
6. HVAC system shall be alarmed for: AC power loss, high and low temperature, high and low humidity, smoke detection, compressor failures, and water sensors for potential flooding

I. Ceiling Requirements:

1. The minimum ceiling height should be 10’ above finished floor or greater. This will allow for a minimum 8.5’ Telecom environment consisting of equipment racks, elevation kits, cable runways and cable. This allows adequate clearance for all other room elements such as lighting, cooling, fire suppression systems, and cable pathways above the environment.
2. Suspended ceilings are not allowed in Telecommunications Spaces.

3. The ceiling finish should minimize dust and be light colored to enhance the room lighting.

J. Clearances:

1. Provide 1 m (3.28 ft) of clear, unobstructed space for the installation and maintenance of all cabling and equipment mounted on walls, racks, cabinets, or enclosure.
2. Provide space for an aisle of at least 1 m (3.28 ft) wide in the front and in the rear of the space for each equipment rack, cabinet, or enclosure.
3. Allocate a space of at least 1 m (3.28 ft) wide, 1 m (3.28 ft) deep, and 2.6 m (8.5 ft) high for each equipment rack, cabinet, or enclosure.
4. The clearance is measured from the outermost surface of the wall mounted and rack mounted equipment rather than from the mounting surface of the rack, cabinet, enclosure, or backboard.
5. Provide at least 12-inches depth off the wall for wall-mounted equipment.
6. In corners, a minimum side clearance of 12-inches is recommended.
7. All applicable codes, standards, and regulations during the design, construction, and use of telecommunications spaces shall be observed.

K. Fire Suppression Requirements:

1. Consideration should be given to pre-action fire sprinkler systems.
 - a. Provide protective cage at fire sprinkler heads.
2. A fire suppression system with sensors should be installed in a telecommunications space according to applicable codes.
3. Portable fire extinguishers with appropriate ratings should be mounted as close to the entrance as possible.

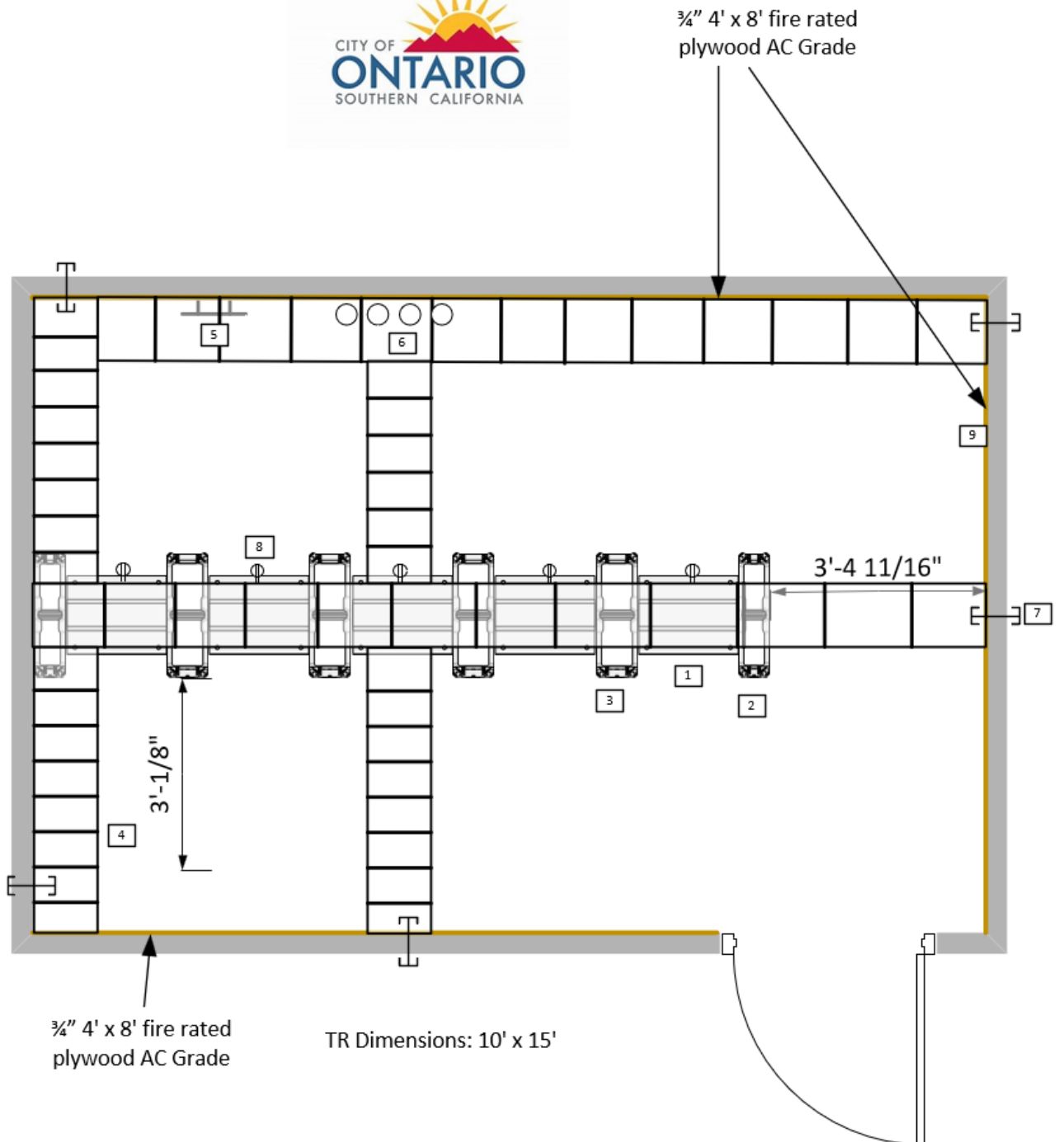
L. Cabling Contractor shall provide and install all appropriate equipment racks, cabinets, ladder racks, cable trays and supports, and wire management accessories necessary to fit-out a complete IT Equipment Room/Telecommunications Room.

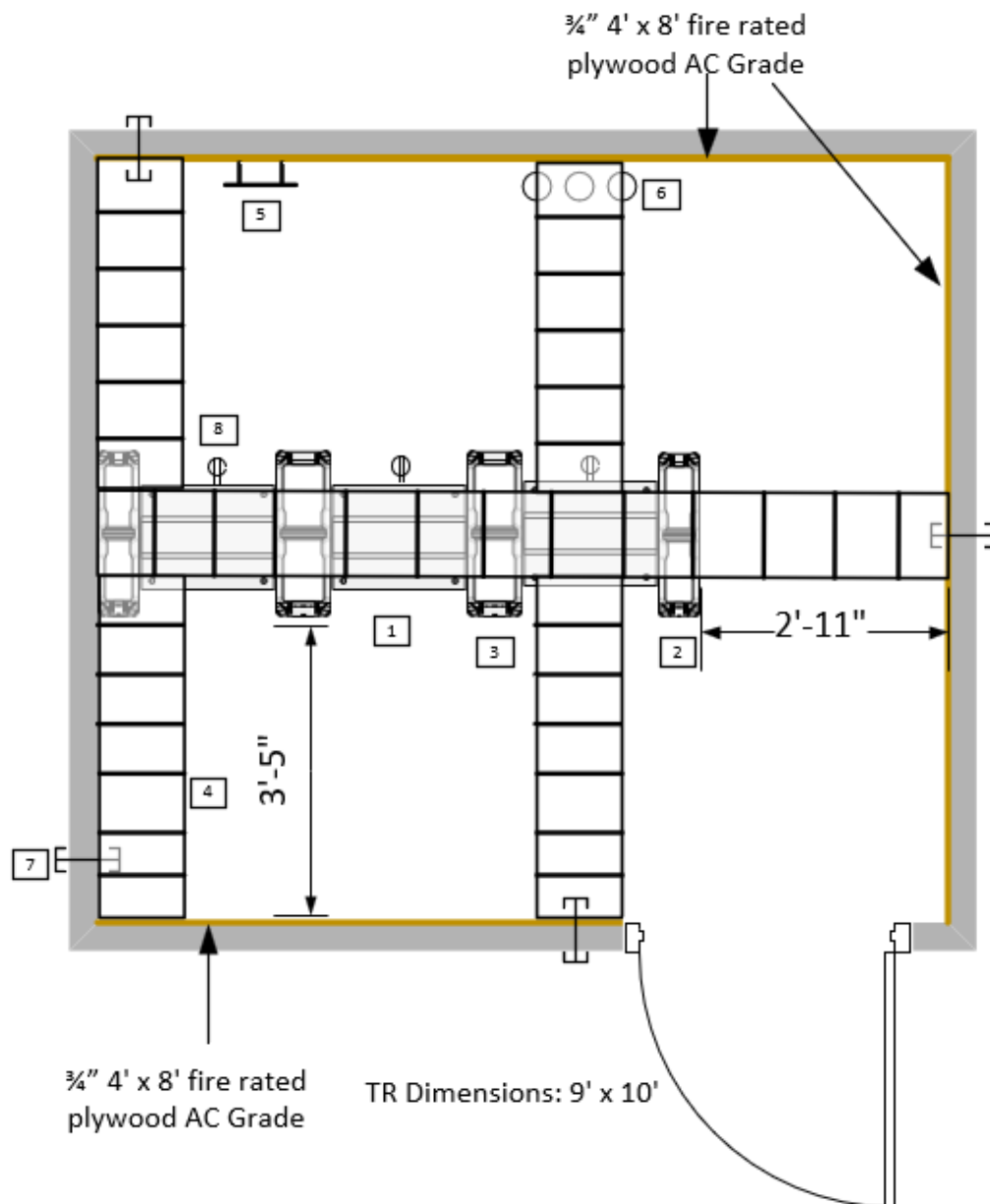
1. Cabinets, Racks and Vertical Cable Management:
2. Telecommunications rooms shall be fitted out with a minimum of:
 - a. MER: Three cabinets and/or racks.
 - b. TR's: Two cabinets and/or racks.
 - c. Server Equipment shall be housed in cabinets/enclosures.
 - d. Network Equipment shall be mounted in 2- or 4-post racks.
 - e. Racks shall be fitted with a minimum of 6" wide double sided vertical cable managers on all sides.
3. Horizontal Cable Managers and Blanking Panels:
 - a. 2RU Horizontal cable managers at the top of each rack.
 - b. (2) 2RU Blanking panel to be installed after the last patch panel in a rack.
 - c. 2RU Horizontal cable manager above and below each network switch.

M. Rack Mount PDU's:

1. Furnish and install horizontal rack mount PDU's as indicated on the construction drawings.
 - a. At a minimum provide (1) horizontal PDU 120V 20A L5-20P with (10) 5-20R receptacles for each rack.
 2. Contractor shall confirm power cord lengths will extend to electrical outlets mounted above racks without extension cords.
- N. Rack Mount UPS:
1. Furnish and install horizontal rack mount UPS as indicated on the construction drawings.
 2. Contractor shall confirm power cord lengths will extend to electrical outlets mounted above racks without extension cords.
 3. Furnish and install a minimum 3000VA (2700W) UPS per rack.
- O. Telecom Room Electrical Requirements
1. A separate dedicated electrical service panel, sized to support a minimum of 100 amps shall be installed in each telecom room.
 2. Server Rooms/Main Equipment Rooms
 - a. At a minimum provide (1) dedicated, non-switched 208V/30A AC circuit on L6-30R receptacle and (2) dedicated, non-switched 120V/30A AC circuits on L5-30P receptacles for equipment power at each equipment rack. Each outlet shall be on a separate branch circuits.
 3. Telecommunications Rooms / IDF's
 - a. At a minimum provide (2) non-switched 120V/30A AC circuits on L5-30P receptacles for equipment power at each equipment rack. Each outlet shall be on a separate branch circuits
 4. Receptacles for equipment racks and cabinets shall be mounted to the side of the ladder rack and at the rear of the equipment racks/cabinets.
 5. Each outlet shall be on a separate branch circuit and supported from a centralized UPS/emergency power if available.
 6. At a minimum, one (1) dedicated 120V/20A circuits shall be provided for wall mounted access control equipment.
 7. Provide duplex 120V AC convenience outlets (NEMA 5-20R) placed at 6-ft. intervals around perimeter walls.
 8. Maximum power load per rack shall be calculated during early design phases by a qualified electrical engineer.

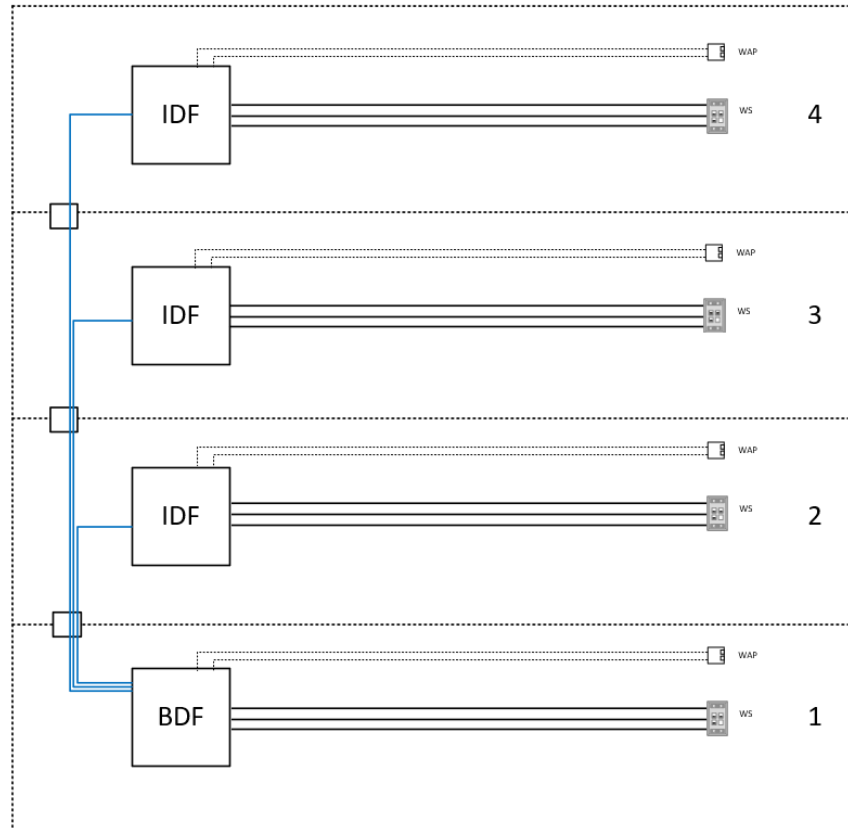
TYPICAL MDF/MER AND IDF/TR LAYOUTS



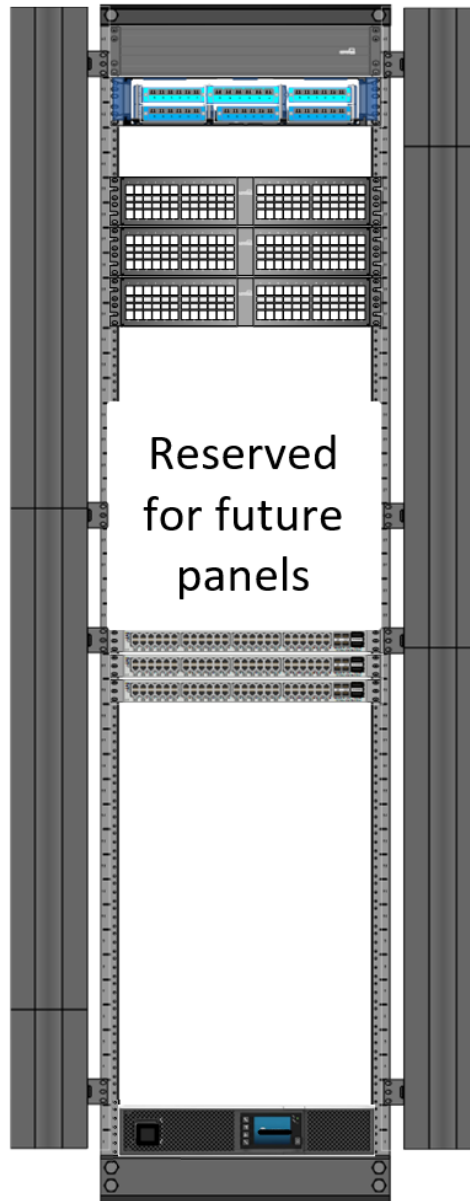


1.18 STRUCTURED CABLING SCHEMATICS

TYPICAL STRUCTURED CABLING TOPOLOGY



TYPICAL RACK LAYOUT



1.19 HORIZONTAL CABLING GUARANTEED SYSTEM PERFORMANCE

- A. Manufacturer to provide internal testing data that demonstrates typical Category 6A Plenum UTP channel performance margins above ANSI/TIA-568-D standards as listed below.
- | | | |
|-----|----------------|-------|
| 1. | Insertion Loss | 3% |
| 2. | NEXT | 2 dB |
| 3. | PSNEXT | 3 dB |
| 4. | ACR-F | 8 dB |
| 5. | PSACR-F | 8 db |
| 6. | Return Loss | 3 dB |
| 7. | ACR-N | 3 dB |
| 8. | PSACR-N | 4 dB |
| 9. | PSANEXT | 3 dB |
| 10. | PSAACR-F | 5 dB |
| 11. | TCL | 3 dB |
| 12. | ELTCTL | 10 dB |
- B. Manufacturer to provide internal testing data that demonstrates typical Category 6A Plenum Indoor/Outdoor UTP cable channel performance margins above ANSI/TIA-568-D standards as listed below.
- | | | |
|-----|----------------|------|
| 1. | Insertion Loss | 0% |
| 2. | NEXT | 2 dB |
| 3. | PSNEXT | 2 dB |
| 4. | ACR-F | 6 dB |
| 5. | PSACR-F | 6 db |
| 6. | Return Loss | 2 dB |
| 7. | ACR-N | 2 dB |
| 8. | PSACR-N | 2 dB |
| 9. | PSANEXT | 1 dB |
| 10. | PSAACR-F | 7 dB |
| 11. | TCL | 2 dB |
| 12. | ELTCTL | 2 dB |

1.20 MANUFACTURER SPECIFIC DECLARATION

- A. The City of Ontario has specified Leviton Network Solutions as the product brand required to meet their design requirements. Product support questions can be directed to Leviton contacts below:
1. Leviton Network Solutions, www.leviton.com/ns

2222 - 222nd St SE, Bothell, WA 98021-4422

Customer Service 1-800-722-2082, 1-425-486-2222

Product Support 1-800-824-3005

Larry Gillen – Specification Engineer, 909-202-2031, larry.gillen@leviton.com,
USA Specifications

- B. Cabinets and Racks
 - 1. RXL USA
- C. PDU's and UPS
 - 1. Xtreme Power Conversion

LEVITON PRODUCTS ORDERING GUIDE

SECTION 2 PRODUCTS

2.01 COPPER HORIZONTAL CABLING

A. CATEGORY 6A CABLE

1. High Performance UTP Plenum Category 6A, 4-pair cable with an internal divider and cable core surrounded by an insulated metallic isolation wrap and jacketed with a flame-retardant polymer alloy.
2. Cable shall have an advanced polymer jacket compound that creates a flexible cable at room and cold temperatures, exhibit less recoil memory, and fewer stress marks during installation for plenum cables.
3. Cable shall provide 10dB PSANEXT and PSAACRF margin to Cat 6A requirements.
4. Cable shall have 4dB ACRF and PSACRF margin to Cat 6A requirements.
5. Cable shall meet fire rating appropriate to local building codes.



Category 6A Plenum UTP Cable		
Part Number	Description	Comment/Attribute
11140627	Leviton SST Plenum Category 6A cable, 1000ft reel in a box, Blue	Data/Workstations
11140630	Leviton SST Plenum Category 6A cable, 1000ft reel in a box, Yellow	Wireless Access Points (WAP's)
11140628	Leviton SST Plenum Category 6A cable, 1000ft reel in a box, White	Security Cameras
11140632	Leviton SST Plenum Category 6A cable, 1000ft reel in a box, Red	IoT Devices

B. CATEGORY 6A INDOOR/OUTDOOR PLENUM CABLE

1. Reduced Diameter UTP Plenum Indoor/Outdoor Category 6A, 4-pair cable core surrounded by an insulated metallic isolation wrap with no internal divider and gel-free construction.



2. Cable shall have an advanced polymer jacket compound that creates a flexible cable at room and cold temperatures, exhibit less recoil memory, and fewer stress marks during installation.
3. Cable shall provide 8dB PSANEXT and PSAACRF margin to Cat 6A requirements.
4. Cable shall have Flame Rating of Plenum-NFPA 70, CMP as well as CMX for outdoor applications.

Category 6A Indoor/Outdoor Plenum UTP Cable		
Part Number	Description	Comment/Attribute
11142753	Leviton LM-RDT-I/O Plenum, Category 6A cable, 1000ft reel, Black, Indoor/Outdoor rated, gel-free, UV resistant jacket.	Indoor/Outdoor Plenum where applicable – Black Only

C. CATEGORY 6A CONNECTOR MODULES

1. The modular connector shall be independently tested and verified by a Nationally Recognized Testing Laboratory to meet or exceed the Category 6A performance requirements.
2. The connector module shall utilize an engineered tine geometry to prevent POE arcing damage due to plug removal cycles from occurring at the critical contact-mating zone between the plug and connector module tines.
3. The connector module will exceed IEEE 802.3bt standard to support up to 0.5 amps per conductor (100 watts) continuously.
4. Connector Module shall comply with UL 2043 as suitable for installation in plenum spaces. All plastics used in construction of connector bodies shall be fire retardant with a UL flammability rating of 94V-0.
5. Shuttered Jacks shall be used in dusty environments like woodshops, metal shops, automotive shops, etc. See drawings for specific callouts.



Category 6A connector modules		
Part Number	Description	Comment/Attribute
6110G-RL6	EXTREME Cat 6A UTP QUICKPORT Jack, Blue	Data/Workstations
6110G-RY6	EXTREME Cat 6A UTP QUICKPORT Jack, Yellow	Wireless Access Points (WAP's)
6110G-RW6	EXTREME Cat 6A UTP QUICKPORT Jack, White	Security Cameras
6110G-RR6	EXTREME Cat 6A UTP QUICKPORT Jack, Red	IoT Devices
	*Colors: (W) White, (E) Black, (L) Blue, (Y) Yellow, (O) Orange, (C) Crimson Red, (V) Green, (G) Gray	

D. COPPER PATCH PANELS



1. Patch panels shall be field configurable angled QUICKPORT style jack panels with rear management.



Patch Panels with Rear Cable Manager		
Part Number	Description	Comment/Attribute
49256-H48	2RU 48-Port Angled QUICKPORT Patch Panel, black	
49006-AMB	Rack-Mounted Rear Cable Management Bar	Use with patch panels that have no rear cable management bar included

E. CATEGORY 6A PATCH CORDS

1. 26 AWG Category 6A UTP patch cords shall be used at work area outlet locations.
2. 28 AWG "Hi-Flex" Category 6A patch cords shall be used at the TR patch panel locations to reduce congestion.
3. NFPA-70 Plenum Rated Category 6A patch cords to be used in above ceiling applications. Coordinate color with the City of Ontario for applicable devices.
4. Right size patch cord length to eliminate excessive slack. Oversized patch cords will not be accepted.
5. Confirm with IT if patch cords are Contractor or Owner furnished for project.



Category 6A Copper Patch Cords		
Part Number	Description	Comment/Attribute
6AS10-##*	Category 6A 26 AWG FTP Standard CMR patch cord, ##- any standard length in feet.	Work Area Patch Cords
H6A10-##*	Category 6A 28 AWG Shielded Hi-Flex Dual Rated CM/LSZH patch cord, ##- any standard length in feet.	Telecom Room patch cords
H6A1i-##*	Category 6A 28 AWG Shielded Hi-Flex Dual Rated CM/LSZH patch cord, ##- in inches (ie: 6" H6A1i-06* or 8" H6A1i-08*)	Telecom Room Patch Cords
6ASP0-##*	Category 6A, 26 AWG, Plenum/CMP patch cords (* Colors: White, Blue, Gray only) – ## any standard length in feet.	Plenum above ceiling applications
	## - 03, 05, 07, 10, 15, 20-foot standard lengths	
	*Colors: (W) White, (Y) Yellow, (R) Red, (L) Blue, (G) Green, (S) Gray, (E) Black	
	Blue = Data/Workstations; Yellow = WAP's, White = Security Cameras, Red = IoT	

F. WALLPLATES, SURFACE MOUNT BOXES & COUPLER/ASSEMBLY

1. Match type to back-box standards.



2. Match style and color to work area décor.
3. Blank all empty ports with matching color blanks as applicable.
4. Use above ceiling bracket to secure SMB as needed.
5. Use VXC coupler or VXC assembly as needed for Modular Plug Terminated Link (MPTL) applications.



Wallplates, SMB's, Coupler/Assembly		
Part Number	Description	Comment/Attribute
42080-#*S	Single-Gang QUICKPORT Wallplate with ID Windows	#- Port count 2,4,6
42080-#*P	Double-Gang QUICKPORT Wallplate with ID Windows	#- Port count 2, 4, 6, 8, for 12-Port use color code in place of "P"
43080-1L#	Single-Gang Stainless Steel Wallplate with ID Windows	#- Port count 1,2,3,4,6
4108W-1SP	Single-Gang Recessed Stainless Steel Telephone Wallplate	
41089-#WP	surface mount box, Plenum Rated, White	#- Port count 1,2,4,6, 12
49223-CBC	QUICKPORT In-Ceiling Bracket with Drop Ceiling Clip	
49223-CB0	QUICKPORT In-Ceiling Bracket	
SBCPI-00S	VXC Coupler	
SBCPI-XX*	VXC Plenum Assembly with Patch Cable,	XX- (06) 6", (12) 12", (18) 18", *Color – (W) White, (L) Blue
	*Wallplate Color: (W) White, (T) Lt. Almond, (I) Ivory, (G) Gray, (E) Black	

2.02 FIBER BACKBONE PRODUCTS

A. SINGLE MODE FIBER OPTIC CABLE – TIGHT BUFFERED INDOOR/OUTDOOR

1. Fiber optic cable shall be suitable for installation in plenum and riser horizontal environments and interbuilding backbone structures.
2. The fiber optic cable design shall have tight buffered optical fibers within a dry water blocked cable core. No buffer tube fanout kits are required.
3. Sheath shall be flame-resistant plenum, fungus resistant and sunlight resistant jacket per UL 444 clause 7.22. Suitable for use in conduit below frost line.
4. Refer to drawings for interlocking armor call-out and details.



Bulk Tight Buffer Fiber Cable		
Part Number	Description	
PDP012AB0707-I/O-C4(YEL)	12F OS2 SM tight buffered Indoor/Outdoor Plenum fiber optic cable	
PDPK012AB0707-I/O-C4(YEL)	12F OS2 SM tight buffered interlocking armored Indoor/Outdoor Plenum fiber optic cable	
PDP024AB0707-I/O-C4(YEL)	24F OS2 SM tight buffered Indoor/Outdoor Plenum fiber optic cable	
PDPK024AB0707-I/O-C4C5(YEL)	24F OS2 SM tight buffered interlocking armored Indoor/Outdoor Plenum fiber optic cable	
11140671	Armor-Tek Ground Strips	

B. MULTIMODE OM4 INDOOR/OUTDOOR TIGHT-BUFFER FIBER OPTIC CABLES

1. Fiber optic cable shall be suitable for installation in plenum and/or riser horizontal environments and interbuilding backbone structures.
2. Fiber optic cable design shall have tight buffered optical fibers within a dry water blocked cable core. No buffer tube fanout kits are required.
3. Sheath shall be flame resistant plenum, fungus resistant and sunlight resistant jacket per UL 444 clause 7.22.
4. Cable shall comply with EN 50173; ISO/IEC 11801, ANSI/ICEA S-104-696; ANSI/IDEA S-83-596; ANSI/TIA-568.3-D; NFPA 130; and Telcordia GR-409.
5. Cable construction shall be, tight buffered, 900-micron from 6-144 fibers, sub-unitized and color coded per ANSI/TIA-598-D with aramid yarn strength member.
6. Cable shall meet fire rating appropriate to local building codes.
7. Utilize Premise Distribution Tight Buffered Fiber-Optic for all applications where conduit is below frost line.

Multimode OM4 Indoor/Outdoor Premises Distribution Tight-Buffered Fiber Optic Cable		
Part Number	Description	Comment/Attribute
PDP012FB3010/F5-I/O-C4(AQU)	Berk-Tek 12F Multimode OM4 Bend Insensitive laser optimized optical fibers, Indoor/Outdoor Plenum Tight Buffer, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
PDPK012FB3010/F5-I/O-C4(AQU)	Berk-Tek 12F Multimode OM4 Bend Insensitive laser optimized optical fibers, Armored Indoor/Outdoor Plenum Tight Buffer, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
PDP024FB3010/F5-I/O-C4(AQU)	Berk-Tek 24F Multimode OM4 Bend Insensitive optical fibers, Indoor/Outdoor Plenum Tight Buffer, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
PDPK024FB3010/F5-I/O-C4(AQU)	Berk-Tek 24F Multimode OM4 Bend Insensitive optical fibers, Indoor/Outdoor Plenum Tight Buffer, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable

C. SINGLE MODE FIBER OPTIC CABLE – LOOSE TUBE INDOOR/OUTDOOR

1. Loose tube cable construction, water blocked, plenum rated jacket for installation in any outside plant to riser or through plenum spaces.
2. Cable buffer tube construction shall be dry water-blocked color-coded loose tubes containing up to 12, 250 micron, individually colored fibers.
3. Cable shall have a sunlight resistant outer jacket that protects the cable in outside plant installations.
4. Refer to drawings for interlocking armor call-out details.



Single Mode Bulk Loose Tube Fiber Cable		
Part Number	Description	Comment

LTP012AB0403	12F OS2 SM loose tube Indoor/Outdoor Plenum fiber optic cable, Yellow jacket	
LTPK012AB0403	12F OS2 SM loose tube interlocking armored Indoor/Outdoor Plenum fiber optic cable, Yellow jacket	
LTP12B024AB0403	24F OS2 SM loose tube Indoor/Outdoor Plenum fiber optic cable, Yellow jacket	
LTPK12B024AB0403	24F OS2 SM loose tube interlocking armored Indoor/Outdoor Plenum fiber optic cable, Yellow jacket	
11140671	Armor-Tek Ground Strips	

D. MULTIMODE OM4 INDOOR/OUTDOOR LOOSE TUBE FIBER OPTIC CABLES

1. Loose Tube Plenum Fiber Optic cables shall be compact, water blocked, plenum rated, flexible loose tube design of all dielectric construction allows for installation in any outside plant to riser or through plenum spaces.
2. Cable buffer tube construction shall be dry water-blocked color-coded loose tubes containing up to 12, 250 micron, individually colored fibers.
3. Cable shall have a sunlight resistant outer jacket per UL 444 clause 7.22 that protects the cable in outside plant installations.
4. Cable shall comply with EN 50173; ISO/IEC 11801, ANSI/ICEA S-104-696; ANSI/IDEA S-83-596; ANSI/TIA-568.3-D; NFPA 130; and Telcordia GR-409.
5. Refer to drawings for fiber strand count and details.
6. Cable shall meet fire rating appropriate to local building codes.



Multimode OM4 Indoor/Outdoor Adventum Loose Tube Fiber Optic Cable		
Part Number	Description	Comment/Attribute
LTP012FB3010/F5	Berk-Tek 12F Multimode OM4 Bend Insensitive laser optimized optical fibers, Indoor/Outdoor Adventum Plenum Loose Tube, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
LTPK012FB3010/F5	Berk-Tek 12F Multimode OM4 Bend Insensitive laser optimized optical fibers, interlocking armor Indoor/Outdoor Adventum Plenum Loose Tube, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
LTP12B024FB3010/F5	Berk-Tek 24F Multimode OM4 Bend Insensitive optical fibers, Indoor/Outdoor Adventum Plenum Loose Tube, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
LTPK12B024FB3010/F5	Berk-Tek 24F Multimode OM4 Bend Insensitive optical fibers, interlocking armor Indoor/Outdoor Adventum Plenum Loose Tube, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable

E. LC Shuttered Molded Splice Modules

1. Fiber pigtail fusion splice modules shall be offered in 12 and 24-fiber LC (PC, UPC, and APC).
2. Construction of module shall be 16-gauge sheet metal faceplate for robustness and the chassis and cover shall be polycarbonate for overall light weight.



3. LC splice modules shall be pre-loaded and routed with respective one-meter, color-coded individual 900 um pigtail assembly.
4. Individual pigtails shall have maximum insertion loss of 0.40 dB for OM3/OM4 and 0.35 dB for OS2 fiber types.
5. Return Loss shall be greater than 25 dB (for OM3 and OM4), 55 dB (for OS2/UPC), and 65 dB (for OS2/APC).
6. LC adapters shall use ceramic ferrules and they shall provide IP5x-rated internal shutters compliant with IEC 60529.

LC Shuttered Splice Modules		
Part Number	Description	Comment
SPLCS-2LL	12-Fiber, OS2, Duplex LC Shuttered (Blue)	
SPLCS-4LL	24-fiber, OS2, Quad LC Shuttered (blue)	

F. Fusion Splice-On Connectors

1. Fusion splice-on fiber optic connectors shall meet or exceed the requirements described in ANSI/TIA-568.3-E, ANSI/TIA-604, Fiber Optic Connector Intermateability Standards and RoHS 2 per 2011/65/eu
2. All plastic components shall be molded of 94 V-0 rated plastic.
3. The connectors shall be factory-polished and field installable.
4. Maximum insertion loss shall be = 0.25 dB per connector and return loss shall be ≥ 65 dB for single-mode APC connectors, ≥ 55 dB for single-mode UPC connectors.
5. The connectors shall support 900-micron buffered fiber or 250-micron coated fiber with appropriate fanout kit or furcation tubing.
6. LC connectors can be joined using optional duplex clips.



Fusion Splice-On Connectors		
Part Number	Description	Comment
499LC-GN9	LC SM APC OS2 Green 900 μ m	
499LC-BL9	LC SM OS2 Blue 900 μ m	

G. PRE-POLISHED LC FIBER CONNECTORS PC

1. The mechanical fiber optic connector shall meet or exceed the requirements described in ANSI/TIA-568.3-D and ANSI/TIA-604 standards.
2. Connector shall be pre-polished and field-installable to eliminate the need for hand polishing, bonding, or epoxy in the field.



3. Connector shall be available in LC Laser Optimized 50/125µm configurations terminated on 250 or 900µm buffered fiber and/or 2 or 3mm jacketed fiber.
4. Maximum connector insertion loss shall be no greater than 0.5dB, with an average of 0.1 dB and 0.2 dB Single Mode.
5. Typical connector return loss shall be 25 dB Multimode and 55 dB Single Mode.
6. LC connectors require a 0-degree cleave with a maximum angle of 2 degrees for Multimode and 1 degree for Single Mode fibers.
7. Termination method shall allow continuity to be verified by use of a visual fault locator (VFL) prior to crimp.

Field Installable Single-Mode/Multimode Pre-Polished UPC LC Fiber Connector		
Part Number	Description	Comment/Attribute
49991-LLC	Leviton FastCAM Multimode LC Pre-Polished Connector	Standard connector for Multimode applications
49991-SLC	Leviton FastCAM Single Mode LC Pre-Polished Connector	Standard connector for Single Mode applications

H. FIBER OPTIC PIGTAILS AND FIBER FAN OUT KIT

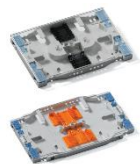
1. Pigtail's insertion loss shall be a maximum of 0.25 dB Single Mode.
2. Pigtails return loss shall be greater than 50 dB Single Mode.
3. Pigtails shall be available in singles or 12-fiber kits available in TIA color sequence.
4. All pigtails shall be 100% optically tested and serialized for traceability.
5. Fanout kit shall separate 250-micron fibers and route them into color-coded 900-micron buffer tubes, via a protective housing, allowing cable to be easily terminated.
6. Fanout kit shall use "Hytrell Furcation Tubing" and be available in either six or twelve fiber capacity in 24" or 36" lengths.



Pigtails and Fanout Kits		
Part Number	Description	Comment
UPPLC-KIT	12-Fiber Pigtail Kit, Single-Mode UPC Polish OS2, LC, 3m	Fusion splice method
49887-12S	12 Position Fan-Out Kit with 24" Fan-Out Tubing	
49887-12L	12 Position Fan-Out Kit with 36" Fan-Out Tubing	

I. FIBER OPTIC INJECTION-MOLDED SPLICE TRAYS FOR ENCLOSURES

1. Fiber splice trays shall be offered in mini and high-density versions with removable clear covers for viewing and inspection of fibers.
2. The trays shall accommodate slack management of both single mode and multimode 250 um or 900 um fiber and protection of up to 12 or 24 fiber heat-shrink fusion splices.



SDX Injection-Molded Splice Trays		
Part Number	Description	Comment/Attribute
T5PLS-12F	Leviton SDX 12-Fiber Mini Injection-Molded Splice Tray	Splice Trays for SDX Enclosures
T5PLS-24F	Leviton SDX 24-Fiber High Density Injection-Molded Splice Tray	
SPLMT-HKT	Leviton Splice Tray Mounting Hardware Kit	

J. FIBER OPTIC RACK MOUNTED ENCLOSURES

1. Choose an appropriate size enclosure to match fiber count at TR.
2. Enclosure with sliding tray shall be available in 1RU, 2RU and 4RU versions that accommodate termination and splicing of fiber.
3. Adapter bulkhead shall accept a variety of modular adapter plates and Plug-n-Play MTP modules/cassettes including 24 strand MTP.
4. The rack mount optical fiber Enclosure shall be capable of terminating tight-buffered or loose tube optical fiber cable and support either direct connectorization or fusion splicing.
5. Splice trays shall be available to support 12 or 24 strands per tray, heat shrink or bare fiber splicing and be available in metal or molded plastic design.
6. Blank filler adapters to be installed in empty positions.



SDX Fiber Enclosures		
Part Number	Description	Comment
5R1UH-S03	Leviton SDX 2000i 1RU Fiber Enclosure with Sliding Tray, Black.	TR locations
5R2UH-S06	Leviton SDX 2000i 2RU Fiber Enclosure with Sliding Tray, Black.	
5R4UH-S12	Leviton SDX 2000i 4RU Fiber Enclosure with Sliding Tray, Black.	

K. FIBER OPTIC WALL MOUNT ENCLOSURES

1. Wall-Mount Enclosures shall be available in multiple sizes to accommodate field connector termination, heat-fusion splicing, and plug-and-play MTP® cassettes for up to 288 fibers (LC), as well as copper connectivity up to 72 ports.
2. Enclosures can be oriented for left- or right-side patching to provide added flexibility.
3. Adapter bulkhead shall accept Adapter Plates, Splice Modules, and MTP® Cassettes in LC, SC, ST, and MTP connectivity.
4. Fiber cable management for routing, storage, and protection shall accept tight-buffered fiber and loose tube backbone cables.
5. Wall-mount fiber enclosures shall be provided with lock and key kit.



6. Confirm with Owner when using wall mount enclosures in place of rack mount enclosures.

SDX Wall-Mounted Fiber Optic Panels		
Part Number	Description	Comment/Attribute
5WMNT-1C	Leviton SDX Mini Wall-Mount Fiber Enclosure, Black	
5WSML-02C	Leviton SDX Small Wall-Mount Fiber Enclosure, Black	
5WMED-04C	Leviton SDX Medium Wall-Mount Fiber Enclosure, Black	
5WLRG-12C	Leviton SDX Large Wall-Mount Fiber Enclosure, Black	
5L000-KAL	Leviton SDX Wall-Mount Lock and Key kit	

L. FIBER OPTIC LC ADAPTER PLATES FOR RACK MOUNT AND WALL-MOUNT ENCLOSURES

1. The adapter plate shall be modular and functional for use in panel or Panel (rack- or wall-mount) specified.
2. The adapter plate shall be offered in Shuttered LC connectors in 12 or 24 fiber configurations.
3. The adapter plate shall be compliant to ANSI/TIA-568.3-D and ISO 11801 (for performance) and respective ANSI/TIA-604-X and applicable IEC (for intermateability) standards.
4. Entire adapter plates shall be color coded, not just feed-thrus, to identify performance grade. OS2 (Blue).
5. Adapter plates shall use zirconia ceramic sleeves and be offered in standard fiber type colors pursuant to ANSI/TIA-568.3-D and appropriate IEC standards.
6. The adapter and plate shall be integrated to eliminate “rattle” and loose fit.



SDX Precision Molded Fiber Optic Shuttered LC Adapter Plates		
Part Number	Description	Comment/Attribute
5F100-S2L	Leviton SDX Precision Molded OS2 SM Laser Optimized, Duplex LC, 12- fibers, zirconia ceramic sleeve, Blue	
5F100-S2M	Leviton SDX Precision Molded OM4 MM Laser Optimized, Quad LC, 12- fibers, zirconia ceramic sleeve, Aqua	
5F100-S4L	Leviton SDX Precision Molded OS2 SM Laser Optimized, Duplex LC, 24- fibers, zirconia ceramic sleeve, Blue	
5F100-S4Q	Leviton SDX Precision Molded OM4 MM Laser Optimized, Quad LC, 24- fibers, zirconia ceramic sleeve, Aqua	

M. FIBER PATCH CORDS

1. Patch cords shall meet or exceed the requirements of ANSI/TIA-568.3-D.
2. Patch cords shall meet an optical return loss equal to or better than 50 dB Single mode.
3. Insertion loss shall not exceed 0.35dB for Single mode.



4. The optical fiber cord connectors shall have precision pre-radiused zirconia ferrules.
5. The fiber cord assembly shall be dual zip, OFNR rated with a yellow jacket for Single mode.
6. Duplex LC fiber patch cords shall be A-B polarity.
7. Standard stock lengths of 1m, 2m, 3m, 5m, and 10m shall be available. Custom lengths shall be available through a made-to-order program.
8. Right size patch cord length to eliminate excessive slack. Oversized patch cords will not be accepted.

Fiber Optic Patch Cords		
Part Number	Description	Comment/Attribute
UPDLC-SXX	Leviton LC to LC OS2 Duplex Fiber Optic Patch Cord	
	XX – length (in meters) 01, 02, 03, 05 and 10	

2.03 TELECOM ROOM & PATHWAYS AND SPACES

A. J-HOOKS

1. Furnish and install J-Hooks as indicated in plans for horizontal cable runs.
2. The Contractor shall calculate proper J-Hook sizing throughout the project to properly support horizontal cables.



J-Hooks		
Part Number	Description	Comment
BEJH21W	Bascor 1-5/16" Batwing J-Hook, Size 21	Confirm drawings for locations and calculate proper J-Hook sizing
BEJH32W	Bascor 2" Batwing J-Hook, Size 32	
BEJH64W	Bascor 4" Batwing J-Hook, Size 64	

B. WIRE MESH CABLE TRAY

1. UL Certified wire mesh cable tray, fully bonded and grounded.
2. Tray elevation, brackets, plates, junction, splice, support, bracing, radius bends, radius drops, divider, retaining posts, endcaps, closing and hardware kits shall be furnished and installed for a full and complete system.
3. Confirm with City of Ontario IT Agency on the number of tray dividers required to separate different systems if applicable.
4. Seismically brace cable tray to building structure.



Wire Mesh Cable Tray		
Part Number	Description	Comment
BF2R 6x2 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 06"W x 2"H Basket Tray with Speed Splice	Confirm drawings for required widths, depths, and mounting details.
BF2R 12x2 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 12"W x 2"H Basket Tray with Speed Splice	
BF2R 18x2 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 18"W x 2"H Basket Tray with Speed Splice	
BF2R 24x2 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 24"W x 2"H Basket Tray with Speed Splice	
BF2R 6x4 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 06"W x 4"H Basket Tray with Speed Splice	
BF2R 12x4 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 12"W x 4"H Basket Tray with Speed Splice	
BF2R 18x4 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 18"W x 4"H Basket Tray with Speed Splice	
BF2R 24x4 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 24"W x 4"H Basket Tray with Speed Splice	
BF2R 8x6 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 08"W x 6"H Basket Tray with Speed Splice	
BF2R 12x6 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 12"W x 6"H Basket Tray with Speed Splice	
BF2R 18x6 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 18"W x 6"H Basket Tray with Speed Splice	
BF2R 24x6 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 24"W x 6"H Basket Tray with Speed Splice	
SB6	Basor 6" Solid Bottom Insert	
SB12	Basor 12" Solid Bottom Insert	
SB18	Basor 18" Solid Bottom Insert	
SB24	Basor 24" Solid Bottom Insert	
	Furnish and install all wire mesh cable tray and accessories required for a complete system	

C. CABLE RUNWAY (LADDER RACK)

1. Made of 3/8-inch x 1-1/2-inch x .065-inch wall rectangular tubing, Cross members welded at 12-inch intervals, and length 119.75".
2. UL Listed.
3. Runway elevation, brackets, plates, junction, splice, support, bracing, radius bends, radius drops, divider, retaining posts, movable cross members, endcaps, closing and hardware kits shall be furnished and installed for a full and complete system.



4. Seismically brace ladder to racks, cabinets and to building structure.

Ladder Rack - Runway		
Part Number	Description	Comment
1050-BK12	RXL 12-inch-wide global cable runway, Black	Confirm drawings for required widths and mounting details. USA
	Review drawings for all runway accessories required for a complete system	

D. BONDING AND GROUNDING

1. BICSI and ANSI/EIA/TIA Bonding Busbars, UL Listed.
2. Hole patterns on Busbars accommodate two-hole lugs per ANSI/BICSI N3-20 and ANSI/TIA-607 standards.
3. Furnish and install all required 2-hole lugs, clamps, terminal blocks, taps, ground wire, bonding strap, and jumper kits for a complete install. #4/0 copper insulated green ground conductor for ground wire to building service ground and all required hardware.



Bonding and Grounding		
Part Number	Description	Comment/Attribute
GBI14420TMGBKT	Harger Primary Telecommunications Main Grounding Busbar (TMGB/PBB) shall be a ¼" x 4" x 20" copper bus bar with tapped connections	See Construction Documents and Drawings for exact specifications. USA
GBI14412TMGBKT	Harger Primary Telecommunications Main Grounding Busbar (TMGB/PBB) shall be a ¼" x 4" x 12" copper bus bar with tapped connections	
GBI14212TGBKT	Harger Secondary Telecommunications Grounding Busbar (TGB/SBB) shall be a ¼" x 2" x 12" copper bus bar with tapped connections	
RGBHKIT14119.25	Harger ¼" x 1" x 19.25" Horizontal width rack bonding bus bar	
RGBVKIT145836A	Harger ¼" x 5/8" x 36" Vertical rack bonding busbar	
RGBVKIT145872A	Harger ¼" x 5/8" x 72" Vertical rack bonding busbar	
67G	Harger 6 AWG 7 Strand Green THW-2 Insulated Conductor	
RGJ67G1082AKIT	Harger Two-hole compression lug rack ground jumper kit, 9'	
GJ67G102A1/4	Harger Two-hole compression lug end bonding jumpers, 10"	
IP0621520.5MOTO	Harger Rack Isolation Pads	

E. ADJUSTABLE FOUR POST SERVER RACKS

1. 7' x 19" 4-post server racks, 12 Gauge Steel, with 12-24 tapped or square punched adjustable mounting rails with RU markings. Black.
2. Depth can be adjusted with 6" range.
3. Integrated grounding on rails with grounding terminal block included.
4. 2000lbs load capacity.
5. Seismically brace four post server racks according to AHJ requirements.



Adjustable Four-Post Server Rack		
Part Number	Description	Comment/Attribute
2410-BK7042T	RXL 7' X 19"45RU Adjustable Four-Post Rack, 12-24 Tapped Rails, 36"-42" Depth	See drawings for details

F. TWO POST SERVER RACKS

1. 7' x 19" 2-post server racks, Aluminum, with 12-24 tapped mounting rails with RU markings. Black.
2. 1000lbs load capacity.
3. Seismically brace two post server racks according to AHJ requirements.



Two Post Server Rack		
Part Number	Description	Comment/Attribute
2200-BK-70-T	RXL 7' X 19"45RU Adjustable Two-Post Rack, 12-24 Tapped Rails	See drawings for details

G. WALL MOUNT ENCLOSURE

1. Three-part, swing-out design allows access and service to the front and rear of equipment.
2. 250-lbs load rating.
3. Front door shall be available in solid or tempered glass.
4. Available in 12RU, 18RU and 25RU heights; 23" depths.
5. Confirm final cabinet dimensions and color prior to ordering.
6. Confirm approval on all wall mount enclosures – only to be used when there is no option for a dedicated TR.



Wall Mount Cabinet		
Part Number	Description	Comment
4500-BK1223GT	RXL 12 RU x 24" x 23" CUBE Wall Mount, 12-24 tapped rails, Black	Confirm drawings for required height, depth, and mounting details.
4500-BK1823GT	RXL 18 RU x 24" x 23" CUBE Wall Mount, 12-24 tapped rails, Black	

4500-BK2523GT	RXL 25 RU x 24" x 23" CUBE Wall Mount, 12-24 tapped rails, Black	
	Review drawings for all accessories required for a complete installation	

H. FLOOR MOUNT CABINET

1. Made from welded heavy-duty steel with a load capacity of 3000lbs.
2. Adjustable mounting rails are made from 12GA sheet metal and RU marked for securing and simplifying mounting equipment.
3. Locking front/back doors, side panels (removable).
4. Ships fully assembled for fast installation.
5. Seismically brace floor mount cabinets according to AHJ requirements.



Floor Mount Cabinet		
Part Number	Description	Comment
RXL-5550	RXL Nemesis Cabinet Series	Confirm drawings for required height, width, depth and mounting details.
	Review drawings for all accessories required for a complete system	

I. HORIZONTAL CABLE MANAGERS WITH SNAP ON COVERS

1. 19-inch universal horizontal cable managers with covers and bend radius compliant router to transition between horizontal and vertical slotted ducts.
2. Furnish and install a 2RU manager at the top of each rack.



Horizontal Cable Managers and Blanking Panels		
Part Number	Description	Comment/Attribute
491RU-HFR	Leviton 1RU Horizontal Slotted Duct (front and rear) with cover	
491RU-HFO	Leviton 1RU Horizontal Slotted Duct (front only) with cover	
492RU-HFR	Leviton 2RU Horizontal Slotted Duct (front and rear) with cover	
492RU-HFO	Leviton 2RU Horizontal Slotted Duct (front only) with cover	
49254-BP1	Leviton 1RU Flat Blanking Panel	

J. VERTICAL DOUBLE SIDED CABLE MANAGERS WITH COVERS

1. 8-inch and 5-inch-wide vertical cable managers with radius finger edges to protect cable routing and passthrough space that aligns with rack units. Black.
2. Dual hinged, cable concealing covers included.
3. Channels kitted with cable retainers, slack loop organizers, mounting brackets and covers.



Vertical Double Sided Cable Managers with Covers		
Part Number	Description	Comment/Attribute
8980L-VFR	Leviton Versi-Duct Vertical 80"L x 8"W x 8"D channel w/standard hinged black cover	
4980L-VFR	Leviton Versi-Duct Vertical 80"L x 5"W x 4"D channel w/standard snap on black cover	

K. Power Distribution Units (PDU's)

1. Unmetered Horizontal 120V 20A PDU with a minimum of (10) 5-20R receptacles.
2. Feature circuit breaker protection to prevent current overloads.
3. LED indicators for power and grounding/polarity.



Part Number	Description	Comment/Attribute
P1021-12S	Leviton horizontal PDU 120V 20A 5-20P plug, (10) 5-20R receptacles, 12' cord length	Minimum one required per rack or cabinet

L. Lithium-ion UPS

1. 3000VA (2700 Watts) Rack Mount UPS. Black.
2. Hot swappable battery design.
3. 3 Year full warranty.



Part Number	Description	Comment/Attribute
P91g-3000	XTREME Power Conversion, 3000VA (2700W) Rackmount UPS	Minimum one required per rack or cabinet

M. 5 SQUARE BACKBOX

1. 5 Square Backbox x 2.875" Deep Metal Outlet Box
2. Supply appropriate extension / reducer rings for faceplates.
3. Confirm all final sizes with Owner.



5 Square Backbox		
Part Number	Description	
R-55014	Randl Industries, Inc. 5 Square x 2.875" Deep Metal Outlet Box. Side KO's: (1) ½" & (2) 1" each side. Back KO's: (3) ½" & (2) ¾".	See Construction Documents and Drawings. USA

2.04 NETWORK CHANNEL EXTENDER SYSTEMS

- The Network Extender System shall provide the capability to upgrade a channel of a standard ethernet switch to deliver IEEE 802.3 Type 1 – Type 4 Power over Ethernet (PoE) over a composite fiber/power cable for Owner Approved locations.
- The PoE extender system shall support auto-negotiated 10/100/1000BASE-T over a standard 4-pair Ethernet cable, Cat 6 or higher.
- System shall be able to deliver a PoE port up to:
 - 5,000 ft from source to remote with up to a 100 m (328 ft) Category 6/6A copper channel.
 - 10,000 ft with up to 10 m (32 ft) of Category 6/6A copper patch cords.
- The system shall utilize an external power injector at the source end; no other power inputs are needed.
- The PoE extender system shall be a transparent Layer 1 device, shall require no MAC or IP address, and shall be fully transparent to Layer 2 devices with no restriction on network traffic.
- The system shall provide power that is compliant with the requirements of a Class 2 Power Source per NFPA 70 or CSA C22.1 and be listed as such.
- Power injectors and remotes shall utilize TVSS.
- The system shall provide options that allow for redundancy of the DC power used for the system for certain configurations.
- OneReach is an Engineered Solution and all projects must have a OneReach Input Worksheet completed for each separate head end location and submitted to Leviton Applications Engineering Group to calculate a complete bill of materials for each project.



Network Channel Extender System-OneReach		
Part Number	Description	
81001531	Leviton OneReach 2RU Power Injection Chassis	
81001536	Leviton OneReach 1RU Power Supply Module 250 W	
81001262	Leviton OneReach Media Module, 4-port duplex LC, Single Mode	
81000413	Leviton OneReach Media Module, 4-port duplex LC, Multimode	

81000190	Leviton OneReach Chassis 1RU Blanking Panel	
81000463	Leviton OneReach 1RU Mounting Bracket for (2) 1-Port Power Source	
81001514	Leviton OneReach 1-Port Power Source, LC Duplex Multimode	
81001515	Leviton OneReach 1-Port Power Source, LC Duplex Single Mode	
TBD	Leviton OneReach Pre-Terminated Composite Cable Assemblies	Made to order
TBD	Leviton OneReach Bulk Composite Cable	
11097538	Leviton OneReach Duplex LC Pigtails, Multitmode – TR/Headend	
11097539	Leviton OneReach Duplex LC Pigtails, Multitmode – Remote End	
11101278	Leviton OneReach Duplex LC Pigtails, Single Mode-TR/Headend	
11101279	Leviton OneReach Duplex LC Pigtails, Single Mode-Remote End	
11099456	Leviton OneReach Copper M8 Pigtails, 2 x 18 AWG conductor, 36"	
11099453	Leviton OneReach Copper M8 Pigtails, 4 x 20 AWG conductor, 36"	
81001512	Leviton OneReach 1-Port Remote, PoE++, LC Duplex, Multimode	
81001513	Leviton OneReach 1-Port Remote, PoE++, LC Duplex, Single Mode	
81001534	Leviton OneReach 2-Port Remote, PoE++, 2 x LC Duplex, Multimode	
81001535	Leviton OneReach 2-Port Remote, PoE++, 2 x LC Duplex, Single Mode	
81001532	Leviton OneReach 4-Port Remote, PoE++, 4 x LC Duplex, Multimode	
81001533	Leviton OneReach 4-Port Remote, PoE++, 4 x LC Duplex, Single Mode	
DTK-2MHLP48BWB	DITEK Surge Protection Data & Signaling Circuit Surge Protector with Snap-Track Base	
DTK-MRJEXTS	DITEK POE Extender Surge Protector, (1 and 2-port remotes)	
DTK-WM4NETS	DITEK POE Extender Surge Protector, (4-port remotes)	
11099858	Leviton Industrial Patch Cordset - Cat 6A, RJ-RJ, IP20 Rated, 2-meter	
11099858	Leviton Industrial Patch Cordset - Cat 6A, RJ-RJ, IP20 Rated, 5-meter	
11142753	Leviton LM-RDT-I/O Category 6A, Plenum	

SECTION 3 – INSTALLATION AND INSPECTION

3.01 HORIZONTAL CABLES

- A. Cable shall be installed in accordance with most current ANSI/TIA, BICSI, ISO/IEC, and CENELEC standards, manufacturer's recommendations, and best industry practices.
- B. A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.
- C. Cable raceways shall not be filled greater than the maximum fill for the particular raceway type.
- D. Cables shall be installed in continuous lengths from origin to destination (no splices) except for approved connection points.
- E. Where consolidation/connection points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
- F. The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to manufacturer's requirements.
- G. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 1.2 to 1.5 m (4 – 5 ft) intervals and be randomly spaced. J hooks shall be properly sized to accommodate the immediate need and future growth of the cable pathway. J Hooks shall be designed to control bend radius requirements of the cable categories being installed.
- H. Cable supports shall be self-supporting and utilize independent wires, support rods and associated hardware for suspension. At no point shall cable(s) rest on acoustic ceiling grids, T-bars, ceiling support wires, acoustical panels or other components of the suspended ceiling.
- I. The bundle size recommendations of ANSI/TIA TSB-184-A and/or ISO/IEC 29125 shall be followed as it pertains to current or future support for POE applications.
- J. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- K. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner.

- L. When cables are being installed, slack (service loops) shall be provided to accommodate future changes in the structured cabling system. Slack should be included in all length calculations to ensure that the permanent link does not exceed 90 m (295 ft). The amount of cable slack required will depend on the size and layout of the connecting hardware at the TR, TE or TO.

The recommended amount of cable slack shall be:

3m (10 ft) in telecom spaces (ER, TR, TE) and ceiling above TO

1m (3 ft) – 3m (10 ft) in the ceiling above the outlet

30cm (12-inches) at the work area outlet

- M. Cables shall be neatly bundled and dressed to their respective termination device. Each terminating device shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- N. Cable bundles shall not be painted.
- O. Each cable shall be clearly labeled on the cable jacket behind the termination device at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.02 EMI/RFI AVOIDANCE

- A. Cables shall be routed such that the minimum separation distances from EMI/RFI and electrical power sources, as detailed in, are maintained and in accordance with most current ANSI/TIA-569-E-1 and or ISO/IEC 11801, BICSI TDM, manufacturer's recommendations, and best industry practices.
- B. Telecommunication cables shall cross electrical cables/conduits at 90 degree angles.

3.03 VOICE AND DATA MODULAR JACKS

- A. 8-position, 8-contact (8P8C) modular jacks shall be installed in accordance with manufacturer's recommendations and installation guides, and best industry practices.
- B. Pair untwist at the termination shall not exceed 6.35 mm (0.25 inch).
- C. Data jacks, unless otherwise noted in Drawings shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).
- D. Voice jacks, unless otherwise noted in Drawings, shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.04 PATCH PANELS

- A. Cables shall be dressed and terminated in accordance with the recommendations made by manufacturer's recommendations and best industry practice.
- B. Cables shall be separated into groups of twelve and routed symmetrically from both sides of the patch panel (e.g., split panel)
- C. Cables shall be properly supported vertically in the rack or cabinet and supported at the rear of the patch panel using a cable management bar or a rear horizontal cable management to retain terminations.
- D. Pair untwist at the termination shall not exceed 12.7 mm (.5 inch) for Cat 5e cabling.

- E. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- F. All patch panels shall be bonded to grounding system according to local code requirements.

3.05 PATCH CORD INSTALLATION

- A. Patch cords shall be installed at IT room end and at workstation end with cords of appropriate length such that cables are routed through proper cable management ducts and patch ways in a consistent manner. Cords should be routed so as not to block panel labels where possible.
- B. Patch cords shall be installed with the proper color to match the adopted color scheme for the organization.
- C. Patch cords shall be labeled at both ends according to the adopted labeling scheme for the organization. Labeling scheme shall adhere to most current ANSI/TIA-606 standard.
- D. Patching schedules and or records shall be updated by the Structured Cabling Plant Administrator after patching has been completed.
- E. Patch cords that are no longer in use shall be removed from the patching frame and properly stored. Patch cords to be harvested for reuse shall have unique ID labeling removed and be retested prior to being made available for re-use.
- F. Patch cords installed in plenum air handling spaces must meet appropriate fire/building codes.

3.06 FACEPLATES

- A. Blank inserts shall be installed where ports are not used.
- B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.
- C. Faceplates shall be installed straight and level.
- D. Faceplates shall be installed at the same heights as electrical faceplates or as designated on architectural and construction plans.

3.07 SURFACE MOUNT BOXES

- A. Blank inserts shall be installed where ports are not used.
- B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.
- C. Surface mount boxes shall be installed straight and level.
- D. Surface mount boxes shall be secured with screws to appropriate building structure or support bracket.
- E. Plenum rated surface mount boxes shall be used for in ceiling and raised floor applications where required.

3.08 CATEGORY 6A FIELD INSTALLABLE MODULAR PLUG

- A. Modular plugs shall be installed in accordance with manufacturer's recommendations and installation guides, and best industry practices.
- B. 100% of all installed cable segments shall be tested, partial or sample testing shall not be acceptable.

- C. Test procedure shall adhere to the method for testing a Modular Plug Terminated Link as described in ANSI/TIA-568.2-D Annex F.
- D. The MPTL shall be tested with a Permanent Link Adapter on the Main Unit and a Patch Cord Adapter Suitable for the Category being tested on the Far End or Remote Test Equipment. Channel adapters shall not be used.
- E. Test limits shall be set to meet the MPTL performance requirements defined in ANSI/TIA-568.2-D Annex F.
- F. The patch cord adapter used on the far end of the MPTL shall meet the requirements for Category 6A patch cord test head as qualified per TIA 568.2-D Annex C or D.
- G. The detailed test results are to be provided to owner and submitted electronically to Manufacturer for warranty acceptance for each tested link.

3.09 BACKBONE FIBER CABLES (INSIDE PLANT)

- A. Cables shall be dressed and terminated in accordance with the recommendations made in most current ANSI/TIA-568 Series, ISO/IEC 14763-3, BICSI TDMM, manufacturer's recommendations, and best industry practices.
- B. Minimum bend radius and maximum pulling tension for all cables shall be maintained during and after installation.
- C. All cable and associated hardware shall be placed so as to make efficient use of available space in coordination with other uses. All cable and associated hardware shall be placed so as to not impair the use or capacity of other building systems, equipment, or hardware placed by others (or existing).
- D. Backbone cables shall be installed separately from horizontal distribution cables.
- E. A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.
- F. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits.
- G. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
- H. Leave 10' (3m) of slack on each end of Fiber backbone cable.
- I. Vertical runs of cable shall be supported to messenger strand, cable ladder, mesh grips or other method to provide proper support for the weight of the cable.
- J. Each optical Fiber cable shall be individually attached to the respective enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
- K. Each optical Fiber cable shall be clearly labeled at the entrance to the enclosure. Cables labeled within the bundle shall not be acceptable.
- L. When splicing each Fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
- M. All spare Fiber strands shall be installed into spare splice trays.
- N. Fiber slack shall be neatly coiled within the Fiber splice tray or enclosure. No slack loops shall be allowed external to the Fiber panel.

3.10 OPTICAL FIBER PANELS/ENCLOSURES

- A. Cables shall be dressed and terminated in accordance with manufacturer's recommendations and best industry practices.
- B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
- C. Bend radius of the optic Fiber cable in the panel/enclosure shall not exceed 10 times the outside diameter of the cable.
- D. Each Fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
- E. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
- F. A maximum of 12 strands of Fiber shall be spliced in each tray.
- G. All spare strands shall be installed into spare splice trays.
- H. Fiber slack shall be neatly coiled within the Fiber splice tray or enclosure. No slack loops shall be allowed external to the Fiber panel.
- I. Installer will visually clean and inspect fiber connector endface prior to insertion into coupler plate.
- J. Installer will attach dust caps immediately after endface inspection and after testing.
- K. All patch panels shall be bonded to grounding system according to local code requirements.

3.11 OPTICAL FIBER CONNECTORS AND PIGTAILS

- A. All optical fiber shards shall be properly disposed in an approved container to prevent injury. The use of tape is not an approved method for disposal.
- B. Application of direct connect fiber connectors (crimp, adhesive or anaerobic) shall be done in accordance with manufacturer's instructions and industry best practice.
- C. Pigtaills shall be installed with appropriate fusion splicing equipment that has been calibrated per manufacturer's recommendations.
- D. After polishing/splicing is completed, optical fiber connectors shall be visually checked with an inspection scope (min x200) for damage and debris.
- E. If the optical fiber core is fractured, chipped, or scratched it must be re-terminated.
- F. Dust caps to be installed immediately after inspection and insertion into coupler plates.

3.12 OPTICAL FIBER PATCH CORDS

- A. Fiber patch cords/workstation cords shall be installed as per the requirements specified by the manufacturer's installation guidelines.
- B. Installer will visually inspect and clean fiber connectors at every stage of handling BEFORE mating them.
- C. Inspection of both endfaces (Cord end and internal Bulkhead) before mating patch cords is required.
- D. Cleaning both connectors each time you disconnect and reconnect is required.
- E. Inspection and cleaning of simplex fiber interfaces will adhere to the procedures detailed in International Standard IEC 61300-3-35.
- F. Objective inspection tools shall be used to perform endface inspection.

- G. Submit software copy of test results, in original tester software format, to the Owner and to Leviton.

3.13 FACTORY PRETERMINATED FIBER OPTIC TRUNK AND CASSETTE SYSTEM

- A. The System shall be installed by factory trained personnel.
- B. Polarity of fiber trunks and Cassettes must be coordinated with factory.
- C. Rear cable managers and cable clamps shall be provided in all cases and installed per manufacturers recommendations.
- D. System components shall be installed in accordance with the recommendations made in ANSI/TIA standards as well as manufacturer's recommendations and best industry practices.
- E. Each cable shall be individually attached to the respective enclosure/panel by mechanical means.
- F. Bend radius of the optic fiber cable in the enclosure/panel shall not exceed 10 times the outside diameter of the cable.
- G. Each cable shall be clearly labeled at the entrance to the patch panel. Cables labeled within the bundle shall not be acceptable.
- H. Fiber slack shall be neatly coiled stored inside enclosure or at an appropriate external location.
- I. Proper handling, inspection, and cleaning of all MTP and duplex connector interfaces prior to final connections is required to achieve factory performance results as detailed below.
 - 1. Installer shall visually inspect fiber connectors at every stage of handling BEFORE mating them.
 - 2. Inspection of both endfaces (Cord end and internal Bulkhead) before mating patch cords and/or MPO/MTP trunks is required.
 - 3. Cleaning both connectors each time you disconnect and reconnect is required.
 - 4. Inspection and cleaning of simplex and MPO/MTP fiber interfaces will adhere to the procedures detailed in International Standard IEC 61300-3-35.
 - 5. Objective inspection tools shall be used to perform endface inspection.

3.14 NETWORK CHANNEL EXTENDER SYSTEM

- A. All Network Channel Extension System designs must be reviewed, confirmed, and approved by the manufacturer of the system.
 - 1. All end devices, end device locations, and end device requirements must be determined before designing a Network Channel Extension System, including but not limited to distance, power needs, data needs, and environment.
 - a. Determine remote device(s) compliance to IEEE 802.3 PoE standards; Type 1-4, PoE 15 W, PoE+ 30 W, PoE++ 60 W, or PoE++ 100 W.
 - b. Determine the maximum distance between the remote device and the telecommunication closet or location where the source or chassis will be installed, for each device.
 - c. Identify if any component of the system (source/chassis, cable, remote module, device) will be installed in a location where they may be exposed

to voltage spikes or currents generated by electrical surges or lightning strikes and design the system accordingly.

- d. Confirm the environmental conditions (temperature, humidity, etc.) of which the components are expected to withstand and accommodate in the design.
- B. Follow the manufacturer's instruction manual, i.e., Leviton OneReach™ System Installation Manual
https://www.leviton.com/en/docs/Leviton_IST_OneReach_System.pdf. Review and understand all instructions from the manual completely before designing and installing the Network Channel Extension System.
- C. Safety
1. Never install communications components in wet locations, unless the components are specifically designed for use in wet locations.
 2. Never touch uninsulated wires or terminals unless the wiring has been disconnected from the network interface.
 3. Never install wiring or components during a lightning storm.
 4. Use caution when modifying or installing communications wiring or components.
 5. Be sure the chassis has all power supplies shut off before hooking up a cable and that the wire colors match the terminal block identification.
- D. Bulk cable and assembly installation
1. Ensure sufficient pathway/conduit size is available to accommodate the new cabling. Consider all parts of the cable, including the pulling eye assembly, when sizing pathways.
 2. Always pull in cable assemblies by attaching the pull rope to the pulling eye assembly, per the manufacturer's instructions.
 3. Cables shall be dressed and terminated in accordance with the recommendations made in the latest ANSI/TIA-568 standards, manufacturer's recommendations, and best industry practices.
 4. Minimum bend radius and maximum pulling tension for all cables shall be maintained during and after installation.
 5. All cable and associated hardware shall be placed to make efficient use of available space in coordination with other uses. All cable and associated hardware shall be placed to not impair the use or capacity of other building systems, equipment, or hardware placed by others (or existing).
 6. A plastic or nylon pull cord with a minimum test rating of 90 kg (200 lb.) shall be co-installed with all cable installed in any conduit.
 7. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
 8. Cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and be supported by messenger strand, cable ladder, or other method to provide proper support for the weight of the cable on alternating floors or as required by local codes.
 9. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

10. The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to manufacturer's requirements.
 11. Each cable shall be clearly labeled at the entrance to the enclosure. Cables labeled within the bundle shall not be acceptable.
 12. When splicing each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
 13. All spare fiber strands shall be installed into spare splice trays.
 14. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No fiber strand slack loops shall be allowed external to the fiber panel or enclosure.
- E. Remotes shall be placed in enclosures/boxes suitable for the environment such as NEMA Type 1 (indoors, typical) or NEMA Type 4 or greater (outdoors, typical). If any part of the system is outdoors, it is highly recommended that additional surge suppression be installed on both sides of the copper conductors connecting TR equipment to remote equipment. Warranty does not cover damage caused by surges induced on any part of the system.
- F. Grounding and Surge Protection
1. If any part of the system is outdoors, it is highly recommended that additional surge suppression be installed on both sides of the copper conductors connecting TR equipment to remote equipment.
 2. The manufacturer's instructions and requirements as well as the BICSI TDMM Chapter 9 (Bonding and Grounding) shall be utilized as general reference for grounding and bonding, to include the ER & TR Telecommunications Grounding Busbar (TGB) and sizing of grounding conductors. Grounding conductors shall be a minimum of #6 AWG insulated green stranded copper if length is less than 100ft. Consult NEC if length is more than 100ft.
 - a. For outdoors installations and other environments with potential surge events, 48 VDC surge protectors, specifically rated for lightning strike protection, are required to be included in the Network Channel Extension system. Additionally, in locations with potential surge events, a surge protector should be added to the network cables running to the powered device.
 - b. Proper grounding is required for surge protectors to operate correctly.
 - c. Regardless of these details, installations must be compliant with the requirements of the local authority having jurisdiction.
 3. The composite cable surge protector has two sides:
 - a. Telecommunications Room / Head-End:
 - (i) Unprotected input of the surge protector connects to the composite cable.
 - (ii) Protected input of the surge protector connects to the source.
 4. Remote End:
 - (i) Unprotected input of the surge protector connects to the composite cable.
 - (ii) Protected input of the surge protector connects to the remote module.

3.15 FIELD QUALITY CONTROL

A. OPTICAL FIBER TESTING AND QUALITY ASSURANCE- FIELD TERMINATED CABLING

1. Testing procedures shall be in accordance with the following:
 - a. ANSI/TIA-568.3-D.
 - b. ANSI/TIA-526-7, Method B.
 - c. ISO/IEC 14763-3
2. Testing:
 - a. Test optical fibers at both 850 nm and 1300 nm wavelengths for multimode, 1310 nm and 1550 nm wavelengths for singlemode, end-to-end insertion loss,
 - b. Maximum channel insertion loss for fiber optic cables without consolidation point: 2.0 db.
3. All OLTS units shall be of current calibration, submit calibration certificate with test results to Manufacturer.
4. Submit software copy of test results, in original tester software format, to the Owner and to Leviton.
5. One jumper reference method is required for fiber links.
6. Negative fiber attenuation results will not be accepted.

B. OPTICAL FIBER TESTING AND QUALITY ASSURANCE- FACTORY PRE-TERMINATED CABLING

1. Pre-terminated fiber optic trunk cables shall be installed as per the requirements specified by the manufacturer's installation guidelines.
2. Components shall be installed by factory trained personnel.
3. Proper handling, inspection, and cleaning of all MTP™ and duplex connector interfaces prior to final connections is required to achieve factory performance results.
 - a. Installer shall visually inspect fiber connectors at every stage of handling BEFORE mating them.
 - b. Inspection of both endfaces (Cord end and internal Bulkhead) before mating patch cords and/or MPO/MTP™ trunks is required.
 - c. Cleaning both connectors each time you disconnect and reconnect is required.
 - d. Inspection and cleaning of simplex and MPO/MTP™ fiber interfaces will adhere to the procedures detailed in International Standard IEC 61300-3-35.
 - e. Objective inspection tools shall be used to perform endface inspection.
4. Installation contractor shall perform optical test on all fiber channels upon completed installation to include continuity, attenuation, and length. Test results shall be provided to Leviton upon completion for full product warranty requirements.
5. All channel testing shall comply with ANSI/TIA-568.3-D as applicable.
6. Field test equipment must be Encircled Flux compliant to ANSI/TIA-526-14-C.

C. HORIZONTAL

1. Test 100 percent of all cable runs for defects in installation and verify cabling system performance under installed conditions in accordance with most current ANSI/TIA-568.0-E Series, ISO/IEC 11801-1, BICSI TDMM, manufacturer's recommendations, and best industry practices.
2. Defects in cabling system installation, including but not limited to cables, connectors, patch panels, and connector blocks shall be repaired or replaced to ensure 100 percent useable conductors in all cables installed.
3. Performance Certification Testing of Twisted-Pair Cables: (NOTE: Permanent Link Test results are recommended and are the expected norm).
 - a. Test twisted-pair copper cable links for continuity, pair reversals, shorts, opens, and performance as specified.
 - b. Test horizontal cabling using approved certification tester for Class EA performance compliance in accordance with ANSI/TIA-568.0-E.
 - c. Basic Tests Required:
 - i. Wire map.
 - ii. Length (feet).
 - iii. Insertion loss (dB), formerly attenuation.
 - iv. NEXT (Near end crosstalk) (dB).
 - v. Return loss (dB).
 - vi. ELFEXT (dB).
 - vii. Propagation delay (ns).
 - viii. Delay skew (ns).
 - ix. PSNEXT (Power sum near-end crosstalk loss) (dB).
 - x. PSELFEXT (Power sum equal level far-end crosstalk loss) (dB).
 - b. Provide test results in approved certification testers original software format on CD, with the following minimum information per cable:
 - i. Circuit ID.
 - ii. Information from specified basic tests required.
 - iii. Test Result: "Pass" or "Fail".
 - iv. Date and time of test.
 - v. Project name.
 - vi. NVP.
 - vii. Software version.
 - c. Submit fully functional version of tester software for use by the Owner in reviewing test results.
 - d. Report in writing to the Owner immediately, along with copy of test results, failed test results that cannot be remedied through re-termination (as in the case of reversed or split pairs).

1. All labeling is to be in accordance with ANSI/TIA-606-D, ISO 11801-1, adopted labelling schema, and manufacturer's instructions.
2. Label horizontal cables using machine-printed label at each end of cable at approximately 12 inches from termination point and again at approximately 48 inches from termination point.
3. Handwritten Labels: Not acceptable.
4. Label patch panel ports and TO ports with cable identifier.
5. City of Ontario Label scheme example:
 - a. Wall Plate: [(IDF/MDF) Room Number] [Port Number]
 - b. Patch Panel: [Port Number]

3.17 QUALITY INSPECTION REPORT

- A. The City of Ontario Information Technology (IT) Agency shall use a Quality Inspection Checklist Report for all projects to verify proper installation of the products in this document.

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