

## **1 GENERAL**

### **1.1 GENERAL REQUIREMENTS**

- .1 Supply and install a complete telecommunications cabling system based on a physical star wiring topology that is designed in accordance with and supported by a twenty-five (25) year manufacturer-backed warranty and certification as specified herein.
- .2 The structured cabling system must be standards compliant and will comprise of all components specified, implied, or otherwise necessary to constitute a fully operational system. The work includes, but is not necessarily limited to, the following:
  - .1 Cross-connect System.
  - .2 Horizontal cabling system.
  - .3 Telecommunications outlet/connector associated cords and adapters.
  - .4 Patch panels.
  - .5 Backbone cabling system.

### **1.2 DESCRIPTION OF WORK**

- .1 Data cabling system for the new Green Gables Visitor's Centre as indicated herein and which generally includes but is not limited to: cabling terminations, cross connects, backbone cabling, horizontal cabling, BIX panels, racks/frames, cable management, etc. Active components (hubs and switches) are not part of this work, except where indicated otherwise.

### **1.3 REFERENCES**

- .1 CAN/CSA C22.1-15, Canadian Electrical Code.
- .2 CAN/CSA C22.2 No. 226-92 (Reaffirmed 2011), Protectors in Telecommunications Networks.
- .3 ANSI/TIA/EIA-526-7-2002, Measurement of Optical Power Loss of Installed Single mode Fibre Cable Plant.
- .4 ANSI/TIA-526-14-A, Optical Power Loss Measurements of Installed Multimode Fibre Cable Plant.
- .5 ANSI/TIA-568-C.0-2009, Generic Telecommunications Cabling for Customer Premises

- .6 ANSI/TIA-568-C.1-2009, Commercial Building Telecommunications Cable Standard.
- .7 ANSI/TIA-568-C.2-2009, Balanced Twisted Pair Cabling and Components.
- .8 ANSI/TIA-568-C.3-2008, Optical Fibre Cabling Components Standard.
- .9 ANSI/TIA-568-C.4-2011, Broadband Coaxial Cabling and Components Standard.
- .10 ANSI/TIA-569-2012, Commercial Building Standard for Telecommunications Pathways and Spaces.
- .11 ANSI/TIA-569-C-2012, Optical Fibre Colour Coding.
- .12 ANSI/TIA/EIA-606-B-2012, Administration Standard for Commercial Telecommunications Infrastructure.
- .13 ATIS J-STD-607-C-2015, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
- .14 ANSI/TIA-758-A-2004, Customer Owned Outside Plant Telecommunications Infrastructure Standard.
- .15 BICSI Telecommunications Distribution Methods Manual (TDMM), latest edition.
- .16 BICSI Information Transport Systems Installation Methods Manual (ITSIMM), latest edition.
- .17 Canada Green Building Council (CaGBC)
  - .1 LEED (Leadership in Energy and Environmental Design) Green Building Rating System for New Construction and Major Renovations: LEED Canada-NC - 2009.

#### 1.4 QUALIFICATION OF CONTRACTOR

- .1 Qualified vendors must provide technical field services in compliance with labour standards (Communications Cabling Specialist, CCS). Obtain an installation permit from the Electrical Inspection Department for the Work on this Project
- .2 Source all structured cabling, termination hardware, and connecting cords from the certifying manufacturer to assure quality control and validity of the manufacturer's warranty.
- .3 Accept complete responsibility for the installation, certification, and support of the cabling system. Provide proof

that vendor has the certifying manufacturer's support on all of these issues.

- .4 Vendors must comply with all applicable Prince Edward Island Workers Compensation requirements.
- .5 Vendors must maintain current Prince Edward Island Construction Safety Association compliant status.
- .6 Qualified vendors must maintain Belden IBDN Certified System Vendor (CSV) accreditation throughout the duration of the project. Provide proof of certification with shop drawing and maintenance manual submissions.

#### **1.5 QUALIFICATION OF SYSTEM**

- .1 The cabling system, materials and installation practices must strictly conform to the current issue of industry standards TIA 568, TIA 568-C.2-1 and CSA C22.1 Canadian Electrical Code Part 1. All performance requirements of this document must be followed. In addition, workmanship and installation methods used shall be equal to or better than those found in the BICSI (Building Industry Consulting Service International) TDM Manual (latest edition).
- .2 The cabling system must conform to applicable local building and electrical safety codes. Have the vendor apply and receive acceptance for the installation by the electrical inspector as per the Canadian Electrical Code.

#### **1.6 PRODUCT DATA**

- .1 Submit product data indicating system components, mounting method, grounding, and special attachments including tie-ins to all external facilities.

#### **1.7 SUBMITTALS**

- .1 Submit:
  - .1 A complete telecommunications cabling system layout, including cable routing, telecommunications closet(s) and telecommunications outlet/connector designations. Layout to detail locations of all equipment and indicate all wiring pathways.
  - .2 Manufacturer's technical documentation on all devices used in cabling system.
  - .3 Results of all tests for review. Conduct and pay for all required testing as indicated herein.

## 1.8 IDENTIFICATION

- .1 Provide identification for communications systems in accordance with Section 26 05 01 - Electrical Identification.

## 2 PRODUCTS

### 2.1 BACKBONE CABLING

- .1 Backbone cables to consist of multi-strand OM4 multi-mode fibre optic cable, multi-strand OS2 single-mode fibre optic cable, multi-pair Category 6 data, and multi-pair Category 3 voice riser cable. Refer to riser diagram on drawings for number of stands/pairs required.
- .2 Configure backbone cabling as a physical star, with separate dedicated cables to each remote telecommunication cabinet. Identify backbone cables with permanent labels at both ends. Label will indicate building and room. Labels must be in accordance with Section 26 05 01 - Electrical Identification.
- .3 Fibre optic cabling to consist of 50/125mm, multi-mode, OM4 cable and single-mode OS2 cable. Run all fibre optic cable in inner duct at all times. Each end of all fibre runs must contain a slack loop of at least 2 m of cable.
- .4 Provide inner duct for all fibre optic cables installed in conduit.
- .5 Provide all cables complete with a minimum CMR (FT-4) jacket and installed in conduit.
- .6 Terminate and test all copper cables; final termination of fibre optic cable is by the Departmental Representative.

### 2.2 TERMINATION SUB-SYSTEMS

- .1 Telecommunications equipment racks:
  - .1 Equipment racks should be set up to allow for standards compliant cabling systems and usable areas for cable management.
  - .2 Provide wall-mounted racks as indicated. Racks to be standard TIA 483 mm (19") wide. Racks are to be black in colour, with a minimum of 19U of rack space and tapped #10/32.
- .2 Cable Management:

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- .1 Provide 150 mm- and 305 mm-wide vertical cable management as indicated on the drawings. Provide each cable managers complete with two (2) slack spool kits.
  - .2 Provide horizontal cable manager between rows of racks as indicated on the drawings.
  - .3 Patch Panels:
    - .1 Patch panels to be TIA-568C Category 6 complete with RJ45 jacks and designed for mounting in 483 mm (19") racks. Provide all required mounting brackets and hardware.
    - .2 All patch panels must be fully populated with jacks, regardless of quantity terminated.
    - .3 Patch panels to be 48-port, 2U, black, flex patch panels.
    - .4 Patch panel modular jacks (MVDO) as follows:
      - .1 Telephone riser: Green.
      - .2 Voice distribution: Blue.
      - .3 Data distribution: Grey.
      - .4 CATV distribution (F-type): White.
  - .4 Work area telecommunications outlet/connector:
    - .1 The work area telecommunications outlet/connector is the interface between the horizontal wiring and the work area device (via line cord).
    - .2 Install all telecommunications outlet/connectors in an appropriate faceplate.
    - .3 Faceplates to be clean in appearance and complete with identification inserts and clear covers. Mounting hardware must not be visible on the faceplate.
    - .4 Flush mounted faceplates to accommodate modular telecommunications outlet/connectors and other multimedia outlets as indicated provide with required number of connectors.
    - .5 The eight-position modular UTP telecommunications outlet/connector and its pin assignments must meet the requirements described in the TIA-568C standard as T568A, and must be CAT 6 compliant.
    - .6 All work area telecommunications outlets to have their modular outlets colour coded as follows:
      - .1 Telephone riser: Green.
      - .2 Voice distribution: Blue.
      - .3 Data distribution: Grey.
      - .4 CATV distribution (F-type): White.
    - .7 Supply and install blank module covers in all unused openings in faceplates. Colour to match faceplate.
    - .8 Uniquely label each telecommunications outlet. The label will form an integral part of the faceplate.
    - .9 Provide dust covers for all work-area telecommunications modular outlets.

- .5 Provide a rack Mounted uninterruptible power supply with the following features:
  - .1 2200VA, 1600W.
  - .2 120V with CSA type 5-20P plug.
  - .3 Full load efficiency 89% minimum.
  - .4 Output distortion less than 3%.
  - .5 Sine wave output.
  - .6 Six (6) CSA type 5-15R Outputs.
  - .7 Built in bypass mode.
  - .8 Minimum 1.83m cord length.
  - .9 Maintenance free sealed lead acid battery with suspended electrolyte.
  - .10 USB connection to PC for monitoring and setup.
  - .11 LED status display showing current mode, load, battery level, and alarms.
  - .12 Emergency power off (EPO).
  - .13 Rack-mounted external expansion battery pack for extended runtime.
  - .14 Rack mountable in a 2U enclosure.

### 2.3 HORIZONTAL CABLING

- .1 Horizontal cables to consist of eight (8) #23 AWG insulated, solid conductors, formed into four individually twisted pairs. Refer to drawings for location and quantity of horizontal data cables.
- .2 Limit the horizontal cable length from the telecommunications rack to the farthest workstation area to 90 m, as specified in the TIA-568-C standard document.
- .3 The installation of the horizontal cable must follow the appropriate recommendations covered in the respective manufacturer's design guide and the appropriate standards documents. This is done in order to provide adequate protection from electromagnetic interference (EMI) sources and to confirm all components and cables are in good condition after installation.
- .4 All UTP data cabling must be CAT 6 cable and meet or exceed the transmission and electrical characteristics of the TIA 568-C.2-1 requirements for horizontal cabling for Extended Frequency LANs. The UTP cable to be minimum CMP (FT-6) rated cable. The UTP cable consists of #23 AWG thermoplastic insulated solid conductors formed into four (4) individually twisted pairs and enclosed in a thermoplastic jacket.

- .5 Provide technology J-hooks, conduit, pull boxes as indicated or as required by code.
- .6 Provide technology all faceplates and appurtenances necessary for the installation of telecommunications outlets in wall boxes. Install conduit and boxes in walls where indicated.
- .7 All data cabling must be home runs (1 cable per drop) from the telecommunications closet to the work area.
- .8 Colour code horizontal cabling as follows:
  - .1 Data cabling to have blue outer jacket (includes all equipment connected to the data network, such as video surveillance cameras and data outlets for building automation system equipment, etc.).
  - .2 Voice cabling to have white or grey outer jacket
  - .3 Special application cabling to have yellow outer jacket.
  - .4 All building service wiring not part of the Network to be Green.

## 2.4 MODULAR LINE AND PATCH CORDS

- .1 General:
  - .1 Modular line/patch cords consist of #24 AWG insulated, solid or stranded conductors formed into four (4) individually twisted pairs and enclosed in a jacket. No cord may degrade the required channel performance characteristics as per TIA-568-C. Cover all cords by the manufacturer's warranty and certification. All cords must maintain the appropriate polarity.
  - .2 Total line and patch cord lengths per channel must not exceed 10 m.
  - .3 Work area (line cords):
    - .1 Use modular line cords to attach each workstation network interface card to a telecommunications outlet/connector. They must not normally exceed 3 m in length as per TIA-568-C. Provide line cords with eight-position modular plugs terminated at both ends. The modular plugs must comply with TIA-568-C. Pin configuration to be T568A (as per TIA-568-C).
    - .2 Use manufacturer factory-built and tested connectorized cords.
    - .3 Provide 3 m long line cords.
    - .4 Provide sufficient quantity of line cords for total number of horizontal data cables installed.
  - .4 Telecommunications closets (patch cords):

- .1 Use modular patch cords to patch within each cross-connect. They must not exceed 6m in length as per TIA-568-C. Provide patch cords with eight-position modular plugs terminated at both ends.
- .2 Use manufacturer factory-built and tested connectorized cords.
- .5 Specifications:
  - .1 All copper line and patch cords must be manufacturer backed, built and tested with Category 6 characteristics which comply with TIA-568-C.

### 3 EXECUTION

#### 3.1 INSTALLATION

- .1 Label all telecommunications outlet/connectors, patch panels, cross connects, cabinets, and other components in accordance with Section 26 05 01 - Electrical Identification. Regardless of the numbering scheme, every cable must have the same permanent identifier on its termination hardware at both ends. Have the numbering scheme approved by the Departmental Representative.
- .2 Properly bond each equipment/distribution rack in the telecommunications room to a ground bus in accordance with the applicable code requirements as per ANSI-607 and Section 26 05 00 - Common Work Results for Electrical.
- .3 Provide basket trays and install in the communications room to manage cable concentrations above the racks in an orderly fashion. Refer to drawings for basket tray layout. Install cable management in racks and on walls.
- .4 Perform installation in a professional manner using the best practices in the industry. Best practices include, but are not limited to the following points:
  - .1 All cabling must be continuous without joints, or splices from the work area to the telecommunications room.
  - .2 Install all cables in conduits in walls and in areas with exposed ceilings. Provide technology J-hooks (1-24 cables only) above accessible ceilings. Ensure cables above ceilings are within 750mm of ceiling. Provide cable trays where noted on the drawings. The maximum number of bends between cable pulling points will be two (2) ninety degree bends over a maximum of 30 m.
  - .3 Horizontal fill ratios for conduit, cable trays, raceways, and ducts must conform to standards and manufacturer

- recommendations including 25% spare for future installation.
- .4 Follow standards for separation distances between cables and sources of electromagnetic interference.
  - .5 Handle, install, and support all cables in accordance with the manufacturer's guidelines. During the laying of the cable, take care not to overstress the cable. After the cable is installed, make sure that all parts of the cable are supported properly and stress free at both ends and throughout their length.
  - .6 Give appropriate attention to the handling of all cables to confirm bending radius conforms to the manufacturer's requirements. At no time shall the cable's static or dynamic bending radius be exceeded.
  - .7 Securely mount all telecommunications outlet/connectors at all work area locations and locate so that the cable required to reach the work area equipment will be no longer than three meters.
  - .8 Coordinate work with that of other trades.
  - .9 Terminate all four (4) pairs of unshielded twisted pair (UTP) cable on a single port. The splitting of cable pairs between different jacks is not permitted.
  - .10 Provide a minimum 3 m service loop at the telecommunications room by routing the cables to the rack by the longest route in the cable tray within the TR.
  - .11 Provide 1.5 m cable slack loops above the telecommunications outlet in the accessible ceiling space. The loops must have a minimum bend radius of 225 mm.
  - .12 Install all optical fibre backbone cabling inside 32 mm diameter inner-duct. Inner-duct shall be green in colour and minimum FT-4 rated complete with pull tape.
  - .13 Terminate voice backbone cables with two (2) pairs per port.
- .5 Install outside plant (OSP) cables in accordance with ANSI/TIA-568-C. Outside plant (OSP) cables within the premise must be run in conduit, except that a maximum of 3 m may be exposed at the termination point.

### 3.2 RCDD PROJECT MANAGER

- .1 General:
  - .1 Retain the services of one (1) Registered Communications Distribution Designer (RCDD) for the duration of project. The RCDD must be identified and the must provide a copy of the RCDD current certificate and BICSI membership on a timely basis prior to the commencement of work.
- .2 Have the RCDD maintain responsibility for the following:

- .1 Review and accept the Telecommunications Distribution System materials, hardware and related components proposed. Review the proposed pathways and spaces and accept the size and location of all telecommunications spaces. Notify the Departmental Representative of any issues or concerns related to CSA, IEEE and TIA specification compliance.
- .2 Review and approve Telecommunications Distribution System material shop drawings prior to submission to the Departmental Representative.
- .3 Ensure system installation practices and procedures comply with all applicable CSA, IEEE, and TIA/EIA specifications and procedures.
- .4 Provide regular project status reports and updates as requested by the Departmental Representative.
- .5 Observe testing and certification procedures and provide manufacturers assurance and warranty.
- .6 Review and approve all project as-built documentation including drawings, test reports, details and provide current RCDD seal on all.

### 3.3 TESTING AND CERTIFICATION

- .1 Provide commissioning, verification, inspection, and certification. Conduct and pay for all tests required.
- .2 Conduct end-to-end testing for UTP copper for 100% of pairs as follows:
  - .1 Balanced twisted-pair cable testing:
    - .1 Use testing procedures applicable to the horizontal cabling configuration to meet field test compliance. Consolidation/Transition points are optional interface points as specified and permitted under ANSI/TIA/EIA specifications and are considered a seamless link for acceptance testing.
    - .2 The field testing acceptance parameters for balanced twisted-pair cabling are as follows:
      - .1 Wire map (continuity).
      - .2 Length.
      - .3 Insertion loss.
      - .4 NEXT Loss.
      - .5 ELFEXT.
      - .6 Propagation delay and delay skew.
      - .7 Return loss.
      - .8 Power sum near-end crosstalk (PSNEXT) loss.
      - .9 Power sum equal level far-end crosstalk (PSELFEXT).
  - .3 Level III field test instruments are required for measurements up to Category 6 and Class E cabling.

- .4 Document and provide to the Departmental Representative acceptance testing results.
- .3 Testing of fibre optic cabling will be performed by the Departmental Representative.
- .4 Verify labelling of all wiring at all termination points in accordance with Section 26 05 01 - Electrical Identification.
- .5 The Departmental Representative reserves the right to check and verify all installation performed by the Contractor. In case of failure to meet certification standards, reinstall any non-compliant cabling at no additional cost to the Contract.

### 3.4 PROJECT DOCUMENTATION

- .1 Record Drawings:
  - .1 Provide record drawings in both hard copy and CD-ROM format.
  - .2 Drawings in AutoCAD .dwg file format will be provided by the Departmental Representative to the Contractor for preparation of the Record drawings.
  - .3 Record drawings to provide the following information:
    - .1 All work area telecommunications outlet locations as constructed.
    - .2 Project administration system identifiers for telecommunications outlets as specified within this document.
    - .3 Project administration system identifiers for telecommunications spaces as specified within this Section.
  - .4 Provide hard-copy format record drawings in ISO B1 format.
- .2 Test Results:
  - .1 Provide test results on CD-ROM or USB memory stick in Fluke Linkware format (.FLW files).
  - .2 Provide test results in hard-copy format and include with the Operation and Maintenance Manual submission.
- .3 Manufacturers' Warranty:
  - .1 Provide a manufacturer generated and supported Product Warranty and Application Assurance certificates upon completion of installation and acceptance by the Departmental Representative.
  - .2 Product Warranty and Application Assurance must provide coverage of materials and labour for a minimum of twenty (20) years from date of Substantial Completion, regardless of installing agent/vendor status.

.4 RCDD Project Certification:

- .1 Provide RCDD Project Certification in hard copy format.
- .2 Provide the RCDD's current certificate.

**END OF SECTION**

## **1 GENERAL**

### **1.01 SYSTEM DESCRIPTION**

- .1 Telecommunications raceways system consists of outlet boxes, cover plates, terminal distribution cabinets, conduits, pull boxes, sleeves and caps, fish wires.
- .2 Overhead distribution system.

## **2 PRODUCTS**

### **2.01 MATERIAL**

- .1 Conduits: to Section 26 05 34 - Conduits, Conduit Fittings, and Fastenings.
- .2 Outlet boxes: to Section 26 05 32 - Outlet Boxes, Conduit Boxes, and Fittings.
- .3 Fish wire: polypropylene type.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Install cable tray, basket tray and raceway system, including fish wire, outlet boxes, pull boxes, cover plates, conduit, sleeves and caps, miscellaneous and positioning material to constitute complete system and in accordance with Section 26 05 34 - Conduits, Conduit Fittings and Fastenings.
- .2 Provide corrugated Inner duct for all fibre optic cables installed in conduit or cable tray. Extend Inner duct to rack-mounted patch panels in the communication rooms.
- .3 Use EMT in areas with unfinished or inaccessible ceiling systems and in all walls. Size in accordance with cable manufacturers' recommendations and the requirements of the Canadian Electrical Code. Conduit sizing to include a 25% allowance for future. Under no circumstance install more than 40% fill ratio in any conduit, including the 25% allowance. Install bond conductor in all EMT.
- .4 Provide nylon insulated bushings at conversion of EMT to free air system.

- .5 EMT type conduit wall-stub complete with flush installed device box shall be located in all walls/partitions. Turn out stubs into accessible ceiling space within the same room where possible.
- .6 Where the grouping of various systems outlets or multiple type outlets in drywall type construction is specified, install box mounting brackets between and secured to both metal studs. Install suitably sized 100mm square and/or 119mm boxes complete with raised tile rings as required.
- .7 Minimum conduit size to be 27 mm diameter.
- .8 Each telecommunications outlet box to be a minimum 119 mm square, 54 mm deep box, complete with one-gang raised plaster ring.
- .9 Where telecommunication outlet boxes are required to be surface mounted, provide a single gang deep "FS" type box (minimum volume 368 mL) complete with "FS" type cover plate.
- .10 Do not install more than four (4) cables in a double-gang box.

**END OF SECTION**