

PART 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 25 year manufacturer backed warranty and certification as specified herein.
- .2 Tie in the building's telecommunications system into the facility's telecommunication system.
- .3 The structured cabling system to be standards compliant based upon a structured cabling system and should be composed of the following interdependent sub-systems:
 - .1 Cross-connect System.
 - .2 Horizontal cabling system.
 - .3 CATV Cabling
 - .4 Telecommunications outlet/connector associated cords and adapters.
 - .5 Patch panels.
 - .6 Backbone cabling system.
 - .7 UPS.
 - .8 Networking switch.
 - .9 Racks and enclosures.

1.2 DESCRIPTION OF WORK

- .1 Data cabling system for the Building as indicated herein and which generally includes but is not limited to cabling terminations, cross connects, backbone cabling, horizontal cabling, BIX panels, racks/frames/enclosures, cable management, ethernet switch, fibre interface, UPS, patch cables, etc.

1.3 QUALIFICATION OF CONTRACTOR

- .1 All installation staff must show proof of certification with Nova Scotia Department of Labour and Advanced Education for low voltage installations. Obtain an installation permit from the Electrical Inspection Department for the work on this Project
- .2 All structured cabling, termination hardware, and connecting cords shall be sourced from the certifying manufacturer to assure quality control and validity of the manufacturer's warranty.
- .3 Structured cabling system to be Belden/CDT, System 2400 or Commscope Systimax.
- .4 The vendor, will accept complete responsibility for the design, installation, certification, and support of the cabling system. Contractor must show proof that vendor has the certifying manufacturer's support on all of these issues.
- .5 Qualified vendors must provide technical field services in compliance with labour standards (e.g. Communications Cabling Specialist CCS).
- .6 Vendors to comply with all applicable Nova Scotia Workers Compensation requirements.
- .7 Vendors must maintain current Nova Scotia Construction Safety Association NSCSA compliant status.
- .8 Qualified vendors to maintain current Building Industry Constructors Services International (BICSI) membership.

- .9 Qualified vendors to maintain manufacturer recognition as a certified installation contractor for the telecommunications product solution being implemented.

1.4 QUALIFICATION OF SYSTEM

- .1 The cabling system, materials and installation practices must strictly conform to the current issue of industry standards, ANSI/TIA-568-C.0, ANSI/TIA-568-C.1, ANSI/TIA-568-C.3, ANSI/TIA-569, ANSI/TIA-598, ANSI/TIA-604-10, ANSI/TIA-607, ANSI/NECA/BICSI 568, CSA C22.1 Canadian Electrical Code Part 1 and the Nova Scotia Government Structured Cabling Standards. All performance requirements of this document must be followed. In addition, workmanship and installation methods used must be equal to or better than those found in the BICSI (Building Industry Consulting Service International) TDMM (latest edition).
- .2 The cabling system must conform to applicable local building and electrical safety codes. The vendor shall apply and receive acceptance for the installation by the electrical inspector as per the Canadian Electrical Code.

1.5 REFERENCES

- .1 CAN/CSA C22.1-12, Canadian Electrical Code.
- .2 CAN/CSA C22.2 No. 226-92(R2011), Protectors in Telecommunications Networks.
- .3 ANSI/TIA/EIA 568Set, Commercial Building Telecommunications.
- .4 ANSI/TIA 569-2012, B Commercial Building Standard for Telecommunications Pathways and Spaces.
- .5 ANSI/NECA/BICI 568-2006, Standard for Installing Building Telecommunications Cabling.
- .6 NFPA 262-2011, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air Handling Spaces.
- .7 EIA/TIA-568-C.0-2009, Generic Telecommunication Cabling for Customer Promises.
- .8 EIA/TIA-568-C.1-2009, Commercial Building Telecommunications Cabling Standard, Part 1 General Requirements.
- .9 EIA/TIA-568-C.3-2008, Optical Fiber Cabling Components Standard.
- .10 EIA/TIA-569-2012, Commercial Building Standard for Telecommunications Pathways and Spaces.
- .11 EIA/TIA-604-10-2002, FOCIS 10 fiber Optic Connector Intermateability Standard, Type LC.
- .12 EIA/TIA-607-2013, Commercial Building Bonding Requirements for Telecommunications.
- .13 TIA 526-7-2008, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.
- .14 TIA 527-14-2010, Measurements of Installed Multimode Fiber Cabling.
- .15 TIA 598-2005, Optical fiber Cable Color Coding.
- .16 UL 1666-2007, Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts.

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 RECORD DATA

- .1 The vendor will provide an end user's manual describing the essential system elements, as well as the end user's responsibility for maintaining the integrity of the cabling system over time. This Manual must include, as a minimum, guidelines for system expansion and modification as well as labelling, test results, and record keeping.
- .2 Record on one (1) set of white print drawings all of the cable locations and all approved changes and other details. Show all cable runs by the labelled numbering system. Supply a complete, current and accurate set of record drawings and floor plans at job completion.
- .3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

1.8 SUBMITTALS

- .1 Submit:
 - .1 A complete telecommunications cabling system layout, including cable routing, telecommunications closet(s) and telecommunications outlet/connector designations. The layout shall 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. Contractor will conduct and pay for all required testing as indicated herein.

1.9 IDENTIFICATION

- .1 Telecommunications Spaces:
 - .1 Uniquely identify telecommunications spaces within a building as part of a complete administration system.
 - .2 Use the room designation number within the administration system identifier as follows and use "Iamicaid" type nameplate minimum 50mm X 300mmL.

Example: TR-110
Where TR denotes Telecommunications Room
110 denotes room number

- .3 For the Main Telecommunications room, use 'MTR' as the abbreviation for the room type.
- .4 The Iamicaid nameplate shall be secured to the exterior of the door entering that space.
- .5 All telecommunications equipment racks within each telecommunications space require a unique component identifier as part of the administration system by a "Iamicaid" type nameplate, minimum (50mm H) X (600mm L) shown and secured to the upper horizontal rail of the equipment rack.

Example: TR-110-Rack 1
Where Rack 1 denotes rack position in bay
110 denotes architectural room number

TR denotes Telecommunications room

.6 All telecommunications termination hardware within the telecommunications space requires a unique component identifier as part of the administration system. Identifiers are to be self adhesive thermal transfer type (minimum 300mm long x 50mm high) and placed appropriately to indicate all ports.

.2 Horizontal Distribution System:

.1 Uniquely identify all horizontal cabling with a wrap type self laminating adhesive label with mechanically generated (not hand written) identifier.

.2 Horizontal cable identifiers to denote basic telecommunications system application and the originating telecommunications space termination equipment port:

Example: D-024
where 'D' denotes 'data', '024' denotes
'Termination Equipment port number'

.3 For other telecommunications cabling system other than data, use the following abbreviations:

.1 V=Voice

.2 DB=Data Backbone

.3 VB=Voice Backbone

.4 DMR=Demarcation Backbone

.3 Work Area:

.1 For the purposes of system administration, the work area includes the telecommunications outlet faceplate, all outlet termination hardware and 3m long work area patch cord.

.2 All telecommunications outlet faceplates to be standard four port configuration with port assignments as shown.

.3 All Telecommunications Outlet (TO) locations require a unique component identifier as part of the administration system by a "lamicoid" type etched vinyl nameplate, minimum 120mm H X 70mm L and secure to the wall-space centered and above min. 12mm the telecommunications outlet faceplate.

.4 Telecommunications work area outlet identifiers must denote basic telecommunications system application, originating telecommunications space and termination equipment port:

Example: TR-118 D-012
Where: TR denotes telecommunications room
118 denotes room number
D denotes data
012 denotes termination equipment port
number

.4 Backbone System:

.1 For the purposes of system administration the backbone system shall include all backbone system cabling only.

.2 Uniquely identify all backbone system cabling with a wrap type self laminating adhesive label with mechanically generated (not hand written) identifier.

.3 Backbone cable identifiers to denote basic telecommunications system application and originating telecommunications space.

.5 Telecommunications Demarcation Facilities:

.1 For the purposes of system administration, the telecommunications demarcation facilities will include three basic components;

.1 Building cross-connect hardware.

.2 Building demarcation backbone cable.

- .3 Building demarcation termination hardware.
- .2 All Building cross-connect hardware within the telecommunications space requires a unique component identifier as part of the administration system. Identifiers must be self-adhesive thermal transfer type and placed appropriately to indicate applicable pair assignments as shown;
- .3 All administration system requirements for associated termination hardware located within the telecommunications spaces are addressed in clause 1.8.1.
- .4 Uniquely identify all telecommunications demarcation backbone cabling with a wrap type self-laminating adhesive label with mechanically generated (not hand written) identifier.
- .5 All telecommunications demarcation backbone cable identifiers to denote basic telecommunications system application and originating telecommunications space.

PART 2 - PRODUCTS

2.1 BACKBONE CABLING

- .1 Indoor distribution optical fiber non-conductive tight-buffered cable:
 - .1 Optical fiber cable to be designed for low to high fiber count in building installations.
 - .2 Optical fibre cable to be available in multimode, single-mode or both as a composite cable.
 - .3 Optical fiber cable to be available with up to 144 fibers, with tight-buffered fibers placed in a colour-coded subunit bundle with aramid strength elements.
 - .4 Optical fiber cable to be available with Riser (OFNR) or Plenum (OFNP) fire rating.
 - .5 Optical fiber cable to be fully dielectric, with no metallic elements in the cable.
 - .6 Optical fiber cable to have 900µm tight-buffered fibers to allow the use of field-installable connectors.
 - .7 Optical fiber cable to be made of flexible thermoplastic jacket to provide excellent handling characteristics.
 - .8 Optical fiber cable to have decreasing sequential print on cable jacket or remaining cable length.
 - .9 Optical fiber cable to have fibers and cable sub-units colour-coded for easy identification.
 - .10 Single-mode cable to be a low water peak single-mode fiber.
 - .11 Optical fiber cable to have a minimum bending radius of 10x cable diameter (long term no load) and 15x cable diameter (short term load).
 - .12 Optical fiber cable to have a storage temperature of -40°C to +80°C and an operating temperature of -20°C to +70°C.
 - .13 Optical fiber cable to be UL/cUL rated type OFNP/OFN FT6 in accordance with the flame resistance standards UL 1666 and NFPA 262.

Cable Type	Attenuation (max) dB	OFL Bandwidth (min) MHz*km	RML Bandwidth (min) MHz*km
Wavelengths (nm)	800 1300 1500	85 1300	850
OM3 laser optimized 50/125µm Multimode	3.5 1.25 -	1500 500	2000

- .14 Voice backbone to be 100 PR CTP cables.

2.2 TERMINATION SUB-SYSTEMS

- .1 Telecommunications Cabinets (TC's) and horizontal cross-connect:
 - .1 Set up TCs should to allow for standards compliant cabling systems and usable areas for cable management.
 - .2 The TCs will house, various floor and wall-mounted telecommunications equipment, in addition to the cross-connecting hardware. Provide free standing enclosure as indicated or as required. Provide telecommunications (LAN) enclosures in the Communications Room as indicated. Enclosures are to be Standard EIA 19" wide and with 150mm wide vertical cable management with hinged cover on both sides of the rack and horizontal cable management. Racks are to be black in colour, with a minimum of 45U of rack space and tapped #10/32. Provide two (2) integral rack shelves for future LAN equipment, two (2) 19 6-15A outlet power strips, dual split front and back tempered glass lockable doors, swing latch and 10" ventilation fan.
 - .3 The copper cross-connect system shall be sized to support the telecommunications outlet/connectors served by that closet. The layout shall be sized for 10% growth.
 - .4 Supply and install "blank" dust covers in all unused openings in patch panels. Colour to match patch panel.
 - .5 Patch panels to be Cat. 6, 24 or 48 port patch panel, designed for mounting in 19" racks.
 - .6 Avaya 4526T-PWR Networking Switch.
 - .7 Cisco 100 Meg FX SFP fibre interface.
 - .8 Eaton 9130 700VA pedestal UPS.
- .2 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 Face plates to be clean in appearance. Mounting hardware must not be visible on the faceplate, if at all possible. Make face plates in walls of vertically brushed stainless steel.
 - .4 Flush mounted faceplates must accommodate modular telecommunications outlet/connectors as indicated and be provided with required number of connectors. No additional mounting hardware will be required to mount outlet/connectors into faceplate. Standard outlet to accommodate four (4) data ports.
 - .5 The eight-position modular UTP telecommunications outlet/connector and its pin assignments must meet the requirements described in the standards CSA T568A and be CAT 6 compliant.
 - .6 Uniquely label each telecommunications outlet. The label forms an integral part of the faceplate.
 - .7 All work area telecommunications outlets shall have their modular outlets colour coded as follows:
 - .1 Data to be blue.
 - .2 Voice to be white.
 - .8 Supply and install "blank" dust covers in all unused openings in face plates. Colour to match face plate.

2.3 CONNECTORS

- .1 Telecommunications outlet/connector (modular jacks):
 - .1 Connectors shall have as a minimum all of the performance parameters outlined in EIA/TIA 568-B.2-1.
 - .2 Colour coding at TC terminations:
 - .1 Orange for UTP data backbone.
 - .2 Green for incoming UTP voice backbone.
 - .3 Blue for UTP data horizontal cabling.
 - .4 White for UTP voice horizontal cabling.
 - .3 Colour coding at work area outlet:
 - .1 Blue for data.
 - .2 White for voice.

- .2 Field installable connectors:
 - .1 Optical fiber field installable connectors to provide a rapid mechanism for the field-connectorization of multimode 62.5/125 micron, 50/125 micron or single-mode 9/125 micron fiber cabling with either ST compatible, SC or LC connectors and a connection point for optical fiber cord assemblies.
 - .2 Optical fiber field-installable connector must:
 - .1 Be available to ST-compatible, SC or LC format, for installation onto either multimode 62.5/125 micron fiber, 50/125 micron fiber or singlemode 9/125 microns fiber.
 - .2 Be field installs, without requiring epoxy or polishing.
 - .3 Be compatible with 3 mm or smaller jacketed fibers, 900 micron tight-buffered fibers and 250 micron loose-tube fibers.
 - .4 Have a 50 micron connector that contain a Laser-Optimized fiber stub that is compatible with the Laser-Optimized fiber types and is backward compatible with the regular 50 micron fiber types.
 - .5 Have a ceramic ferrule and a factory PC polish for multimode and SPC for singlemode.
 - .6 Have a typical Insertion Loss of 0.3 dB.
 - .7 Have a typical Reflectance of -30 dB for multimode and a guaranteed reflectance of -40 dB for singlemode.
 - .8 Have a durability rating change of less than 0.2 dB for multimode and 0.3 dB for singlemode after 500 cycles.
 - .9 Have an unlimited shelf life.
 - .10 Have a tensile load on jacketed fiber of 50N (5.1 kg/11.2 lbs) and a tensile load of 900 micron tight-buffered fiber of 6.7N (0.68 kg/1.5 lbs).
 - .11 Have a storage temperature of -40° to 65°C (-40° to 149°F) and an operation temperature of 0° to 60°C (32° to 140°F).
 - .12 Have a tool kit available to easily make the connector installation.
 - .3 CATV cabling connectors shall be BNC type

2.4 HORIZONTAL CABLING

- .1 Horizontal cables consists of eight (8) #23 AWG insulated, solid conductors, formed into four (4) individually twisted pairs. Refer to drawings for location and quantity of horizontal data cables.
- .2 The horizontal cable length from the telecommunications rack to the farthest workstation area shall be limited to 90m.
- .3 Installation of the horizontal cable to follow the appropriate recommendations covered in the respective manufacturer's design guide and the appropriate standards documents. This is done in order to ensure adequate protection from electromagnetic interference (EMI) sources and to confirm all components and cables are in good condition after installation.
- .4 UTP data cabling shall be CAT 6 cable and meet or exceed the transmission and electrical characteristics of the EIA/TIA 568-B.2-1 requirements for horizontal cabling for Extended Frequency LANs. The UTP cable to be minimum FT6 rated cable. The UTP cable consists of #23 AWG thermoplastic insulated solid conductors formed into four individually twisted pairs and enclosed in a thermoplastic jacket.
- .5 Provide conduit, pull boxes as indicated or as required by code.
- .6 Provide technology all face plates and appurtenances necessary for the installation of telecommunications outlets in wall boxes. Install conduit and boxes in walls where indicated.
- .7 All data and voice cabling to be home runs (1 cable per drop) from the telecommunications closet to the work area.
- .8 Horizontal data cabling to be blue in colour. Horizontal voice cabling to be white in colour.

- .9 CATV cabling to be RG6 Coaxial, quad shield, black in colour

2.5 MODULAR LINE AND PATCH CORDS

- .1 General:
 - .1 Modular line/patch cords consist of #23 AWG insulated, solid or stranded conductors formed into four individually twisted pairs and enclosed in a jacket CAT 6. No cord may degrade the required channel performance characteristics as per CSA T529. All cords shall be covered by the manufacturer's warranty and certification. All cords shall maintain the appropriate polarity.
- .2 Total line and patch cord lengths per channel must not exceed 10m.
- .3 Work area (line cords):
 - .1 Use modular line cords to attach each workstation network interface card to a telecommunications outlet/connector, 3m in length. Terminate line cords with eight (8) position modular plugs at both ends. The modular plugs to comply with CSA T529. Pin configuration to be T568A (as per CSA T529).
 - .2 Use manufacturer factory built and tested connectorized cords.
 - .3 Provide 3m long line cords.
 - .4 Provide sufficient quantity of line cords for total number of horizontal data cables installed.
- .4 Telecommunications closets (patch cords):
 - .1 Modular patch cords shall be used to patch within each cross-connect. Terminate patch cords with eight (8) position modular plugs at both ends.
 - .2 Provide 1.5m long patch cords unless noted otherwise. Coordinate colours with Departmental Representative.
 - .3 Use manufacturer factory built and tested connectorized cords.
 - .4 Provide sufficient quantity of patch cords for crossing over all horizontal data and backbone cables in telecommunications room.
- .5 Specifications:
 - .1 All copper line and patch cords to be manufacturer backed, built and tested with Category 6 characteristics which comply with EIA/TIA 568- B.2-1.

2.6 FAST ETHERNET SWITCH

- .1 Fast ethernet switch to be a 48 port managed switch with power over ethernet PoE (Power Over Ethernet) capability. Switch is to have the following features.
 - .1 48 10/100 BASE-TX ports supporting 802.3af PoE.
 - .2 Two (2) combo 10/100/1000 BASE-SFP (fibre ports).
 - .3 Rack mountable 1U enclosure.
- .2 Standard of acceptance: AVAYA ERS 4526T-PWR+ or equivalent alternate.

2.7 RACK MOUNT UNINTERRUPTABLE POWER SUPPLY

- .1 Uninterruptable power supply (UPS) to be an online type with the following features:
 - .1 700VA, 630W.
 - .2 120V with NEMA 5-15 plug.
 - .3 Full load efficiency ~95%, 86% in online mode minimum.
 - .4 Output distortion less than 3%.
 - .5 Sine wave output.
 - .6 Six (6) NEMA 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 Remote emergency power off (REPO).
- .13 Optional external expansion battery pack modules (EBM) for extended runtime, (2U) in size.
- .14 Rack mountable in a 2U enclosure.
- .15 Provide unit complete with communications card(s) for direct control and remote monitoring via SNMP based networks, web browser interface, relay card(s) for integration into existing Building Management System.

2.8 RACKS AND ENCLOSURES

- .1 Free standing enclosure to be black, four post style with a minimum vertical capacity of 42U (U=1.75 inches/45mm) complete with front and rear lockable doors, mounting hardware and rack-mounted power strips.
 - .1 Acceptable Material: HP 10842 G2 Wide Rack c/w AF054A Side panels
- .2 Bond all racks and enclosures as indicated on the drawings.
- .3 Complete with vertical and horizontal cable management, 250mm ventilation fan, back and front tempered glass doors, lockable side panels and two (2) additional equipment shelves.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Label all telecommunications outlet/connectors, patch panels, cross connects, cabinets, and other components in accordance with the specifications. Regardless of the numbering scheme, every cable must have the same permanent identifier on its termination hardware at both ends. Numbering scheme to be approved by Departmental Representative.
- .2 Label cross-connect ports to correspond to workstation address and riser cable. Use the BICSI colour code standard unless noted otherwise.
- .3 Properly bond each equipment/distribution rack in the TCs to a ground bus in accordance with the applicable code requirements as per CSA T527 and Section 26 05 00.
- .4 Perform installation in a professional manner using the best practices in the industry. Best practices include, but are not limited to:
 - .1 All cabling to be continuous without joints, or splices from the work area to the telecommunications closet.
 - .2 Install all cables in conduits. Confirm cables above T-bar are within reach (750mm) of T-bar ceiling. The maximum number of bends between cable pulling points shall be two ninety degree bends over a maximum of 30m.
 - .3 Horizontal fill ratios for conduit, cable trays, raceways and ducts shall conform with standards and manufacturer recommendations plus 25% spare for future installation. Minimum conduit sizes to be 27mm dia.
 - .4 Standards for separation distances between cables and sources of electromagnetic interference should be followed.
 - .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 shall be stress free at both ends and throughout their length.

.6 Give appropriate attention to the handling of all cables to ensure that 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 shall be located so that the cable required to reach the work area equipment will be no longer than three meters.

.8 Co-ordinate Work with that of other trades.

.9 Terminate all four 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 3m service loop at the Telecommunications Room. The loop to have a minimum bend radius of 225mm.

.11 Install all optical fibre backbone cabling inside 32mm diameter inner-duct. Inner-duct to be orange in colour and minimum FT-6 rated complete with pull tape. Install inner-duct in conduit.

.12 Terminate voice backbone cables with two (2) pairs per port.

3.2 RCDD PROJECT MANAGER

.1 General:

.1 The successful Telecommunications Distribution System contractor is required to retain the services of one (1) Registered Communications Distribution Designer (RCDD) for the duration of the project. The RCDD must be identified and the successful vendor must provide a copy of the RCDD current certificate and BICSI membership on a timely basis prior to the commencement of work.

.2 The RCDD will 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 (TS). Notify the Departmental Representative of any issues or concerns related to CAN/CSA, IEE and TIE/EIA specification compliance.

.2 Review and approve Telecommunications Distribution System material shop drawings prior to submission to the Departmental Representative.

.3 Attend regularly scheduled project construction and job meetings as requested by the project Departmental Representative.

.4 Ensure system installation practices and procedures comply with all applicable CAN/CSA, IEE and TIA/EIA specifications and procedures.

.5 Provide regular project status reports and updates as requested by the project Departmental Representative.

.6 Observe testing and certification procedures and provide manufacturers assurance and warranty.

.7 Review and approve all project as-built documentation including drawings, test reports, details and provide current RCDD seal on all.

3.3 INSPECTION AND FIELD TESTING

.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 Testing procedures used are to be applicable to the horizontal cabling configuration to meet field test compliance. Consolidation/Transition points are optional interface points as specified and permitted under CAN/CSA and 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 and class E cabling.
 - .4 Acceptance testing results are to be documented and provided.
- .2 UTP Backbone cable testing:
 - .1 Backbone cabling involving lengths within the performance and acceptance requirements are to be tested for length, opens and shorts of all pairs terminated within the cable sheath.
 - .2 For Category 6, UTP backbone lengths and channels that do not exceed the length limits for horizontal cables, the test parameters for horizontal cabling must be used.
 - .3 Document and provide acceptance testing results.
- .3 Complete field testing of fibre optic cable after the fibre is installed as follows:
 - .1 Optical Fibre Cable Testing
 - .1 Conduct:
 - .1 Attenuation testing (after fibre is installed.)
 - .2 OTDR testing.
 - .3 Document and provide acceptance testing results to the Departmental Representative.
- .4 Verify labelling of all wiring at all termination points.

3.4 CERTIFICATION AND TESTING

- .1 Vendors providing services shall reference and comply with all requirements for telecommunications system certification and testing as specified in this Section.
 - .1 Provide a Product Manufacturer's Application Warranty for a minimum of Twenty-five (25) Years.
 - .2 Provide RCDD Letter of Certification for the complete Telecommunications Cabling System as facilitated for the project.
 - .3 Certification and testing documentation shall be provided as a complete part of the Project Documentation requirements as specified within this document.

3.5 PROJECT DOCUMENTATION

- .1 As-built Drawings:
 - .1 Provide record drawings in both hard copy and electronic format.
 - .2 Provide drawings in AutoCAD .dwg file format by the Departmental Representative to the vendor for preparation of the "As-built" drawings.
 - .3 Provide record drawings with 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 (TR and MTR) as specified within this Section.
 - .4 Provide hard copy format record drawings in "C" size drawings in two (2) complete sets as defined;
 - .1 One (1) complete floor plan drawing set black and white (color optional).
 - .2 One (1) complete floor plan drawing set black and white (color optional) laminated

- (encapsulated) to be placed in all associated telecommunications spaces).
- .5 Laminated hard copy record drawings may be provided in sections (C size sheet) related to the telecommunications space servicing a specific floor section or area.
- .2 Test Results:
- .1 Vendors to provide Test Results in electronic format as part of compliance with this requirement.
- .2 Provide test result for compliance of this section.
- .3 Manufacturer's Warranty:
- .1 Vendors to 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 shall provide coverage of materials and labour for a minimum of Twenty-five (25) Years from date of installation and acceptance regardless of installing agent/vendor status.
- .4 RCDD Project Certification:
- .1 Vendors to provide RCDD Project Certificate in hard copy format.
- .2 Provide the RCDD certification.

END OF SECTION

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

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

PART 2 - PRODUCTS

2.1 MATERIAL

- .1 Conduits: to Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Outlet boxes: to Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
- .3 Fish wire: polypropylene type.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install raceway system, including fish wire, outlet boxes, pull boxes, cover plates, conduit, miscellaneous and positioning material to constitute complete system and in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Use EMT in all areas. Size in accordance with cable manufacturers recommendations. Under no circumstance, install more than 40% fill ratio in any conduit. Allow for 25% spare cables. Install bond conductor in all conduits.
- .3 Where the "grouping" of various systems outlets or multiple type outlets in dry-wall type construction is specified, install "box mounting brackets" between and secure to both metal studs. To install suitably sized 100mm square and/or 119mm boxes complete with raised tile rings as may be required.
- .4 Minimum conduit size will be 27mm diameter.
- .5 All Telecommunications outlet boxes must be sized 100mm square and be complete with single gang square raised tile ring.

END OF SECTION

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

- .1 Public address loudspeaker system to incorporate:
 - .1 Voice paging.
 - .2 Additional features as specified.
- .2 Operations:
 - .1 Paging:
 - .1 Voice paging from microphone, intercom system or telephone set.
 - .2 Selective area page to areas as indicated.
 - .3 Emergency page to all areas.
- .3 Systems in various configurations to be rack mounted.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include, project specific riser diagram, block diagram of complete public address system.
- .3 Public address system design criteria.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for public address system for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
- .2 Include:
 - .1 Operation instructions.
 - .2 Description of system operation.
 - .3 Description of each subsystem operation.
 - .4 List specifying each piece of equipment in system or subsystem by its original manufacturer name and model number.
 - .5 Parts list specifying parts used in equipment by identification numbers that are standard to electronic industry.

1.4 SYSTEM STARTUP

- .1 Manufacturer's factory service engineer to instruct:
 - .1 Maintenance personnel in maintenance of system.
 - .2 Operating personnel in use of system.

1.5 SERVICE

- .1 Use a supplier of the Public Address System represented by an established firm in the business of selling and providing maintenance on this type of equipment. This company must have factory-trained personnel on staff who are knowledgeable with the equipment being supplied under this Contract.

- .2 The technicians carrying out the installation, testing, commissioning and training on the system must be factory trained by the manufacturer of the equipment. Include at the shop drawings stage a copy of those persons' training certificates.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Conduits: to Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

2.2 COMPONENTS

- .1 Continuous duty cycle.
- .2 Modular system design.
- .3 Solid state, and suitable for rack mounting.
- .4 Maximum operating temperature: 65 degrees C.
- .5 Grounding conductor for system components.
- .6 Provide hardware for mounting system equipment.

2.3 MICROPHONE: MAIN SYSTEM

- .1 Microphone: close talking uni-directional, noise cancellation, dynamic type, complete with cradle, built-in preamplifier:
 - .1 Frequency response: 100-10,000 Hz.
 - .2 Output level: approximately -55 dB at 1 kHz.
 - .3 Output impedance, balanced to ground, 600 ohms.
 - .4 Housing: ABS resin plastic with zinc plated steel mesh head for microphone element, desk mounting, finish standard.
 - .5 Push-to-talk switch: microphone and auxiliary switch locking lever to lock push to talk bar in ON position.
 - .6 Magnetic dust shield.
 - .7 Complete with wall mounted recessed microphone jack.
 - .8 Complete with 2.5 m cable and plug to suit wall mounted microphone jack.

2.4 MIXER POWER AMPLIFIER: MAIN SYSTEM

- .1 Nine channel mixer power amplifier.
- .2 Output power: 120W RMS for main system.
- .3 Rack mounting kit for mounting in standard 19 inch rack.
- .4 Frequency Response: 20-20, 000 HZ + 3db at full output with 0.5% total harmonic distortion at 1000 Hz.

- .5 Controls:
 - .1 Nine (9) input volume controls.
 - .2 One (1) master volume control.
 - .3 One (1) bass tone control (± 10 dB at 100 Hz).
 - .4 One (1) power on/off switch.
 - .5 One (1) treble tone control (± 10 db at 10,000 Hz).
- .6 Indicator: Output level meter and power indicator.
- .7 Inputs: Microphone Input Module, Auxiliary Input Modules for telephone system, intercom system as per section 27 51 23, CD Player and AM/FM tuner.
- .8 Six Mic/Line inputs: Balanced with mic trim.
- .9 Two auxiliary inputs: Unbalanced with dual RCA jacks.
- .10 Module slots for plug In modules to accommodate inputs noted.
- .11 Transformer isolation for telephone inputs.
- .12 25V, 70.7V and 4 ohm speaker outputs.
- .13 Auto mute priority function assignable via external switches.
- .14 Auto mute sense control for adjusting mute activation threshold.
- .15 External mute terminals for activating mute function with external switch closure.
- .16 Auxiliary output for connecting an external amplifier or recording device.
- .17 Pre-amp Out/Power Amp In insert jacks for connecting external signal processors.
- .18 Overcurrent and thermal protection circuitry.
- .19 120 Vac input with detachable cord.

2.6 STANDARD CEILING SPEAKERS: MAIN SYSTEM

- .1 Driver 140 mm Woofer 50 mm Tweeter, full range, 15 watts.
- .2 Power Taps: 1.0, 1.5, 2.5, 5.0, 10.0 watts, 8 ohm.
- .3 Frequency Range: 80 - 20,000 Hz.
- .4 Voltage: 70 volts.
- .5 Complete with line matching transformer.
- .6 Complete with backbox and t-bar support or gypsum board support as required. Color: White.
- .7 Sensitivity (IW/IM): 86dB.

- .8 Shape: round.
- .9 Dimensions: 20.5 mm X 130 mm.
- .10 Metallic construction.

2.7 CABLES

- .1 Speaker Wiring: 18/2 twisted shielded in 21 mm conduit.
- .2 Microphone Wiring: One (1) 2-pair twisted shielded 20 gauge in 21 mm conduit.

PART 3 – EXECUTION

3.1 INSTALLATION

- .1 Locate and install all devices and components.
- .2 Coordinate the location of all devices with other devices and equipment in the area.
- .3 Locate AC power outlets in a position that properly serve the equipment.
- .4 Supply all components necessary to constitute a complete system.

3.2 WIRING

- .1 Wire and connect all devices and equipment.
- .2 Install all wire in conduit to Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.3 TESTS

- .1 Perform tests in accordance with Section 26 05 00 – Electrical General Requirements.
- .2 Test all system functions.
- .3 Conduct intelligibility tests.
- .4 Provide written test results in Operation and Maintenance Manuals.

3.4 SETUP AND PROGRAMMING

- .1 Manufacturer's factory representative to verify the system operation and set up the system to meet the design intent. At the end of the project, provide a letter to the Departmental Representative confirming that the system has been checked out and set up as per the design intent and that the demonstration and training function has been carried out.

- .2 Training to include the following:
 - .1 System description.
 - .2 System features.
 - .3 Repeat training at no additional cost should the initial training session be insufficient to properly familiarize staff with operation of system.
 - .4 Time and date shall be a time mutually agreeable to all parties and must be held before the substantial certificate is awarded.
- .3 Supply all necessary training brochures and training aids.
- .4 During the training session, each staff member will be permitted to activate and operate the system until they are comfortable with its use.
- .5 Conduct staff training in groups of four (4) or less persons.

3.5 COMMISSIONING

- .1 Provide manufacturer's representative and one (1) electrician for commissioning as per Section 01 91 00 – Commissioning.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Supply, install & commission a complete video intercom system as described herein.
- .2 The work shall include all material not specifically mentioned, but which may be deemed necessary to complete any portion of the work in compliance with the requirement of these specifications.

1.2 SYSTEM DESCRIPTION

- .1 The building intercom system shall consist of an audio video master receiving station, One (1) audio video call station and all associated wiring, conduit, junction boxes, and power supplies necessary for a full and complete installation.
- .2 The master station is to have the ability to receive and respond to video calls from the call station.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include product cut sheets, project specific riser diagram, block diagram of complete video intercom system.

PART 2 - PRODUCTS

2.1 AUDIO VIDEO MASTER STATION

- .1 Audio Video Master Station is to be a wall or desk mount with the following features:
 - .1 Support for up to four (4) door stations.
 - .2 7" colour touch screen.
 - .3 Ability to address one or all door stations.
 - .4 LED's and tone for communication of calls.
 - .5 Push to talk communications.
 - .6 Door release button.
 - .7 Volume control.
 - .8 Colour to be white.
 - .9 To come with optional desk stand.
 - .10 UL listed power supply
- .2 Standard of acceptance: Aiphone JP-4MED+PS-2420UL
- .3 Acceptable material:
 - .1 Airphone.
 - .2 Siedle.
 - .3 Commax.

2.2 AUDIO VIDEO CALL STATION

- .1 Call station is to be recess mounted with the following features:
 - .1 Stainless steel face plate
 - .2 Tamper resistant mounting screws.
 - .3 Wide Angle Lens camera.
 - .4 Protective lens.
 - .5 Hands free communications.
 - .6 Back box for mounting.
 - .7 LED illumination for low light conditions.
- .2 Call station is to communicate and receive power over a Cat 6A cable.
- .3 Standard of acceptance: Aiphone JP-DVF.
- .4 Acceptable material:
 - .1 Aiphone.
 - .2 Siedle Classic
 - .3 Commax.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install all wiring in conduit. Carefully support & install cabling to manufacturers recommendations.
- .2 Install call station at location shown on drawings.
- .3 Install master station at reception/security desk and all associated power supplies.

3.2 INSPECTION, TESTING & TRAINING

- .1 Fully test the intercom to ensure it functions as desired.
- .2 Provide a written report of all testing.
- .3 Provide two (2) training sessions to users of the system.

END OF SECTION