

PART 1 - GENERAL

1.1 REFERENCES

- .1 Latest edition of the following:
 - .1 ANSI/TIA/EIA-568-B.1; Commercial Building Telecommunications Cabling Standard (refer to CSA standard CAN/CSA T529-M91, CAN/CSA-C22.2 No. 214-M90) and Addenda.
 - .2 ANSI/TIA/EIA-568-B.2; Balanced Twisted Pair Cabling Components and Addenda.
 - .3 ANSI/TIA/EIA-568-B.3; Optical Fiber Cabling Components Standard and Addenda
 - .4 ANSI/TIA/EIA-568-B; and Addenda.
 - .5 EIA/TIA-569A; Commercial Building Standards for Telecommunications Pathways and Spaces (refer to CSA standards CAN/CSA T530-M90) and Addenda.
 - .6 EIA-TIA-606-A; The Administration Standard for the Telecommunications Infrastructure of Commercial Building (refer to CSA standard CAN/CSA T528-93).
 - .7 EIA/TIA-607; Commercial Building Grounding and Bonding Requirements for Telecommunications (refer to CSA standard CAN/CSA T527-94).
 - .8 NBC National Building Code of Canada.
 - .9 CAN/CSA-C22.1 Canadian Electrical Code Part One.
 - .10 CAN/CSA-C22.1 Canadian Electrical Code Part One Section 60 "Electrical Communication Systems".
 - .11 CAN/CSA-C22.2 No. 0 General Requirements - Canadian Electrical Code, Part Two.
 - .12 CSA C22.2 No. 154 Data Processing Equipment.
 - .13 NRC-CNRC National Building & Fire Codes of Canada.
 - .14 IEEE STD 1100 - IEEE Recommended Practice for Powering & Grounding Sensitive Electronic Equipment "Emerald Book".
 - .15 ISO/IEC 11801 Generic Cabling for Customer Premises.

1.2 DESCRIPTION OF SYSTEM

- .1 System to include:
 - .1 A distributed Category 5e network for the Voice Communications cabling system.
 - .2 A Category 5e distributed network for the Data Communications cabling system.
 - .3 Category 5e information outlets, c/w faceplates, recessed enclosures, icons, labeling etc. located in the work area for connection to communications devices.
 - .4 Unshielded Twisted Pair (UTP) Category 5e copper cable for the Voice Communications horizontal cabling system.
 - .5 Unshielded Twisted Pair (UTP) Category 5e copper cable for the Voice Communications backbone cabling system.
 - .6 Unshielded Twisted Pair (UTP) Category 5e copper cable for the Data Communications horizontal cabling system.
 - .7 Unshielded Twisted Pair (UTP) Category 5e copper cable for the Data Communications backbone cabling system.
 - .8 50/125 [6\12\16\24\36\48\60\72] strand multimode fiber Optic cable for

the Data Communications backbone cabling system.

.9 9/125 [6/12/16/24 strand single model fiber optic cable the Data Communications backbone cabling system.

.9 All patch panels, troughs, labeling, clamps, bonding clamps, and grounding to provide a complete system as specified.

.10 All Category 5e and/or ST connector cables, splices, and miscellaneous material to provide a complete system as specified.

.11 Wiring connections to the Local Telephone Service Provider and the contractor shall originate at the demarcation point. The cross connect and disconnect links shall be provided by Voice and Data Contractor.

.12 Wiring connections for voice Cat 3 backbone cables to the telephone/LAN room room is by contractor as indicated on the drawings shall originate at Wiring connections shall be from the Bunker Room / demarcation point in the communications room. The cross connect and disconnect links shall be provided by Voice and Data Contractor.

.13 Wiring connections for Data Category 5e/Fiber Optic backbone cables at the demarcationboard rooms is by contractor/ as indicated on the drawings Wiring connections shall originate at the demarcation point in the communications rooms. The cross connect and disconnect links shall be provided by Voice and Data Contractor.

1.3 STANDARDS

.1 The equipment and installation shall comply with the following current requirements:

.1 National Building Code

.2 Manitoba Building Code

.3 Canadian Electrical Code

.4 EIA/TIA and CSA Telecommunications Building Wiring Standards

.5 Manitoba Fire Code

.6 Local and Municipal By-laws

.7 Authorities having jurisdiction

1.4 APPROVED VOICE AND DATA CONTRACTOR

.1 Voice and Data Communications Cabling System Contractors shall adhere to the following:

.1 Contractor shall indicate vendor to be used in bid submission.

.2 Vendor must be supported by at least three certified local installers.

.3 Contractor shall be certified by the vendor they represent.

.4 Contractor shall be experienced in all aspects of this work and shall have direct experience on recent systems of similar type and size.

.5 Contractor shall own and maintain tools and equipment necessary for successful installation and testing of UTP and Optical Fiber Voice and Data Communications Cabling Systems and shall have personnel who are adequately trained in the use of such tools and equipment.

.6 Contractor shall not subcontract any portion of the work out to other contractors.

1.5 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01300 - Submittals.

- .2 Include:
 - .1 Technical data sheet supplied by cable manufacturer for the cables which are to be used. The data sheets shall include:
 - .1 Mutual Capacitance
 - .2 Impedance
 - .3 DC Resistance
 - .4 Attenuation
 - .5 Near End Crosstalk
 - .6 ACR
 - .7 Delay Skew
 - .8 ELFEXT
 - .2 Information outlets c/w faceplates.
 - .3 Backboards, patch panels, troughs, equipment racks, wall mounted equipment racks, wire management panels.
 - .4 Fiber Optic interconnection units, connectors, couplings.
 - .5 Grounding termination connectors.
 - .6 All test equipment. Include data sheet for test equipment indicating compliance to standards. Testers shall be Class III TIA for Category 5e.
 - .7 Instructions for storage, handling, protection, examination, preparation, operation, and installation of products.
- .3 This information is to be revised to "as-built" after construction is completed. Insert as part of the Operating and Maintenance Manuals.

1.6 OPERATION AND MAINTENANCE MANUALS

- .1 Provide Operation and Maintenance data for the Voice and Data Communications Cabling System for incorporation into manual specified in Section 01300 - Submittals.
- .2 Include:
 - .1 Instructions for complete Voice and Data Communications Cabling System to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings with corrections completed and marks removed except for reviewed stamps.
 - .4 Vendor's list of recommended spare parts for system.
 - .5 Provide name, address and telephone number of the Contractors service representative to be contacted during the warranty period.
 - .6 Provide name, address and telephone number of the Vendor's service representative to be contacted during the warranty period.
 - .7 Complete records of all Administration labeling data. Administrative labeling to be in Microsoft Excel format on CD and included on hardcopy of Record Drawings.
 - .8 A table of all test results to be included in hardcopy and CD (Microsoft Excel).
 - .9 Complete Record Drawings. Include all conduit runs, cable trays, wireways, pull boxes and zone boxes on the Record Drawings plus the location of all communication rack and/or cabinets is to be included.

1.7 MANUFACTURERS WARRANTY

- .1 Warranty all passive equipment, materials, installation and workmanship for one(1) year. The warranty must assure the support of all premise standards applications as listed in EIA/TIA standards.

1.8 TRAINING

- .1 Contractor shall provide two 4 hour on-site training sessions, together with vendor's representative, for Voice and Data Communications Cabling System to operational personal in use and maintenance of system. Contractor shall provide all equipment and personal necessary to video tape training session and submit two copies to owner. Training sessions shall be provided at a time convenient to Owner.
- .2 The Contractor shall provide a technician to assist the owner in cross connecting the voice and data services throughout the facility. Contractor shall also perform cross connecting of the station assignments between the Owners service demarcation.

1.9 CO-ORDINATION WITH LOCAL TELEPHONE UTILITY

- .1 Contractor shall provide and install all cross connects and patch cords required at demarcation. Co-ordinate all cross connects with local telephone utility and the owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Equipment and materials to be CSA or ULC certified. Where there is no alternative to supplying equipment which is not CSA or ULC certified, obtain special approval from local Electrical Inspection Department or authority having jurisdiction.
- .2 All cabling and termination hardware shall be of one manufacturer and shall be as listed in Section 16051.
- .3 Submit for Contract Administrator's approval, a duplicate list of shop drawings for this project as specified prior to placing of orders for same.

2.2 EQUIPMENT RACKS

- .1 Equipment racks shall meet ANSI/EIA-310.
- .2 Constructed of lightweight steel, charcoal gray or black in color.
- .3 Complete with steel mounting hardware.
- .4 Rack hardware must provide vertical wire management on both sides of the equipment rack.
- .5 Rack hardware shall be provided with a top cable trough to facilitate cable management.
- .6 Equipment rack frames shall meet the following specifications:
 - .1 dimensions: 7ft x 20.3in x 3in with 18-5/16in center mounting.

- .2 footprint: 20.3in length x 15in depth.
- .3 hole pattern: 5/8in - 5/8in - 1/2in spacing.
- .4 screw size: 10-24 thread, 1/2in length.

- .7 Each equipment rack or cabinet designated with space for active electronics shall be provided with a surge suppressor power bar. Refer to Section 16051 for acceptable manufacturers.

- .8 All equipment racks shall be of the same manufacturer and shall be listed in Section 16051.

2.3 WALL MOUNTED EQUIPMENT RACKS

- .1 Wall mounted equipment racks shall meet ANSI/EIA-310.
- .2 Constructed of lightweight steel, charcoal gray or black in color.
- .3 Complete with steel mounting hardware.
- .4 Rack hardware must provide vertical wire management on both sides of the wall mounted equipment rack.
- .5 Wall mounted equipment rack frames shall meet the following specifications:
 - .1 dimensions: 48in x 20.3in x 6in deep with 18-5/16in center mounting.
 - .2 hole pattern: 5/8in - 5/8in - 1/2in spacing.
 - .3 screw size: 10-24 thread, 1/2in length.
- .6 Each equipment rack or cabinet designated with space for active electronics shall be provided with a surge suppressor power bar. Manufacturer of surge suppression power bar shall be as listed in Section 16051.
- .7 All equipment racks shall be of the same manufacturer and shall be as listed in Section 16051.

2.4 WALL MOUNTED EQUIPMENT CABINETS

- .1 Wall mounted equipment cabinets shall meet ANSI/EIA-310.
- .2 Constructed of lightweight steel, charcoal gray or black in color.
- .3 Complete with steel mounting hardware.
- .4 Cabinet hardware must provide vertical wire management on wall mounted equipment cabinet.
- .5 Front lockable hinged Lexan door.
- .6 Lockable hinged body for rear cabling access.
- .7 Removable top and bottom covers.

- .8 Wall mounted equipment cabinet frames shall meet the following specifications:
 - .1 Dimensions: 36.75in x 24in x 18in deep (min) with 18-5/16in centre mounting.
 - .2 Hole pattern: 5/8in - 5/8in - 1/2in spacing.
 - .3 Screw size: 10-24 thread, 1/2in length.
- .9 Cabinets shall be wall mounted on 19mm equipment backboard.
- .10 Each equipment rack or cabinet designated with space for active electronics shall be provided with a surge suppressor power bar. Acceptable Manufacturer: Tripp-Lite #IBR-12
- .11 All equipment racks shall be of the same manufacturer and shall be as listed in Section 16051.
- .12 Wall mount equipment cabinets may only be used where indicated on drawings.

2.5 WIRE MANAGEMENT

- .1 Provide a horizontal wire management panel between patch panels or above and below a patch panel for patch cables.
- .2 Horizontal wire management panels shall be 2 rack units high with 5 finger retaining rings minimum.
- .3 Allow for an additional five (5) horizontal wire management panels for active electronics patch cables. Locations to be determined on site.
- .4 Provide one cable support bar, 5" deep min., on rear of equipment rack or cabinet for each patch panel mounted on the equipment rack or cabinet.

2.6 FACEPLATE AND PATCH PANEL ICONS

- .1 The following icon descriptions and colors shall be utilized throughout the voice and data networking systems at all workstations and patch panels.
 - .1 Telephone - "Phone", gray
 - .2 Fax - "Fax", gray
 - .3 Modem - "Modem", gray
 - .4 Data LAN - "Data", blue
 - .5 Patient Monitoring - Green
- .2 Provide blank icons for all unused ports.

2.7 FACEPLATES

- .1 Faceplates shall accept dual port installation kits.
- .2 Faceplates shall accept a minimum of four workstation jacks as specified.

- .3 Faceplates shall be iconable.
- .4 Faceplates shall be provided with integral administrative labeling strips.

2.8 MODULAR FURNITURE FACEPLATES

- .1 Faceplate shall accept a minimum of 3 workstation jacks as specified.
- .2 Faceplate shall be iconable.
- .3 Faceplate provided shall suit the modular furniture supplied by owner. Contractor to coordinate on site.

2.9 CATEGORY 5E WORKSTATION JACKS

- .1 Jacks shall incorporate insulation displacement connections specified for 24 AWG wire.
- .2 Jacks shall be 8 position, 8 conductor modular type.
- .3 All unused jack locations shall be installed with blank inserts.
- .4 The connecting hardware for the Category 5e cabling system channel link shall meet the electrical characteristics of the cabling system for a Category 5e system as defined in ANSI/TIA/EIA 569B.1 and ANSI/TIA/EIA 568B.2. The Category 5e jacks shall meet the requirements specified with the connecting hardware provided.
- .5 Jacks shall be an unshielded T568A wiring configuration.

2.10 CATEGORY 5E PATCH PANELS

- .1 Patch Panels shall be 8-position, 8-conductor modular jack on face to 110 terminations on rear of panel. Wiring patterns to be T568A.
- .2 All patch panels shall be CSA or ULC approved and shall be of one manufacturer.
- .3 Termination blocks shall have the following characteristics:
 - .1 Type: all plastic insulants.
 - .2 Termination type: insulation displacement, dry, gas tight.
 - .3 Wire Size supported: 24AWG
 - .4 Insertion loss at 250 MHz as per ANSI/TIA/EIA 568B and all Addenda
 - .5 Return loss at 250 MHz as per ANSI/TIA/EIA 568B and all Addenda
 - .6 Next loss @ 250 MHz as per ANSI/TIA/EIA 568B and all Addenda
 - .7 All other electrical characteristics as per ANSI/TIA/EIA 568B and all Addenda for Frequency 1 MHz to 250 MHz.
 - .8 Dielectric strength: 2.0kV at 60 Hz.
 - .9 The patch panels for the Category 5e cabling system channel shall meet the electrical characteristics specified with the Category 5e patch panels provided in ANSI/TIA/EIA 568B and Addenda.
- .4 Designation strips shall be provided for each jack. All cables shall be terminated in

numerical sequence and labeled as per approved labeling scheme.

2.11 FIBER OPTIC PATCH PANELS

- .1 Provide combination units for cross connect, inter connect, and splicing capabilities which contain the proper troughs for supporting and routing the fiber cables/jumpers.
- .2 Consist of a modular enclosure with retainer rings in the slack storage section to limit the bending radius of the fibers.
- .3 Contain a front face "window" section to insert connector panels for mounting of connectorized fiber ST connectors.
- .4 Provide terminating capability for 24 fibers.
- .5 Designation strips shall be provided for each port. All fibers shall be terminated in numerical sequence and labeled as per approved labeling scheme. Labeling scheme to be submitted to Contract Administrator for approval prior to installation.

2.12 FIBER OPTIC CONNECTORS

- .1 Connectors shall be epoxy based, oven cured with an average loss of 0.4dB maximum.
- .2 Connector loss: expected=0.3dB, variation=0.5dB maximum.
- .3 Cable retention: 175N minimum.
- .4 Connection repeatability: 0.30dB maximum change/1000 reconnects.
- .5 Axial load: 15.9kg minimum.
- .6 Coupling strength: 110N minimum.
- .7 Tip material: composite polymer
- .8 Connector type: ST
- .9 Meet all electrical characteristics of ANSI/EIA/TIA 568B.3 and Addenda.

2.13 CATEGORY 5E PATCH CABLES

- .1 Shall meet EIA/TIA 568B standards.
- .2 24 AWG stranded tinned copper, insulated with high density polyethylene data grade cordage. The cord shall be jacketed in flame retardant PVC.
- .3 Shall be four pair configuration and terminate with eight pin modular plug.
- .4 Capable of high data rates to support voice, data, and video applications.
- .5 DC resistance per lead: 94 ohms/100m maximum.

- .6 DC resistance unbalanced: 5% maximum.
- .7 Mutual capacitance: 6.6nF/100m maximum.
- .8 Characteristic Impedance: 100 ohms % @ 1 to 100 MHz.
- .9 Return loss as per ANSI/TIA/EIA 568B and all Addenda
- .10 Next loss cord limit as per ANSI/TIA/EIA 568B and all Addenda.
- .11 The patch cables for the Category 5e cabling system channel shall meet the electrical characteristics of the cabling system of ANSI/TIA/EIA 568B.1 and B.2. The channel shall meet the requirements specified with the Category 5e patch cables provided.

2.14 FIBER OPTIC PATCH CABLES

- .1 Shall be buffered, graded index fiber with 50 micron core and a 125 micron cladding for multimode. The fiber cladding shall be covered by aramid yarn and a jacket of flame retardant PVC.
- .2 Cable retention: 220N minimum.
- .3 Patch panel shall meet the requirements of ANSI/TIA/EIA 568B.3 and all Addenda

2.15 HORIZONTAL CABLING

- .1 Horizontal cabling shall consist of the following:
 - .1 four pair 100 ohm unshielded twisted pair (UTP).
 - .1 CSA or ULC certified.
 - .2 The horizontal cable for the Category 5e cabling system channel shall meet the electrical characteristics of the cabling system as specified. The channel permanent link shall meet the requirements of ANSI/TIA/EIA 568B.1 and B.2.
 - .3 24AWG solid copper conductor.
 - .4 insulation shall meet FT-4 fire rating.
 - .5 DC resistance: 9.38 ohms/100m maximum.
 - .6 DC resistance unbalanced: 5% maximum.
 - .7 Mutual capacitance: 5.6nF/100m maximum.
 - .8 Capacitance Unbalance (pair to ground): 330pF/100m.
 - .9 Characteristic Impedance: 100 ohms 15% at 1 to 100MHz.
 - .10 Insertion Loss at as per ANSI/TIA/EIA 568B and all Addenda
 - .11 Return Loss at as per ANSI/TIA/EIA 568B and all Addenda
 - .12 Next loss at as per ANSI/TIA/EIA 568B and all Addenda.
 - .13 As per ANSI/TIA/EIA 568B and all Addenda.

2.16 BACKBONE CABLING

- .1 Voice backbone cabling shall consist of 100 ohm unshielded twisted pair (UTP) conductors sized as indicated on the drawings.
 - .1 meet Category 3 specifications and CSA or ULC certified.

- .2 24AWG solid copper conductor
- .3 insulated with suitable plastic dielectric material, FT-4 rated
- .4 When mixing multiple dissimilar signals the Category 3 cable must support distances up to 100m.
- .5 DC resistance 9.4 ohms/100m maximum.
- .6 Mutual capacitance: 5.6pF/100m.
- .7 Characteristic Impedance: 100 ohms 15% at 1 to 100MHz
- .8 Worst Pair Attenuation dB/100m:

MHz	dB
1.00	2.6
4.00	5.6
8.00	8.5
10.00	9.7
16.00	13.1

- .9 Worst Pair Near End Crosstalk (NEXT) dB at 100m:

MHz	dB
1.00	41
4.00	32
8.00	27
10.00	26
16.00	23

- .2 Data backbone cabling shall consist of:
 - .1 Category 5e UTP 4-pair cable as specified. It shall meet the requirements for Horizontal Category 5e cable and ANSI/TIA/EIA 568B.1 and all Addenda; ANSI/TIA/EIA 568B.3 and all Addenda
 - .2 Multimode Optical Fiber:
 - .1 CSA or ULC certified.
 - .2 50/125 multimode with the number of fiber strands indicated on the drawings.
 - .3 It shall meet the requirements for Horizontal Category 5e cable and ANSI/TIA/EIA 568B.3 and all Addenda
 - .3 Single Mode Optical Fiber CSA or ULC certified.
 - .1 CSA or ULC certified.
 - .2 9/125 single mode fiber with the number of fiber strands indicated on the drawings.
 - .3 It shall meet the requirements for Horizontal Category 5e cable and ANSI/TIA/EIA 568B.3 and all Addenda

2.17 GROUNDING

- .1 Provide a #3/0 AWG RW-90 insulated green copper ground from each communications wiring closet back to the building main electrical ground.
- .2 Provide grounding bus bar in each wiring closet to terminate ground conductors.
- .3 Ground wireways, voice/data racks and cabinets with a #2 green insulated RW90 ground

conductor. Ground cable trays with a #3/0 green insulated RW90 ground conductor.

- .4 All ground connections unless otherwise noted in another part of this Section or on the Voice/Data Drawings shall be compression type.
- .5 Voice/Data conduits are to be a complete system from cable tray, wireways, cable trays, pull boxes etc. The locknuts at for conduits are to make good electrical contact with cable tray adapters, pull boxes etc. to ensure that the conduits are grounded.

PART 3 - EXECUTION

3.1 EQUIPMENT

- .1 There shall be a separate cabling system for the voice/data communication conductors.
- .2 Provide a minimum of 1m clearance between exposed live parts of equipment and cross connect fields.
- .3 Racks and cabinets shall be secured and grounded to communications ground with a #2 RW90 insulated green copper ground.
- .4 Racks and cabinets shall be located so as to provide 800mm clearance in front and behind each rack or cabinet as measured from the outermost point of the rack, cabinet, or equipment which is mounted within the rack or cabinet.
- .5 Wall mounted equipment, racks, cabinets or brackets shall be mounted on [19mm/3/4"] backboard [2.1m/7 ft.] to the top AFF.
- .6 Equipment shall be mounted on backboards, racks, or cabinets a minimum of [300mm/12in] AFF.
- .7 Equipment shall be mounted to provide a minimum clearance of [300mm/12in] from end walls.
- .8 Equipment connected directly to a cross connect shall be connected with cables not more than [3m/10ft] in length.
- .9 Install the surge suppressor power bar on the rack designated for active electronics as directed on site.

3.2 CONNECTORS AND FACEPLATES

- .1 Modular jacks shall be mounted with the contacts up.
- .2 Four pair 100 ohms UTP cable:
 - .1 Terminate each four pair 100 ohms UTP cable directly to an 8 position, 8 conductor modular jack assembly at the work area.
 - .2 Terminate all 8 position, 8 conductor modular jacks as per T568B pin assignment as per Diagram A.

3.3 UTP PATCH CABLES

- .1 Patch cables shall not exceed a combined length of [6m/20ft] in a channel.
- .2 Provide all Category 5e patch cables required to cross connect and connect all patch panels and active electronics, and telephone cross connects throughout the communications system including the telephone demarcation field.
- .3 Provide 3m patch Category 5e cables for all workstations.
- .4 Install patch cables in an organized manner, neatly laced within the wire management provided.

3.4 FIBER OPTIC PATCH CABLES

- .1 Provide all multi-mode or single-mode patch cables required to cross connect and connect all patch panels and active electronics.
- .2 Install patch cables in an organized manner, neatly laced within the wire management provided.

3.5 HORIZONTAL CABLING

- .1 Horizontal cabling shall be installed in a star topology.
- .2 Cables shall be "combed" within cable tray in an organized manner.
- .3 Bridged taps shall not be used within the horizontal cabling system.
- .4 Hard splices shall not be used within a twisted pair horizontal cabling system.
- .5 Equipment shall not be connected directly to horizontal cables.
- .6 Ensure minimum cable bend radius and maximum pulling tension, as recommended by the cable manufacturer, is not exceeded. Minimum bend radii for UTP cable is four (6) times the cable diameter, manufacturers recommendations may be greater.
- .7 Cables shall be bundled with Velcro cable straps. No tyrap are permitted. Velcro cable straps are for bundling only, Velcro cable straps shall not support the weight of the cable. Velcro straps are to be used in cable tray to secure coils of slack cable only where the cable leaves the cable at the conduit fitting or voice/data rack. Cable is not to be clamped to the cable tray.
- .8 When terminating cable in connecting hardware insure that that the cable remains untwisted at the termination and meets the requirements of ANSI/TIA/EIA-568B. Untwisted cable is not permitted.
- .9 Ensure cable is mounted, terminated, and managed to meet manufacturers specifications.
- .10 Horizontal cabling shall not exceed a distance of 90 meters from cross connect to

information outlet.

- .11 Provide [3m/10ft] coil of slack in the Telecommunications Closet [in the cable tray] above the equipment rack.
- .12 UTP cable at the information outlet shall be provided with [300mm/12in] coil of slack in the cable tray prior to entering conduit stub.
- .13 All horizontal cabling shall maintain the following distances from EMI producing equipment:
 - .1 [1.2m/48in]: motors or transformers
 - .2 [1.0m/40in]: conduit and/or cables used for electrical power distribution with voltages greater than 300V.
 - .3 [300mm/12in]: conduit and/or cables used for electrical power distribution with voltages less than 300V.
 - .4 [300mm/12in]: fluorescent lighting.
 - .5 When horizontal cabling is required to cross fluorescent lighting, conduit and/or cables used for power they shall cross perpendicular to each other. Cables are to maintain specified clearances when crossing sources of EMI.
- .14 When a building lightning protection system is utilized the communications cabling shall not be installed closer than [1.8m/6ft] from any lightning protection system conductors.
- .15 All horizontal cabling that penetrates fire rated barriers must be provided with fire stop to meet local fire codes.

3.6 UTP BACKBONE CABLING

- .1 Backbone cabling shall be installed in a star topology.
- .2 Install cables individually.
- .3 Cables shall be "combed" within cable tray in an organized manner.
- .4 Bridged taps shall not be used within the backbone cabling system.
- .5 Ensure minimum cable bend radius and maximum pulling tension, as recommended by the cable manufacturer, is not exceeded.
- .6 When a building lightning protection system is utilized the communications cabling shall not be installed closer than [1.8m/6ft] from any lightning protection system conductors.

3.7 FIBER OPTIC BACKBONE CABLING

- .1 Backbone cabling shall be run in a dedicated conduit.
- .2 Backbone cabling shall be run in fiber inner duct, sized to meet the manufacturers percent fill requirements.

- .3 Backbone cabling shall be run in fiber inner duct, sized to meet the manufacturers percent fill requirements. Install inner duct in communications cable tray.
- .4 Ensure minimum cable bend radius and maximum pulling tension, as recommended by the cable manufacturer, is not exceeded.
- .5 All conduit or duct shall be [50mm/2in] unless otherwise indicated. Pull boxes shall be provided after every two 90 degree bends.
- .6 Optical Fiber backbone cable shall be terminated with approximately [1m/3ft] of fiber slack located within the termination panels.
- .7 Fiber Optic cable shall be installed in inner-duct when transitioning from the cable tray to the equipment racks. The inner-duct shall be secured to the cable tray and the equipment rack while maintaining the recommended bend radius.

3.8 ADMINISTRATION

- .1 Labeling shall be as per EIA/TIA 606 standards.
- .2 All administrative labeling shall be typewritten with electronic label maker printed on self-adhesive ribbon or on integral labeling strip provided with equipment. Clean area where label will be applied with alcohol or equivalent cleaner to remove dirt and grease.
- .3 Workstation and Horizontal Patch Panel labeling:
 - .1 R1-1000/2000
 - R R - Rack, C - Cabinet
 - 1 Rack or Cabinet #
 - 1000 sequential cable identification number
 - 2000 room number or workstation location
 - .2 Provide icons as specified on workstation devices and patch panels.
 - .4 Backbone Patch Panel labeling:
 - .1 D1000-R1/C2
 - D D - data backbone, T - telephone backbone
 - 1000 sequential cable identification number
 - R Head end; R - rack, C - cabinet
 - 1 Head end rack or cabinet identification
 - C Intermediate end; R - rack, C - cabinet
 - 2 Intermediate end rack or cabinet identification
 - .2 Provide icons as specified on workstation devices and patch panels.
 - .5 All horizontal and backbone cabling shall be provided with cable labeling identification at both ends. Provide clear plastic cover over cable labeling.

- .6 All administrative labeling shall be recorded on as-built drawings and included in the Operation and Maintenance Manuals.
- .7 The use of colored backboards, connections, covers, or labels are an approved method of color coding for the cross connect fields.

3.9 TESTING

- .1 UTP Cabling:
 - .1 Testing shall be made in accordance with ANSI/EIA/TIA 56B Standards. Testing is to be conducted with a Class III tester certified for Category 5e cabling.
 - .2 Test kit must have been calibrated/re-calibrated within one year prior to test results submitted. Provide a dated paper copy of the calibration/re-calibration report. Include serial number(s), firmware version and date of manufacturer. An accredited laboratory that is traceable to NIST must have completed the calibration.
 - .3 Only special adapters and/or special patch cables or OEM of test kit are allowed to be used to perform a Channel Link test.
 - .4 Test results must show a "headroom" figure for each cable.
 - .5 Test reports must be from software/firmware that is the latest version.
 - .6 Test kit must test for stray noise on the cable prior to performing test.
 - .7 The following tests shall be performed and recorded on all the individual Voice and Data Communications cables from both directions using a level 2 **III** tester at 250MHz sweeps.
 - .1 Continuity or wiremap testing consisting of:
 - .1 Open/short testing.
 - .2 Polarity testing.
 - .3 Pair transposition testing.
 - .2 Signal Attenuation test.
 - .3 Near End Crosstalk (NEXT) at both Telecommunications Closet and information outlet.
 - .4 DC loop resistance test.
 - .5 length in meters
 - .8 Tests shall be performed on the individual permanent links. Permanent link test to ANSI/TIA/EIA 568B Category 5e standards for 250MHz
 - .9 Cables not complying with EIA/TIA 568A Category 5 standards for 100MHz or passing TSB 67 test guidelines shall be identified to the Contract Administrator for corrective action which may include replacement at no additional expense to the owner.
 - .9 Cables not complying with specifications and ANSI/TIA/EIA 568B Category 5e standards including addendum for 250MHz shall be identified to the Contract Administrator for corrective action which may include replacement at no additional expense to the owner.
- .2 Optical Fiber:
 - .1 Each strand in Optical Fiber cables shall be tested for correctness of termination and overall transmission loss using an approved Optical Loss Test Set (OLTS).
 - .2 System loss measurements shall be provided at 850nm and 1300nm for multimode.
 - .3 Documentation shall be submitted listing the test results and both the calculated and measured loss for each fiber.

.4 Fiber Optic Testing shall comply with ANSI/TIA/EIA-568-B.3; Optical Fiber Cabling Components Standard and Addenda

END OF SECTION

1 GENERAL REQUIREMENTS

1.1 GENERAL

- .1 Scope of this section is to provide a complete empty cable tray and pathway system which terminates at telecommunications closet and cabinet backboards, as shown on the drawings.
- .2 The pathway system is a combination of Cabletray and J hook supports and an empty raceway system consisting of terminal cabinets, conduits, pull strings, outlet boxes, floor boxes, pull boxes, coverplates, sleeves and caps, and miscellaneous material to complete system. Open wiring within suite walls will be acceptable with properly rated cable.
- .3 Pathways are to be provided for voice, data, and CATV systems.
- .4 Provide sub-telephone panelboards as required.
- .5 Coordinate complete installation with telephone utility.

1.2 STANDARDS

- .1 Pathways are to meet the requirements of the following standards. The Contractor is to be familiar with these documents, and respond to varying site installation challenges as necessary.
 - .1 CAN/CSA-T527, Grounding and Bonding for Telecommunications in Commercial Buildings.
 - .2 CAN/CSA-T528, Design Guidelines for Administration Telecommunications Infrastructure in Commercial Buildings.
 - .3 CAN/CSA-T529, Design Guidelines for Telecommunications Wiring Systems in Commercial Buildings.
 - .4 CAN/CSA-T530, Building Facilities Design Guidelines for Telecommunications.

2 PRODUCTS

2.1 GENERAL

- .1 Electrical metallic tubing (EMT) and fittings to Section 26 05 34 and 26 05 32. Flexible metal conduit and PVC conduits are not acceptable products for telecommunications systems pathways. Minimum conduit size $\frac{3}{4}$ " (19 mm).

- .2 Wireways to Section 26 05 37.
- .3 Telecommunications closets and cabinet backboards to be 19 mm plywood good one side.
- .4 Pull strings: polypropylene type.

3 EXECUTION

3.1 TELECOMMUNICATIONS CLOSETS AND EQUIPMENT

- .1 Ensure that telecommunications closets remain unobstructed by all architectural, mechanical, and structural equipment and products. Conform to other physical requirements of CAN/CSA- T530.

3.2 BACKBOARDS

- .1 Install continuous floor to ceiling backboards throughout telecommunications closets. Backboards are to be fitted between structural members if necessary, so that all vertical surfaces up to the finished structural ceiling deck are covered with plywood.
- .2 Seal and sand edges and face to a smooth finish. Paint backboards a minimum of two coats of fire retardant white paint. Fill any errant screw holes on completion of cabling installation.

3.3 CONDUITS AND FITTINGS

- .1 Terminate conduits at each backboard in such a manner as to limit wasted space. Provide nylon bushings in fittings. See drawings for correct placement of conduits, and coordinate with Contract Administrator on site prior to installation.
- .2 Run all work station conduits concealed in walls. Terminate conduits and conduit boxes or wireways as indicated. Provide nylon bushings in fittings.
- .3 Where stub-ups or stub-outs are indicated or required, ensure that power system sources, including branch circuit wiring, have the specified clearances from pathways resulting in exposed conductors.
- .4 Conduits poured horizontally into concrete slabs are not acceptable for telecommunications use.
- .5 No section of conduit shall be longer than 30 m or contain more than two 90° bends. If more than two 90° bends or reverse bends are required, install a pull box in an accessible location, satisfying the requirements of CAN/CSA- T530,

Table 4.4-2.

- .6 Inside radius of bends shall be at least six times the internal diameter of the conduit. For conduits greater than 50 mm ID, inside radius shall be at least ten times the internal diameter of the conduit.
- .7 Any single conduit run extending from a telecommunications closet or cable tray shall not serve more than three telecommunications outlet boxes.
- .8 Outlet boxes shall be no smaller than 50 mm wide, 75 mm high, and 64 mm deep for connection to a maximum of two 19 mm conduits. For larger conduit sizes, increase outlet box size on direction from Contract Administrator.
- .9 All conduits and conduit sleeves shall be clearly identified by labelling at both ends and intermediately, as required. Pull boxes shall be labelled on the exposed exterior on a minimum of two sides. Labelling standards are as dictated in Section 26 05 01.
- .10 For pathways run in dropped ceiling areas, maintain a minimum clearance above the ceiling product of 75 mm, unless directed otherwise.

3.4 CABLE TRAYS

- .1 Install cable trays such that Code clearances are not marginalized. Provide a minimum of 300 mm clearance above cable trays. Provide a consistent minimum of 600 mm clearance to anyone side of cable trays.
- .2 Coordinate with mechanical, structural, and architectural trades to ensure clearances are maintained. Marginalization of clearances will be deemed as unacceptable, and will be corrected by the Contractor.
- .3 For pathways run in dropped ceiling areas, maintain a minimum clearance above the ceiling product of 75 mm, unless directed otherwise.
- .4 Minimum clearances between un shielded wires and cables in cable trays and power sources shall be as follows. Ensure these separation distances are maintained.

<u>Condition</u>	<u>Minimum Separation</u>		
	<u>2 kVA</u>	<u>2-5 kVA</u>	<u>5 kVA</u>
Unshielded power near open non-metal pathway	127 mm	305 mm	610 mm

Unshielded power near grounded metal conduit	64mm	152 mm	305 mm
Power lines in grounded shielding or grounded metallic conduit	0 mm	76mm	152 mm
Transformers or electric motors	305 mm	305 mm	305 mm
Fluorescent lighting	305 mm	305 mm	305 mm

3.5 PULL STRINGS

- .1 At least two pull strings shall be installed in all conduits. One pull string shall be used to pull in communications conductors during the initial installation of cables. A second string shall remain in the conduit for future cable pulls.
- .2 Tie-off remaining pull strings so accidental removal is not possible.

3.6 OUTLETS

- .1 Flush wall mounted telephone outlet to consist of a 100mm. x 100mm. backbox with a single gang extension ring. Provide a 1/2" (19 mm) conduit from each outlet connected to raceway systems terminating at the telephone backboard or as otherwise indicated.

3.7 BONDING

- .1 Provide grounding bushings on the ends of all conduits. Bond all conduits and cable trays with copper insulated green conductor, and terminate onto telecommunications room ground bus. Telecommunications room ground bus shall be bonded to the main electrical room ground bus with an insulated #2/0 copper conductor. For complete details, refer to drawings and CAN/CSA-T527.
- .2 Provide a #6 insulation ground in conduit and a fourplex receptacle at each backboard for each system.

END OF SECTION