

1.0 GENERAL

1.1 DOCUMENTS

- .1 This section of the Specification forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 SUMMARY

- .1 Section Includes:

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- 3.10 TERMINATIONS
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1.3 OVERVIEW

- .1 This Section includes equipment, materials, labour and services to provide telephone and data distribution systems including, but not limited to:
 - .1 Installation, termination, testing and labeling of horizontal and backbone UTP/STP, Coaxial CATV and Fibre Optic cabling.
 - .2 Disconnection and removal of existing voice or data cables.
 - .3 Equipment cabinet and or rack installation.
 - .4 System testing and labeling
 - .5 Documentation and submissions.
- .2 Contractors shall provide all equipment, consumable materials, labour and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. Contractors shall ensure that they are compliant with requirements stated or reasonably inferred by the contract documents.

1.4 DESCRIPTION OF SYSTEM

- .1 The number of voice and data jacks in work areas is not standardized and is based on information supplied by the end user and the UBCO Information Technology Representative. All data outlet boxes and connecting conduit will, at a minimum, have the capacity to support 4 (four) Category 6A data cable runs and jacks, even if initially a lesser number is being installed.
- .2 The determination of communication outlet cable counts will be in consultation with UBCO Information Technology during the design phase of each building or renovation. It is not to be assumed that one cable is sufficient for typical installations. A detailed needs assessment could be carried out by the UBCO Information Technology Representative to determine the customer's requirements, which will affect the design.
- .3 When it is determined that a typical work area outlet will consist of only one (1) four-pair FTP Category 6A cable, this cable will be dedicated to the Data network by default. Typically, four-pair FTP Category 6A cables dedicated to Voice/Multimedia use will be quantified during the detailed design process and added as required. Terminate data cables on wall/rack mounted modular patch panels located in the appropriate LCR / MCR.
- .4 Each Wireless Access Point (AP) outlet shall consist of a minimum of two (2) four-pair FTP Category 6A cables, installed from the indicated AP outlet location to the zone Local Communication Room (LCR) unless otherwise specified. ITSTD-50-54
- .5 Fibre Data backbone cabling consisting of 24 strands of single-mode ITU-T Recommendation G.652.C or D compliant optical fiber (Corning-28e or better), and 12 strands of single mode optical cable shall be installed from MCR to each zone LCR. It is expected that these are to be separate cables. All connections will be LC type, using Panduit fiber FLEX1U enclosure management with Panduit HD FLEX Cassette FHS9N-1210N LC-SM
- .7 All FTP Category 6A horizontal cable lengths shall not exceed 90 meters. All FTP Category 6A cables will be bonded to ground at the local consolidation point, for example a communications room or cabinet. All FTP Category 6A patch panels must be bonded to the cabinet or room bonding point at the time of installation of the panel. ITSTD-32
- .8 Local Lighting Controller Systems – A minimum of (1) FTP Category 6A cable for data connection shall be installed from the MCR or LCR to any local lighting controller that is intended to be controlled by the integrated AV system of that room. This connection is in addition to, and independent of, any BMS requirements for lighting controllers (see section 26 51 00 for AV integration).
- .9 BMS Systems and other control systems - A minimum of (1) FTP Category 6A cable for data connection shall be installed from MCR or LCR to specified demarcation locations for centralized BMS panels. This connection cannot be utilized to connect a control device or sensor, it can only be utilized to connect another network switch at demarcation point. There may be more than one location per building. Minimum category 6 cable to be installed between BMS control IP devices and/or sensors from demarcation point, this cable can use existing pathways as CAT6A, FTP CAT6 cable must be distinct color from FTP CAT6A cable, preferably orange. BMS demarcation point CANNOT be installed inside MCR or LCR.
- .10 Security Systems– System specific cables for Security shall be installed as per UBC Access Control drawings and specifications and are not addressed in this document. Typical Communications cable installations for the Security system to communicate with

the Network will consist of a minimum of one (1) FTP Category 6A cable for data communications installed within 300mm of designated security panels in a surface mounted outlet. Typically, there will be more than one location per building, and common locations are on the communications room wall behind entrance door and elevator machine rooms, although it is possible for Secure Access to request any location in any given building. ITSTD-22,23,24,25

- .11 Fire Alarm System - Communications cables for the Fire Alarm system to communicate with the Network or remote location are to be a minimum of (1) FTP Category 6A cable for data communications or 4 single mode fiber strands (2 pair LC or SC). These cables shall be installed from MCR, or LCR to the specified demarcation location for the central fire alarm panel. Typically, there will be only one location per building. ITSTD-22
- .12 Clock/ Bell System - System specific cables for Clock Bell system shall be installed by others and are not addressed in this document. Communications cables for the purposes of delivering a synchronous correction signal to the clock system of a building will consist of a minimum of (1) FTP Category 6A cable for voice communications. The cable shall be installed from the MCR, or LCR to specified demarcation location for the central Clock / Bell panel. Regardless of the intention for the system to use wireless synchronization, this demarcation shall be installed. Typically, there will be only one location per building. ITSTD-22
- .13 Elevator Systems:
 - 1- Phone – A minimum of (1) FTP Category 6A cable for voice communications shall be installed from the MCR or LCR, to a specified elevator phone demarcation location. Typically, there will be one cable installed per elevator car in a building
 - 2- Access Control – A minimum of (1) FTP Category 6A cable for data communications shall be installed from the MCR or LCR to a specified elevator Access control demarcation location. Typically, there will be one cable installed per elevator car in a building. ITSTD-22
 - 3- Typically, these two elevator specific services will appear in separate demarcation locations within the elevator machine rooms due to the nature of the equipment that will be connected
- .14 PML/ Water/Gas/Power Meter - A minimum of (1) FTP Category 6A cable for data communication and/or single mode fiber cable if distance exceeds 90m, from the MCR, or LCR to specified meter locations. There may be more than one per building. ITSTD-22
- .15 The Contractor shall install equipment racking in Communication rooms to UBC Information Technology's specifications and satisfaction. Rack type to be four post, 36" deep, 44U standard open or enclosed rack, preferred manufacturer is Hammond mfg.
- .16 The Contractor must finalize equipment layouts of Communication rooms with UBCO Information Technology Representative before installation can proceed. ITSTD-04, 05, 11, 12
- .17 The Div 27 Contractor must fire-stop the inside of all conduit or cable tray penetrations of fire rated barriers (floors and walls). Div 26 Contractor must fire-stop the outside of all conduit and cable tray penetrations of fire rated barriers. See Section 27 05 07 for Fire-stop information.

- .18 The Div 27 Contractor is responsible for the 'air stopping' the inside of all conduit or cable tray penetrations of any areas that require airborne isolation or air pressure isolation. Div 26 Contractor must 'air-stop' the outside of all conduit and cable tray penetrations.
- .19 The Integrity of the UBC structured cable system must be preserved in all aspects of the installation. All cables installed for UBC IT must appear in designated UBC communications rooms and use UBC IT designated pathways unless instructed otherwise. UBC IT cables should not be installed in shared pathways when UBC IT dedicated pathways are available. UBC IT cables should not travel (exposed) through shared communications spaces or shared utility spaces. All UBC IT communications rooms should be linked to each other with continuous riser pathway dedicated to UBC IT.

1.5 **OTHERS IN INFORMATION TECHNOLOGY PATHWAY**

- .1 All other cable systems that have been pre-approved by UBC IT to share the IT designated pathways must install their cables in accordance with the UBC IT Division 27 guidelines.
- .2 All other cables systems that have been pre-approved by UBC IT to share the IT designated pathways must keep their cable bundles separate from the IT cable bundles.
- .3 No other cable systems that have been pre-approved by UBC IT to share the IT designated pathways will cause any IT pathway to be over filled or reduce future capacity of the functional IT infrastructure.
- .4 UBC IT cabling will always take precedent over other cabling systems within IT pathways.
- .5 UBC IT will have first choice of pathways. If another cable system has prematurely used the IT pathway that UBC IT requires, then that system will remove their cables or provide alternate pathway at no cost to UBC.
- .6 Zone pathways are the only pathways that are suitable for cable system sharing.
- .7 Conduits designated to be 'drop' conduits or conduits with a dedicated purpose are not suitable for cable system sharing.
- .8 UBC IT network cabling system J-Hooks are not suitable for sharing and will not be used by other systems.
- .9 Examples of other cable systems that will need authorization before they will be allowed to share IT pathways on any given project are:
 - Security cabling
 - BMS cabling
 - Access control cabling
 - RF distribution cabling (Cellular, Radio, Microwave)
 - Intercom cabling
 - Audio Video cabling
- .10 Coordinate with UBCO IT representative on site if required.
- .11 Pathway that is to be used for communications room riser shall be enclosed when passing through shared spaces such as utility rooms and non UBC IT communications rooms.

2.0 PRODUCTS - INSIDE PLANT

2.1 MANUFACTURERS

- .1 All horizontal cable and associated jacks, connectors, patch panels and faceplates shall be FTP Category 6A appropriate and manufactured by CommScope, Uniprise SLX series.
- .2 All fibre cables and pigtails shall contain glass manufactured by Corning.
- .3 All fibre termination hardware shall be manufactured by Corning, CCH System, or as directed by UBCO Information Technology.

2.2 MATERIAL

- .1 This section specifies various manufacturers' materials including, but not limited to, cable, jacks and outlet plates, patch panels, equipment racks, and other Communications components used in Communications infrastructure installations at UBC Okanagan.
- .2 The Contractor shall install and connect data network using Contractor supplied material. Typically, data patch cords are not included as part of the contractor's scope.
- .3 The Contractor shall replace and connect existing voice and data cabling where applicable with FTP Category 6A cable and termination hardware.
- .4 The Contractor shall return all removed hardware and accessories to UBC Information Technology for re-tasking or disposal, unless otherwise agreed. All removed redundant and abandoned cable will be disposed of by the contractor at no cost to UBC and in accordance with applicable environmental regulations.
- .5 All materials used must be CSA approved or Electrical Safety Authority of British Columbia recognized standard association approved and installed in accordance with manufacturers' specifications and recommendations.
- .6 Where substitutions of specified materials are allowed, they must at all times meet or exceed the specifications given by the manufacturers listed and be subject to approval by the UBCO Information Technology Representative in writing prior to their use.
- .7 The Contractor shall ensure that the completed project includes installation of all materials required to fulfill the Contract as detailed on IT drawings and in the Contract Documents.
- .8 The following material shall be supplied by the Contractor.

Commscope Uniprise SLX List

Category 6A CMR/P, 4 PR, 23 AWG (CS44 BLU C6A 4/23 F/UTP, UN884018404) or Plenum C-S UN874034704/10 as specified

Category 6A - T568-A SLX Jacks (USL10G-SHLD, A.WHT,760238128)

SG/DG faceplates and blank inserts Alpine White (21110XX-3)

Category 6A - 24 port patch panels (CPP-SDDM-SL-1U-24,760237046 c/w all jacks supplied)

Cable management panels (if requested)

2-port modular box (1-1933668-3 or 1-1116698-3 for wireless and special systems demarcations)

Patch panel bracket kits (if requested)

2-port strap kits (SL or 110, straight)

Modular furniture faceplates (SL or 110, straight, colour to match furniture)

Panduit fibre optic installation hardware

FLEX1U management patch panel, HD FLEX 1U enclosure
HD FLEX cassette FHS9N-1210 LC (SM)
OMX cassette supplied by UBCO

- .9 Long range data cabling with POE to be utilized with Commscope Hybrid cables

CABINET – APPROVED PARTS

.1 In new buildings, all cabinets shall be of the same manufacturer.

.2 Cabinet layouts include:

Four (4) 19" TIA mounting rails

One (1) mid mounted minimum 50 mm D x 150 mm W vertical channel for incoming cable dressing and

Two (2) horizontal (front and rear mounted) cable manager.

Optional price for top, ventilated sides, front and or back door only when specified.

Hammond Mfg C4 series

Four post rack, 44U height, 36 inch depth

J-HOOK SYSTEM

.1 Panduit J-Mod Cable support system for spurs from main tray system to outlet location. Maximum of 2" cable bundle per J-hook. Minimum of 2-J hooks per bracket otherwise additional brackets and J-hooks required to complete system. Bracket mounting to suspended ceiling drop wires is not allowed. Ensure equipment meets all applicable codes when installed in plenums.

. 2 J-Hooks should not be utilized in new buildings or large-scale renovations. J-Hook usage is reserved for small renovations or localized additions where it is not economically feasible to install the preferred forms of pathway.

The following consumable materials shall be supplied by the Contractor at the Contractor's expense.

Pulling lubricants

Pull tapes

Cable Ty raps

Velcro fasteners

Cable labels

All designation labels

Fibre termination consumables

Any miscellaneous material to facilitate cable system installation

2.3 HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

- .1 The Contractor shall be responsible for safekeeping his own and any subcontractors' property, such as equipment and materials, on the job site. UBC assumes no responsibility for protection of above-named properties against damage, fire, theft and deterioration from inclement environmental conditions.

3.0 EXECUTION

3.1 PROTECTION OF OWNER'S FACILITIES

- .1 The Contractor shall effectively protect the Owner's facilities, equipment and materials from dust, dirt and damage during construction.
- .2 The Contractor shall remove protection at completion of the Work. In areas that are continued to be used during construction, protection material and clean up shall be done at the end of each day.

3.2 PRE-INSTALLATION SITE SURVEY

- .1 Prior to start of systems installation, the Contractor shall meet at the project site with the UBC Information Technology Representative, the Consulting Engineer, and representatives of trades performing related work to co-ordinate efforts. The Contractor shall review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with other trades shall be necessary to plan the crucial scheduled completions of the equipment room and Communication rooms.
- .2 The Contractor shall examine areas and conditions under which the system is to be installed. The Contractor shall not proceed with the work until satisfactory conditions have been achieved.

3.3 INSTALLATION - GENERAL

- .1 The Contractor shall Supply all materials, labour, tools and services required to install a complete cabling system
- .2 The Contractor shall perform all work of installation of components, cable terminations, bonding, testing, of cables and racks as indicated to provide a complete voice and data cabling network as specified by the manufacturer.

- .3 The Contractor under Division 26 shall provide all pathway and raceway systems for the Communications cables. All pathways and raceways will be installed for the purpose of installation of high-performance communications cable and the installation may be required to supersede any Code safety limitations to maintain the performance aspects of the communications cables. (Refer to Section 27 05 28)
- .4 The Contractor shall supply & install interconnecting Backbone cabling between floors as indicated.
- .5 The Contractor shall supply & Install horizontal cabling between MCR or LCR, and Communication outlets.
- .6 The Contractor shall support cabling in cable tray and drop conduit, or J-hooks runs to Communications outlets.
- .7 The Contractor shall not carry out any cable terminations until acceptance of the methodology has been obtained.
- .8 Cable supported by J-hook run shall be bundled with Velcro tape at maximum 300 mm on center, after leaving the cable tray.
- .9 Cables on plywood backboards in Communications Rooms shall be supported with J-Mod system and or Velcro tape at maximum 600 mm on center or closer as necessary to dress installed cables in neat and tidy bundles as per Section 27 15 00.
- .10 The Contractor shall install equipment and wiring in Communications Rooms to provide a logical progression for cabling and to minimize cables crossing.
- .11 Cables, installed on J-hooks, shall follow building lines and be anchored where a change of direction occurs to avoid excessive slack, or sags. Cables shall be bundled at J-hooks per Section 27 15 00.
- .12 J-Hooks should not be utilized in new buildings or large-scale renovations. J-Hook usage is reserved for small renovations or localized additions where it is not economically feasible to install the preferred forms of pathway.
- .13 The Contractor shall maintain manufacturer's minimum bending radius for all cables. At initial cable installation on tray, run cables parallel to each other with a minimum of crossovers.
- .14 Defective material and or cabling installed shall be replaced at no cost to UBC.
- .15 The Contractor shall leave data wiring system in complete and operating condition.
- .16 Layouts may not show countertops, benches, and baseboard heaters. The Contractor shall locate voice/data outlets above countertops and baseboard heaters and in benches next to power outlets.
- .17 The Contractor shall locate voice/data outlets adjacent to existing power outlets where possible.

3.4 COMMUNICATION CABLE - GENERAL

- .1 All cables shall run without a splice between a communications room and a communication outlet via cable tray, conduit, J-hook, pack pole, cable channel, or surface raceway.
- .2 All cables shall be CSA-CMR/P rated as required to meet any and all applicable codes and as dictated by each project's particular requirements.
- .3 The Contractor shall ensure that there is no rough handling, kinking, denting or abrasion of the cable, and that the cable shall not be left on the ground where it may be stepped on or run over by vehicles.
- .4 Cable shall not be pulled through 90° conduit fittings such as an LB type joint. LB type fittings are not acceptable in Communications pathways. When installing cables, care shall be exercised to avoid sharp bends, protruding metal edges and unnecessary stress. The minimum bending radius of Category 6A cables shall be 25 mm and minimum bending radius of other cables shall be 10 times of outside jacket diameter. Sharp metal edges in cable trays which could cut the cable shall be smoothed and the cable dressed away from these edges. Dropouts shall be provided for cables leaving horizontal trays.
- .5 Unless specified otherwise, all intra-building cable shall be pulled by hand. Excessive pulling force will cause alteration of the cable's transmission characteristics to the extent that the installed system may not operate within the specified limits and the cable run will have to be replaced at no cost to UBC.
- .6 The Contractor shall ensure that the cable runs freely from the reel or box, without excessive back pull and that all slack is taken up slowly. Precautions shall be taken to protect reeled and unreeled cable from any source of possible damage while attended or unattended.
- .7 If cable lubricants are necessary, ensure that they are compatible with the cable's outer sheath. Refer to the lubricant and cable manufacturer's specification sheet to ensure compatibility. Detergent-based lubricants shall not be used.
- .8 When multiple pathways are available from one location to another, the Contractor shall fill up one pathway before installing cables in other pathways, choosing UBC IT designated pathway over shared pathway.
- .9 The Contractor shall leave the manufacturer recommended amount of slack within the outlet box following termination, as too much slack at the point of termination may result in testing failures and too little slack can compromise future maintenance. No slack loops are permitted in any part of the system.
- .10 Communications cables of all types must not be painted as at a minimum it will void the manufacturer warranty. Any cables that are painted will be immediately replaced at no cost to the University.

3.5 UTP/STP INSTALLATION

- .1 All UTP/STP cable system work completed by the Contractor must be approved by the UBC Information Technology Representative. The following basic requirements must be met to gain system acceptance.
 - .1 Receive, check, unload, handle, store and adequately protect equipment and materials to be installed as part of the Contract. In existing buildings, store in areas

as directed by the UBC Information Technology Representative. Installation includes setting in place, fastening to walls, floors, ceilings, cabinets or other structures where required, interconnecting cabling of system components if specified, equipment alignment and adjustment and other related work whether or not expressly defined herein.

- .2 Install materials and equipment in accordance with applicable standards, codes, requirements and recommendations of national, provincial and local authorities having jurisdiction and with manufacturer's printed instructions.
- .3 Adhere to manufacturer's published specifications for pulling tension, minimum bend radii and sidewall pressure when installing cables.
- .4 Install horizontal cabling from outlets to the nearest Communications closet in a continuous run without a splice, unless otherwise noted.
- .5 Most designs call for a cable tray/zone conduit, and J-hook support structure to facilitate cable system installation. When installing, ensure cable is not subjected to stress due to contact with tray/conduit support mechanisms, bonding lugs or any metal burrs within the support structure. Particular care must be taken when working around corners and offsets. Pulling lubrication must be used at all times to ensure a stress-free installation.
- .6 Cable forming and termination procedures shall conform to the following requirements:
 - .1 All cable installation shall be done in a neat and tidy fashion, with cable routing closely following building lines. All cable forming within the MCR's and LCR's shall also follow building lines.
 - .2 Cable shall be neatly arranged by full cable combing with no crossovers within the bundle. The UBC Information Technology Representative shall have final approval of cable forming quality and any workmanship issues. Bundles may be formed in Communication rooms using Velcro fasteners. Cables must not exhibit sheath deformation due to over-tightening. If cable forming is not performed to the satisfaction of the UBC Information Technology Representative, the Contractor shall be responsible to re-form the bundles at no cost to the Owner.
 - .3 Termination practices must strictly comply with manufacturers' recommendations. Particular care must be taken to limit sheath removal length and pair un-twist at point of termination. The TE cable termination tool – PN-1725080-1 or similar must be used for all Category 6A terminations. Use of 110 Impact tools is not acceptable. .4 Cables shall be terminated in sequential order on patch panels and on GigaBIX termination hardware.
 - .4 At each Communication outlet, follow the same termination practices as stipulated for the Communication room. The Contractor shall leave the manufacturer recommended amount of slack within the outlet box following termination, as too much slack at the point of termination may result in testing failures and too little slack can compromise future maintenance.

- .5 The Contractor shall neatly dress all cables within the Communications room to follow building lines. The objective being, to provide a reasonable amount of slack into each cable run, while at the same time provide neatness and promote order as the cables migrate from the point-of-entry to the termination point. No slack loops are permitted.
- .6 The UBC Information Technology Representative must give final approval to cable forming in the Communications rooms and termination quality at the outlets and in the Communications rooms before the work can be deemed as completed.
- .7 In Communication rooms, horizontal cables shall be bundled separately from entrance and backbone cables. Cable bundles are not to exceed 24 cables per bundle in any communications room, and are not to exceed 40 cables per bundle in any other location.

3.6 **MISCELLANEOUS CABLES**

- .1 UBC IT does not accept or employ; hybrid, under-carpet, or flat cables.

3.7 **CABLE SUPPORT**

- .1 Cables must be properly supported at all times. Cables shall not be left on floors of Communication rooms, or hallways, and shall be installed in a manner that will not allow deformation of the cable over time.
- .2 Unless specified otherwise, all cables shall be bundled and supported to the walls at maximum intervals of 600 mm with Panduit J-mod system and Velcro type straps.
- .3 Do not deform the cable jacket, specifically when using cable fasteners or ties.
- .4 When installing Communications cables in long vertical drops in a building, the bundle of cables shall be rotated horizontally 180° every fourth floor.
- .5 J-Hooks should not be utilized in new buildings or large scale renovations. J-Hook usage is reserved for small renovations or localized additions where it is not economically feasible to install the preferred forms of pathway.

3.8 **FIBRE OPTIC INSTALLATION**

- .1 All fibre optic cable system work completed by the Contractor must meet quality approval as stipulated by the UBCO Information Technology Representative and consulting Engineer. The following requirements must be met to gain system acceptance.
 - .1 Receive, check, unload, handle, store and adequately protect equipment and materials to be installed as part of the Contract. In existing buildings, store in areas as directed by the UBC Information Technology Representative and Consulting Engineer. Installation includes setting in place, fastening to walls, floors, ceilings, cabinets or other structures where required, interconnecting cabling of system components, equipment alignment and adjustment and other related work whether or not expressly defined herein.
 - .2 Install materials and equipment in accordance with applicable standards, codes, requirements and recommendations of national, provincial and local authorities having jurisdiction and with manufacturers' printed instructions.

- .3 Adhere to manufacturers' published specifications for pulling tension, minimum bend radii and sidewall pressure when installing cables.
- .4 The typical fibre backbone cables shall consist of a 24 strand single mode cable. All fibre shall be terminated using LC UTP connectors or LC UTP pigtails. Only pre-polished connectors will be accepted, UBC will not accept on site polished connectors. There shall be spot inspections by the UBCO Information Technology. Any re-termination is done at no cost to UBC.
- .5 No manual fusion splicing shall be performed.
- .6 Fibre cable preparation, pigtail routing, and forming within the splice or distribution panel shall be as per manufacturer printed instructions.
- .7 When splicing, all 900um fibre strands transitioning from cable sheath to splice tray and splice tray to bulkheads must be bundled inside protective tubing.
- .8 After testing is complete all connector end faces will receive a final cleaning with a Cle-top or equivalent cleaning device. Alcohol wipes shall not be used.
- .9 Dust caps must be present and installed on all fibre connectors and adapters that are not properly mated.

3.9 **TERMINATIONS**

- .1 All cables shall be terminated in Communication rooms and at Communications outlets.
- .2 The Contractor will not leave any cables un-terminated unless directed to do so by UBCO Information Technology.

3.10 **TESTING**

- .1 Category 6A UTP/STP testing shall conform to current ANSI/TIA/EIA-568-C Standard. Every cabling link in the installation shall be tested to the most current version of the ANSI/TIA/EIA Standard. Testing shall be accomplished using a Fluke DSX-8000 or newer Fluke Digital Cable Analyzer field tester with the appropriate permanent link adapters. Permanent link testing procedures shall be used to certify the system. **NO SUBSTITUTE TESTERS WILL BE ALLOWED.**
- .2 Initially test every fibre within the fibre optic cable with a light source and power meter utilizing procedures as stated in TIA/EIA-526-14-A. Measured results shall be within manufacturers' loss budget calculations. If loss figures are outside this range, test cable with optical time domain reflectometer to determine cause of variation. Correct improper splices and replace damaged cables or connectors at no cost to UBC.
 - .1 Cables shall be tested at 1300nm and 1550nm for single mode fibre optic cables.
 - .2 Testing procedures shall utilize "Method 1" – one jumper reference.
 - .3 Bi-directional testing of optical fibres is required.
 - .4 Fluke DSX-8000 or newer model with applicable fibre optic modules is required for fibre testing
- .3 Random testing on all cabling mediums shall be done by UBC. Where any portion of the

system does not meet the specifications, the Contractor shall correct the deviation and repeat all applicable testing at no additional cost to UBC.

- .4 Supply a complete set of electronic test results for all UTP/STP and fibre optic tests performed.
- .5 After testing is complete all connector end faces will receive a final cleaning with a Cle-top or equivalent cleaning device. Alcohol wipes shall not be used.
- .6 Dust caps must be present and installed on all fibre connectors and adapters that are not properly mated.

END OF SECTION 27 05 08