
DIVISION 27 – COMMUNICATIONS – VOICE / DATA / WIRELESS

SECTION NUMBER AND TITLE

27 05 00	Communications Overview
27 05 01	Basic Requirements
27 05 02	Administration
27 05 03	Site Requirements
27 05 04	Construction Safety
27 05 05	Communication Rooms Design Guidelines
27 05 07	Fire-stopping
27 05 08	Cable Infrastructure Design Guidelines
27 05 09	Warranty
27 05 26	Bonding and Grounding for Communications Systems
27 05 28	Pathways for Communications Systems
27 05 53	Identification for Communications Systems
27 08 00	Testing of Fibre and Copper Communications Cables
27 13 00	Communications Backbone Cabling
27 15 00	Communications Horizontal Cabling
27 21 33	Data Communications Wireless Access Points

Appendices A – ITSTD – Communication Standard Drawings
Appendices B – Sample of Circuit Numbering for Database Sheet (CCT)

1.0 **GENERAL**

1.1 **DOCUMENTS**

- .1 This section of the Guidelines / 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:

1.0	GENERAL
1.1	DOCUMENTS
1.2	SUMMARY
1.3	INTRODUCTION
1.4	OVERVIEW
1.5	CONSULTANT CO-ORDINATION
1.6	CONTACTS – INFORMATION TECHNOLOGY
1.7	CONTRACTOR QUALIFICATIONS
1.8	APPROVED CONTRACTORS

1.3 **INTRODUCTION**

- .1 The University of British Columbia owns and Information Technology operates most of the Communications systems and facilities on campus. With few exceptions UBC owns all cabling on campus.
- .2 The intent of this document is to assist Consultants and installing contractors to provide standard specifications to ensure the continued implementation and maintenance of the cabling infra-structure system on the UBC Campus. This document is the property of Information Technology.

1.4 **OVERVIEW**

- .1 This document must be read, interpreted and coordinated with all other related UBC Technical Guidelines to deliver a complete Communications infrastructure system.
- .2 These Guidelines / Specifications prescribe mandatory requirements for Telecommunications infra-structure systems within academic and residential buildings, up to and including the Communications outlet, and between buildings to the extent of a campus wide environment.
- .3 A structured approach is specified which will ensure a flexible distribution system that will minimize the future costs of moves, additions and changes.
- .4 The Contractor will supply, furnish, and install all material, labour, apparatus, tools, equipment and services required for construction and put into regular operation the complete Communications system as shown on the Communications drawings, described in the specifications, and any attached appendices.
- .5 Renovations in existing buildings shall always reflect the intent of these Guidelines / Specifications. This includes, but is not limited to:
 - .1 Outlet upgrades with new conduit, outlet boxes, cable faceplates, or jacks.
 - .2 Cable tray in hallways, J-hook spurs, and or zone conduit.

- .3 Communications room design placement shall provide maximum 90-meter, 360-degree coverage for the most cost-effective network equipment deployment and utilization where possible. The intent is to minimize communications rooms with active network equipment.
- .6 Any and all proposed changes to these Guidelines / Specifications shall be subject to approval in writing to the UBC Information Technology Representative prior to implementation.

1.5 **CONSULTANT COORDINATION**

- .1 Information Technology Mandatory Process
 - .1 The Consulting Engineer shall be an RCDD in good standing who has performed recent Communications design. Certifications and references to be forwarded to the Information Technology Representative for approval. The RCDD will approve and stamp all prints relating to the communications infrastructure including all rooms, closets, riser diagrams, work area outlets and logical designs. If the architect or engineer does not have an RCDD on staff, ITS will provide a list of consultants who can contract for the project
 - .2 Provide design based on Communications service requirements signed off by end user and provided by UBC Information Technology Representative.
 - .3 Conceptual design shall include proposed Communication rooms location and layout, square footage of room, outlet locations, communications bonding riser, fibre and copper backbone riser layouts, and horizontal 1-line diagram. The Design shall be based on current UBC Information Technology Communications Design Guidelines / Specifications, and shall be reviewed by Information Technology Representative.
 - .4 95% design review prior to release to tender, inclusive of final tender specifications and UBC Information Technology Representative sign off on final number of Communication outlets. The Contractor shall supply soft copies of all drawings for review.
 - .5 Permit submissions to UBC regulatory as required. The Contractor shall pay all required permit fees.
 - .6 A copy of all Tender responses shall be submitted to Information Technology Representative for review.
 - .7 Random site inspections, testing of copper and or fibre will be done at the discretion of the UBC Information Technology Representative to ensure standards are being met.

NOTE:
This will not remove the responsibility of the Consulting Engineer to ensure these standards and all Contractors' Quality Control and Quality Assurance processes are met. The UBC Information Technology Representative may also request to be present during active testing by the Contractor.
 - .8 All final AutoCAD infrastructure drawing submissions shall comply with Information Technology AutoCAD drawing format and symbol standards. Drawings not meeting the standards will be rejected and revised to meet required standards at no cost to UBC.

1.6 CONTACTS - INFORMATION TECHNOLOGY

Sarah Gardner sarah.gardner@ubc.ca	Project Manager 604-827-5242 bus	Connectivity Infrastructure
Stephen McKenzie stephen.mckenzie@ubc.ca	Project Manager 604-822-0535 bus	Connectivity Infrastructure
Tom Ziemiński tom.ziemiński@ubc.ca	IT Plant Coordinator 604-822-8659 bus	Connectivity Infrastructure
Blake Bridgewater blake.bridgewater@ubc.ca	Manager 604-827-3663 bus	Connectivity Infrastructure
Eric Bourdon eric.bourdon@ubc.ca	Senior Manager UBCNetwork and Infrastructure Facilities 604-822-0832 bus.	

1.7 CONTRACTORS QUALIFICATIONS

Certified Personnel

- .1 The Contractor shall be an authorized "CommScope Partner" cabling system Installer.
- .2 All Technicians performing cable system installation work shall be current ACT 1 & 2 certified. All Technician certification cards shall be checked prior to work start up. Technicians must be current employees of the Communications Contractor.
- .3 The Communications Contractor shall assign a Supervisor with current RCDD certification to provide Quality Control based on UBC Information Technology Guideline Specifications, and to provide weekly report to Information Technology Representative.
- .4 The Contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size.
- .5 The UBC Information Technology Representative will pre-approve contractors for performing communications work at the University of British Columbia.

1.8 APPROVED COMMUNICATIONS CONTRACTORS

- .1 The following Contractors have been pre-approved by UBC Information Technology and are eligible to perform Inside Communications infrastructure work at the University of British Columbia, Point Grey campus:

BKS Cablecom Systems Ltd.

4th Utility Inc.

Houle Electric

PR Bridge Systems Ltd.

Paladin Technologies

- .2 The following Contractors have been pre-approved by UBC Information Technology and are eligible to perform Inside Communications Infrastructure work at the University of British Columbia, Okanagan Campus:

Houle Electric

Terracom Systems

Impact MEP Services Group

END OF SECTION 27 05 00

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:
- 1.0 GENERAL
 - 1.1 DOCUMENTS
 - 1.2 SUMMARY
 - 1.3 REFERENCED CODES AND STANDARDS
 - 1.4 CONTRACTOR RESPONSIBILITIES
 - 1.5 MATERIALS
 - 1.6 DRAWINGS
 - 1.7 ACCEPTANCE CONDITIONS
 - 1.8 PRE-INSTALLATION SITE SURVEY

1.3 REFERENCED CODES AND STANDARDS

- .1 The contractors must comply with the latest British Columbia Building Code, and Canadian Electrical Code, including all Provincial and other amendments, any local by-laws or rules and regulations requirements of UBC Land & Building Services regulating the installation of Communication facilities.
- .2 Materials shall bear the approval of the Canadian Standards Association and where applicable, the Underwriters Laboratories of Canada or alternately shall bear local approval from the Electrical Inspection Department having jurisdiction. Include in the contract all costs associated with obtaining local approvals.
- .3 If there is a conflict between the Drawings and Specifications and the above noted codes, by-laws, rule and orders, the codes, by-laws, rules and orders shall govern. In no instance, however shall the standards established by the Contract Documents be reduced by any of these codes or regulations.
- .4 Install and test telecommunications cabling networks per the latest manufacturer requirements and in accordance with the following standards:

NOTE:

Only the greater titles are referenced in this document but all current details and specifications that appear in each of the standards are relevant and apply to installations covered by this document. Please contact UBC IT – Connectivity Infrastructure if any clarification is required about the codes and standards that apply to any work done under these guidelines.

- .1 The Canadian Electrical Code (CEC)
- .2 BC Amendments to the CEC and associated bulletins.
- .3 ANSI/TIA/EIA Telecommunication Standards.

- .4 IEEE Ethernet Standards.
- .5 IEEE Wireless Standards.
- .6 ISO Telecommunications Standards.
- .7 BICSI Standards.
- .5 If the Contractor should note items in the drawings or in the specifications, or on the construction site, which would result in a code violation, promptly bring them to the attention of the Consulting Engineer and Information Technology Representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.
- .6 Conform to current safety and security standards, codes, and practices in effect at UBC including, but not limited to:
 - .1 Technical Safety BC
 - .2 BC Electrical Safety Act.
 - .3 The BC Building Code with Amendments.
- .7 Any other reference material must be approved by UBC before work commences.

1.4 CONTRACTOR RESPONSIBILITIES

- .1 The Communications guideline specifications generally describe the work of the Sub-Contractors, but does not intend to define the responsibility between the General Contractor and his/her Sub-Contractors.
- .2 The complete scope of all work is fully described in Division 27 drawings and technical specifications described herein.
- .3 The words “provide”, “supply”, “furnish”, and “install” shall imply that the applicable Contractor shall provide all necessary labour, materials, and equipment to complete the installation and where applicable, test same to the approval of the Consultant.
- .4 Unless otherwise noted or specified, the Contractor shall provide all equipment and / or materials shown on the drawings and defined in the specifications.
- .5 Any apparatus, appliances, materials, or work not shown on the drawings, but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered, and installed by the Contractor, without additional expense to the Owner.
- .6 Establishment and verification of dimensions, elevations, grades, boundaries shown on drawings and, reporting of any errors or inconsistencies to the Communications Consultant before starting Work. Starting Work shall imply that the Contractor has verified all items and found them to be correct. Additional costs arising out of any subsequent rectifications shall be borne by the Contractor.
- .7 The maintenance of discipline and general orderliness of the progress of the Project.

- .8 The coordination of Work of all trades in an efficient manner and on a continuous basis.
- .9 For the protection of all existing work, including buildings, finishing's, fixtures, paving, landscaping and other property against damage of any kind arising out of the Work and, reinstatement of anything spoiled or damaged, as directed. Special attention to be given by protecting elevators with plywood and the carpets with material sufficient to avoid staining and damage.
- .10 The coordination of patching, furring, re-finishing, including painting as required for performance of the Work.
- .11 To take measures to maintain security and prevent unauthorized access to existing Communication rooms, Classrooms, Offices, Study Rooms and Lecture Theatres.
- .12 To take steps throughout the Construction process, to prevent dust from escaping the immediate Construction zone and from settling on or contaminating existing Communications equipment terminal hardware, or classroom, and office furniture and equipment.
- .13 The maintenance on site of one complete set of white prints to be used exclusively for purposes of recording changes, deviations and revisions from the original contract. Care shall be taken by directing particular attention to the location of pipes, conduits etc.
- .14 Scheduling the Work in a manner acceptable to the Consulting Engineer and Information Technology Representative.
- .15 The Contractor has the responsibility to ensure that all provisions of these Standards are met and to specifically advise the Information Technology Representative in writing of any contemplated exceptions and obtain approval in writing for these changes.

1.5 **MATERIALS**

- 1. Materials shall be delivered on site in original containers and packages with labels and seals intact. Use in strict accordance with manufacturer's latest printed directions and instructions unless otherwise specified. Materials not approved or not conforming to the Contract Documents will be rejected. Contractor to order materials with long delivery times immediately upon award of Contract and with concurrence of Information Technology Representative.
- 2. Material deliveries to site shall be the responsibility of the Contractor. Post-delivery, the Contractor shall take responsibility to protect material during storage and handling to prevent damage and theft. Do not store equipment or materials where conditions fall outside manufacturer's recommendations for environmental conditions. Do not install damaged material or equipment. Material or equipment damaged during installation, shall be replaced at no cost to the University.

1.6.1 **DRAWINGS**

- .1 The location of various items indicated in IT drawings, are approximate except where specifically mentioned.
- .2 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work.

- .3 The Contractor is responsible to take field measurements where equipment and material dimensions are dependent upon building dimensions.
- .4 The Contractor shall coordinate with General, Mechanical and Electrical trades as well as Furniture Layout Designer for final User outlet locations.
- .5 If any discrepancies or omissions are found in the drawings, or if the intent is not clear, the Contractor shall obtain clarification from the Consulting Engineer or UBC IT representative.

1.7 ACCEPTANCE CONDITIONS

- .1 The installed system will be deemed acceptable when the Contractor delivers the documentation as specified in Section 27 08 00 and 27 05 09 to the UBC Information Technology Representative.
- .2 The Consulting Engineer must supply completed IT Infrastructure as-built drawings.

1.8 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 and Representatives of trades performing related work to co-ordinate efforts.
- .2 The Contractor shall review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with other trades shall be necessary to meet critical deadlines for completion of Communications Rooms and Closets.
- .3 Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.

END OF SECTION 27 05 01

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:

- 1.0 GENERAL
- 1.1 DOCUMENTS
- 1.2 SUMMARY
- 1.3 CONTRACTOR'S FOREMAN
- 1.4 PROJECT MEETINGS
- 1.5 COORDINATION ON SITE
- 1.6 SEQUENCE AND SCHEDULING
- 1.7 PRICING
- 1.8 PERMITS, FEES, TAXES, AND INSPECTIONS
- 1.9 COORDINATION, CLARIFICATION AND ADDENDA
- 1.10 INSPECTIONS
- 2.0 SUBMITTALS
- 2.1 INFORMATION TECHNOLOGY REVIEW AND APPROVAL
- 2.2 FIBRE SUBMITTALS
- 2.3 DRAWINGS AND SPECIFICATIONS
- 2.4 CONSTRUCTION DOCUMENTS
- 2.5 SUBSTANTIAL PERFORMANCE
- 2.6 FIELD QUALITY CONTROL
- 2.7 CERTIFICATE OF A COMMUNICATION SYSTEM

1.3 CONTRACTOR'S FOREMAN

- .1 The Contractor shall designate a Foreman to remain on the job site from the time construction commences until final completion and acceptance of the Work
- .2 The Foreman shall not be changed unless satisfactory reasons are given in writing to UBC Information Technology Representative.

1.4 PROJECT MEETINGS

- .1 The Foreman shall attend all meetings with the General, Mechanical, and Electrical Contractors as requested, as well as meetings that may be requested by the Project Manager, Consulting Engineer, or UBC Information Technology Representative.

1.5 COORDINATION ON SITE

- .1 The Contractor shall coordinate their work with the General, Mechanical, and Electrical Contractors to ensure that all required supporting structures such as (conduits and trays) are in place prior to commencing work.
- .2 Any conduit, outlet boxes, J-hooks or cable trays that are installed at locations that contradict instructions on the drawings, or in the specifications, shall be immediately identified and reported to the Consulting Engineer and UBC Information Technology Representative.
- .3 The Contractor shall promptly advise-the Consulting Engineer and UBC Information

Technology Representative of any specific equipment, materials or installation that are non-conforming with or in violation of laws, by-laws or regulations of authorities having jurisdiction.

1.6 **SEQUENCE AND SCHEDULING**

- .1 The Contractor shall submit a complete Construction Schedule for the installation of equipment (if specified), and cabling within seven (7) days of Awarding of Contract.
- .2 The Construction Schedule shall indicate delivery, installation, and testing dates for conformance to specific task completion dates. As a minimum, the Contractor shall provide the following dates:
 - .1 Bid Submission
 - .2 Start and Completion of Demolition
 - .3 Installation – Start
 - .4 Completion of Horizontal and Backbone Cable Installation
 - .5 Completion of Labeling
 - .6 Completion of Testing
 - .7 Completion of Cut-over
 - .8 Substantial Performance of structured cabling system
 - .9 UBC Information Technology Representative Acceptance
- .3 The Contractor shall submit a separate demolition time schedule with applicable cut-overs in areas that have existing Users.

NOTE:

This applies to any areas where systems will need to be taken off-line.

1.7 **PRICING**

- .1 The Contractor shall provide all separate, alternate and unit pricing as specified in this, or any other documents relevant to this project.

1.8 **PERMITS, FEES, TAXES, AND INSPECTIONS**

- .1 Contractor is fully responsible for compliance with Federal, Provincial and Municipal laws and regulations.
- .2 The Contractor shall, prior to commencement of the project, obtain low voltage permit and, at the end of project, submit request for final inspection to the Provincial Electrical Inspection Authority.
- .3 Technical Safety BC is responsible for issuing electrical permits at the University of British Columbia.
- .4 The Contractor shall submit to Technical Safety BC the necessary number of drawings and specifications for examination and approval, prior to commencement of work.

- .5 The Contractor shall pay all associated permitting and inspection fees.
- .6 The Contractor shall be responsible and pay for any additional time and expense occurred if re-inspections are required for deficiencies which have not been corrected to the Owner's satisfaction.
- .7 The Contractor shall pay for all associated taxes.
- .8 Contractor shall obtain and pay for all necessary key deposits, permits and licenses.
- .9 Prior to commencement of work, the Contractor shall provide a copy of all permits the UBC Information Technology Representative.
- .10 The Consulting Engineer shall be required to provide drawings and specifications to Technical Safety BC. All costs associated with this requirement shall be included in the Consultant's fee proposal.
- .11 The Consulting Engineer shall be required to notify the UBC Information Technology Representative of changes required by Provincial Electrical Inspection Department prior to making changes.
- .12 Upon substantial performance and before final payment, the Contractor shall submit a confirmation copy of acceptance for all work by Technical Safety BC, to the consulting engineer and UBC Information Technology Representative.

1.9 COORDINATION, CLARIFICATION AND ADDENDA

- .1 Questions about the meaning and intent of this document that may require clarification shall be submitted to the UBC Information Technology Representative.
- .2 Replies to tender questions will be issued in writing in the form of Addendum. Replies or modifications made in any other manner will not be binding and have no legal effect.
- .3 Addenda issued by the Consulting Engineer during the tender period shall be incorporated into Contractor's response, shall become part of the contract documents, and shall be reflected in the Contractor's price.

1.10 INSPECTIONS

- .1 The Contractor shall request, and coordinate representation from the Consulting Engineer and UBC Information Technology Representative for inspection of cabling system during, but not limited to the following stages of construction:
 - .1 Cable rough-in
 - .2 Communications room construction
 - .3 Testing
 - .4 Completion.

2.0 **SUBMITTALS**

- .1 The Contractor shall submit the following items to the UBC Information Technology Representative:
 - .1 Bill of materials, noting long lead-time items.
 - .2 Complete test results of UTP/STP and fibre optic horizontal and backbone cables.
 - .3 Project schedule including all major work components that materially affect any other work on the project.
 - .4 Completed electronic UBC IT CCT spread sheet.

2.1 **INFORMATION TECHNOLOGY REVIEW AND APPROVAL**

- .1 The UBC Information Technology Representative's approval of the Contractor's shop drawings, product data, and samples submitted shall not relieve the Contractor of responsibility for errors, omissions, or deviations from requirements of the Contract Documents, unless the Contractor has specifically informed the UBC Information Technology Representative in writing of such deviation at time of submittal, and the UBC Information Technology Representative has given written approval of the specific deviation.
- .2 The UBC Information Technology Representative's review and approval, of shop drawings, product data, and samples, is for the limited purpose of checking for conformance with information given and design concept expressed in the Contract Documents.
- .3 The UBC Information Technology Representative's review of Contractor's submittals is not conducted for the purpose of determining accuracy and completeness of details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor.
- .4 The UBC Information Technology Representative's review shall not constitute approval of safety precautions or of construction means, methods techniques, sequences or procedures.
- .5 The UBC Information Technology Representative's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

2.2 **DRAWINGS AND SPECIFICATIONS**

- .1 The Contract drawings and specifications form an integral part of the contract documents. Neither the drawings nor the specifications shall be used alone. Work omitted from the drawings but mentioned or reasonably implied in the specifications, or vice versa, shall be considered as properly and sufficiently specified and shall be provided.
- .2 Misinterpretation of any requirements on drawings, or specifications shall not relieve the Contractor of his, or her responsibility of properly completing the Contract.
- .3 Where conflict exists between drawings and specifications, the Contractor shall make allowance for provision of the component, system, or installation process in a manner which will provide UBC with the highest monetary cost components, systems, or installation process.
- .4 Drawings are generally diagrammatic and are intended to indicate the scope and general

arrangement of the Work. The Contractor shall not scale the drawings, but rather take field measurements in existing buildings particularly where equipment and material dimensions are dependent on building dimensions.

- .5 The Contractor shall obtain information from the Consultant where exact locations are not indicated.
- .6 The UBC Information Technology Representative has the option of changing the location of Electrical and Communication outlets to within 1 m of designed location prior to rough-in stage at no extra cost to UBC.

2.3 CONSTRUCTION DOCUMENTATION

- .1 The Contractor shall submit to the UBC Information Technology Representative for approval:
 - .1 Product data (including cut sheets and catalogue information) for products not on the approved product list
 - .2 Samples required by the Contract Documents
- .2 All above submittals must be forwarded promptly and, in such sequence, as to cause no delay in the work or in the activities of the other trades.
- .3 The UBC Information Technology Representative shall indicate approval of product data, and samples submitted by stamping such submittals with the word: "APPROVED".
- .4 Submittals shall be signed by the Contractor, imprinted with the date submitted, and shall bear the Contractor's legitimate Company name.
- .5 By submitting product data, and samples, the Contractor signifies that he, or she has carefully reviewed and verified materials, quantities, field measurements, and related field construction criteria. It also signifies the Contractor has checked, coordinated, and verified that all information contained with product data, and samples conforms to the requirements of the Work and of the Contract Documents.
- .6 The Contractor shall perform no portion of the Work requiring submittal and review of product data, or samples until the UBC Information Technology Representative has approved the respective submittal.
- .7 The Contractor shall submit product data, and samples to the UBC Information Technology Representative as a complete set within fifteen (15) days subsequent to Award of-Contract and prior to start of Work.
 - .1 For initial and re-submission for approval, the Contractor shall submit two copies of each proposal.
 - .2 The Contractor shall create reproductions as required for his, or her own use and distribution to subcontractors.
 - .3 The UBC Information Technology Representative shall not accept illegible submittals.
- .8 Prior to the start of installation, the Consultant shall submit an electronic copy of the

following shop drawings and construction documents to the UBC Information Technology Representative for approval:

- .1 Plan view drawings illustrating the layout of all Mechanical, Electrical, and Communication components and equipment in each Communication room.
- .2 Elevation drawings of all walls of each Communication room, clearly showing the layout of all termination hardware, grounding & bonding components, equipment cabinets, Communications equipment, power receptacles, lighting fixtures, cable tray, conduit, entry ducts, etc.
- .3 Vertical and horizontal Backbone cable topology, riser duct, and horizontal cable count diagrams in a one-line format.
- .4 System block diagrams depicting the interconnection between Communication rooms, system components, sub-systems and equipment cabinet layouts.
- .5 Communication Bonding & Grounding System.
- .6 Fire-stop design, identifying all locations to be fire-stopped, complete with documentation, a list of all fire-stopping materials to be used, and fire-stop systems to be installed.
- .7 Cabling installation schedule based on overall construction schedule for the project.
- .8 Manufacturer specification sheets.
- .9 The Consultant shall submit the following to the UBC Information Technology Representative at the conclusion of the project and within (2) weeks of forwarding notification that Substantial Performance has been achieved:
 - .1 (1) electronic set of As-Built drawings to UBC Information Technology Representative
 - .2 (1) full size set of As-Built drawings to Campus & Community Planning

NOTE:

- .1 As-Built drawings shall confirm location and identification of all:
 - .1 Communication Outlets
 - .2 Communication Rooms
 - .3 Backbone Cable Runs
 - .4 Fire stop design and records documentation as per Section 270507
- .2 As-Built drawings shall be drawn with current release AutoCAD software and shall conform to UBC's AutoCAD Drawing Format and use UBC Standards Symbols. A UBC standard symbols sample is included in Appendix A.

2.4 SUBSTANTIAL PERFORMANCE

- .1 The Contractor shall advise the UBC Information Technology Representative in writing when Substantial Performance has been achieved and shall request at the same time a Deficiencies Inspection be made.

- .2 The UBC Information Technology Representative may request to be present during actual live testing of the cable system.
- .3 The Contractor shall not issue a Substantial Performance Deficiencies Inspection request until the following work has been completed and specified documentation forwarded to the UBC Information Technology Representative:
 - .1 Verification of new fire alarm demarcation jack has been completed.
 - .2 All deficiencies noted during job inspection have been completed.
 - .3 Warranty certificates have been provided.
 - .4 All systems have been tested and passed and are ready for operation.
 - .5 Completed test results for the structured cabling system have been provided in a readily readable format such as PDF. Cable tester manufacturer proprietary file formats are not acceptable for submission to UBC IT.
 - .6 The cleanup is finished in all respects.
 - .7 All inspection certificates have been furnished including final low voltage and or electrical inspection certificates.

2.5 FIELD QUALITY CONTROL

- .1 Fire-stop installation shall be performed as per Fire-stop Section 27 05 07.
- .2 Manufacturer's certificate or letter shall be provided to confirm that the entire installation is installed according to manufacturer's instructions.
- .3 At UBC IT's option, tests shall be carried out in presence of UBC Information Technology Representative.
- .4 Instruments, meters, equipment and personnel shall be provided to conduct tests during and at conclusion of the project.
- .5 Test results shall be submitted to for UBC Information Technology Representatives for review.

2.6 CERTIFICATION OF A COMMUNICATIONS SYSTEM

- .1 The Contractor shall ensure that the cabling system installed and the Contractor's Employees working on this project are Certified and Warranted by the Cable Manufacturer.
- .2 The Contractor shall only use Certified Personnel who are trained and equipped to properly install a structured cabling system, including but not limited to supporting pathways, cable, termination hardware, bonding and grounding systems, equipment cabinets or equivalent, and associated Communications equipment, in order to obtain system acceptance.

END OF SECTION 27 05 02

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:

- 1.0 GENERAL
- 1.1 DOCUMENTS
- 1.2 SUMMARY
- 1.3 USE OF PREMISIS
- 1.4 SITE EXAMINATION
- 1.5 NOISE ABATEMENT
- 1.6 CORING AND DRILLING
- 1.7 FINAL CLEAN-UP
- 1.8 REMOVAL OF ABANDONED CABLES
- 1.9 DELIVERY, STORAGE, AND HANDLING

1.3 USE OF PREMISIS

- .1 The Contractor must abide by UBC's requirements regarding protection and security of UBC's property during construction.
- .2 The Contractor must confine construction activities relevant to the work to immediate areas and within the bounds established by UBC.
- .3 The Contractor and his employees and subcontractors employed on the project shall comply with applicable Provincial Government Regulations, Work Safe BC Regulations and the Canada Employment Insurance Commission.
- .4 UBC reserves the right to take possession of and have use of completed or partially completed portions of the work, regardless of the time of completion of the entire work, provided it does not interfere with the contractor's work. Such possession or use of the building or part thereof shall not be construed as final acceptance, or an acknowledgement of fulfilment of the contract.
- .5 The key deposit fee does not relieve the Contractor of paying re-keying costs should any keys be lost.

1.4 SITE EXAMINATION

- .1 The Contractor shall examine the site and become familiar with all characteristics affecting the work prior to submitting the price.
- .2 No additional compensation will be given for extra work due to conditions that the site examination should have disclosed.
- .3 Construction trailer(s) must be located in UBC approved location(s).
- .4 All expenses for trailer services and installation (power or telephone) will be the contractor's responsibility.

- .5 Parking of all vehicles (personal or business) must be in UBC approved locations. Failure to do so will subject the vehicle to parking violations.
- .6 Keys for access must be obtained from appropriate UBC authority. A key deposit may be required. In sensitive areas, UBC Security may be required to be in attendance and a schedule for those locations may be required of the Contractor.

1.5 **NOISE ABATEMENT**

- .1 The Contractor shall comply with the requirements of UBC and with Provincial and Municipal bylaws regarding noise abatement and shall take all the necessary steps to ensure that noise and vibration that are found objectionable, be corrected to the satisfaction of UBC.

1.6 **CORING AND DRILLING**

- .1 Should coring or drilling be required, the work shall be performed by qualified company or personnel trained and familiar with the procedure. Any extra costs for coring out the Coring and Drilling will be paid for by the contractor.
- .2 The Contractor shall confirm that the company or personnel who will carry out the Coring and Drilling work, must conduct an X-Ray or Radar investigation prior to any coring or drilling

1.7 **FINAL CLEAN-UP**

- .1 Upon substantial completion of work, the General Contractor shall remove all surplus materials and thoroughly clean all communications rooms and spaces.
- .2 Upon completion, each communications space will be inspected by UBC IT ensuring an acceptable level of cleanliness prior to equipment installation.

1.8 **REMOVAL OF ABANDONED CABLES**

- .1 As part of the contract, the Contractor shall remove all unused and abandoned *telecommunications* cables. This includes all temporary *telecommunications* cables, as well as *telecommunications* cables that become redundant after cutover. *All Category cables of level 5 and lower are considered to be obsolete and will be removed during the course of any renovation or IT project regardless of size. These obsolete cables are not to be re-installed or reused once they have been changed or moved from their current installed location.*

1.9 **DELIVERY, STORAGE, AND HANDLING**

- .1 Material pickup or delivery to site shall be the responsibility of the Contractor. After delivery, the Contractor shall take responsibility to protect materials during storage and handling to prevent damage and theft.
- .2 The Contractor shall co-ordinate with the UBC Information Technology Representative for secure storage of equipment and materials.
- .3 The Contractor shall not store equipment or materials in conditions that fall outside manufacturer's recommendations for permissible environmental conditions.
- .4 The Contractor shall not install damaged materials, remove them from site and arrange replacement without causing delay to other trades or to the project schedule.

- .5 UBC shall not be held responsible for any damage or disappearance of any materials during construction and before substantial performance review and sign off.

END OF SECTION 27 05 03

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:
- 1.0 GENERAL
 - 1.1 DOCUMENTS
 - 1.2 SUMMARY
 - 1.3 OVERVIEW

1.3 OVERVIEW

- .1 The responsibility for safety on construction sites rests with the Contractor. The regulations of Work Safe BC (WSBC) and the British Columbia Building Code apply.
- .2 All Contractors and Subcontractors must be a registered employer with Work Safe BC and must conform to all WSBC requirements for construction safety.
- .3 All Site Safety Regulations as laid out and under the direction of the General Contractor will apply to the UBC IT contractors and must be observed.

END OF SECTION 27 05 04

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:

- 1.0 GENERAL
- 1.1 DOCUMENTS
- 1.2 SUMMARY
- 1.3 COMMUNICATION ROOM DETERMINATION
- 1.4 COMMUNICATION ROOM RESTRICTIONS
- 1.5 COMMUNICATION ROOM LAYOUT
- 2.0 DOORS
- 2.1 KEYING
- 2.2 FLOORING
- 2.3 PAINTING AND FINISHING SCHEDULE
- 2.4 SIGNAGE
- 2.5 SMOKE DETECTOR, HEAT DETECTOR, SPRINKLER SYSTEM
- 2.6 BACK-UP POWER AND POWER OUTLETS
- 2.7 FIRE-RATED DOOR GRILLS
- 2.8 EQUIPMENT CABINETS
- 2.9 HORIZONTAL CABLE
- 2.10 LABELING
- 2.11 ENTRANCE CABLE PROTECTORS

1.3 **COMMUNICATION ROOM DETERMINATION**

- .1 A Communications room is a service room designed to safely and securely house telecommunications equipment, and mounting and terminating of approved voice and data cables and their associated terminating and distribution equipment. A Communications room will not be used to house, or as a pass-through for, any components or systems that are not specifically related to the function of the communications room or stated as acceptable by UBC IT. This restriction includes, but is not limited to, electrical conduits and junction boxes, mechanical ducts and lines, plumbing connections and lines.
- .2 Number of and placement of Communication rooms will be based on the use of the 90-meter rule in a 360-degree coverage pattern where it allows the concentration of horizontal cable runs to common locations. This provides for cost effective network equipment utilization. A UBC Information Technology Representative will review the proposed placement at the conceptual design phase for approval. Minimizing the quantity of communications rooms and consolidating the network equipment are essential.
- .3 Communications designers are to draw a scaled circle on all electrical building floor plans indicating the 90-meter point from the serving communications room, taking in to account any riser distance needed for communications rooms that are not on the same floor. The intent is quickly identifying any outlets that exceed the 90-meter distance limitation.

- .4 Each Campus building will contain one Main Communications Room (MCR) and, as determined by the size of the building, may also contain one or more Local Communications Rooms (LCR).
- .5 The MCR will be used to mount approved telecommunications equipment and terminations common to the entire building. Usually the room also serves as a floor serving facility for mounting and terminating of approved Communications cabling and hardware. This room requires a minimum one-hour fire rating and is usually located in the basement.
- .6 LCRs serve a floor or several floors and are used to mount and terminate approved Communications cabling, hardware and equipment.
- .7 Installation details of a given communication system in a Communications room shall be verified with the UBC Information Technology Representative on site prior to time of installation.
- .8 Each Communications room shall have some form of environmental control provided regardless of whether the building as a whole is so equipped.
- .9 All Communications rooms shall be designed and placed so that direct access is from a common or non-secure area. Communications rooms are not to be placed behind other rooms that might have specialized or secure locks installed, for example a janitors' room or electrical room.

1.4 COMMUNICATION ROOM RESTRICTIONS

- .1 The minimum size of a communications room is determined by the expected cabinet quantity and associated cabinet clearances. The preferred shape of a communications room is square. For example, a room expecting to house a single cabinet would respect the 1.5m cabinet clearance front and 1m cabinet clearance rear to arrive at a depth of approximately 3.5m. As the preferred shape is square the resulting room will be 3.5m x 3.5m or 12.25m². Additional cabinets will require additional space. Any architectural or mechanical assets located inside a communications room must not subtract or disrupt the intent of the clear working space of the communications room. See section 2.8 of this document. A Communications room will not be used to house, or as a pass-through for, any components or systems that are not specifically related to the function of the communications room or stated as acceptable by UBC IT. This restriction includes, but is not limited to, electrical conduits and junction boxes, mechanical ducts and lines, plumbing connections and lines.
- .2 Communications rooms shall only contain Communications wiring, terminations and distribution equipment. UBC Information Technology must approve all security equipment installations before design. AV equipment is not approved for installation in Communications rooms.
- .3 No building occupant equipment is permitted in the communications rooms.
- .4 Other utilities shall not use the Communications Room space for pathways of ducts and pipes, other than those needed directly for environmental control of the Communication room.
- .5 All supporting infrastructure (i.e.- electrical conduits) will be routed following building lines and utilize the corners of the room for vertical travel. This will allow for the largest uninterrupted space on the plywood back board walls, which is integral to the communications installation.

1.5 COMMUNICATION ROOM LAYOUT

- .1 Penetrations through walls, floors and ceilings shall be fire-stopped using products as outlined in the UBC Guidelines Section 27 05 07 Fire-Stopping if applicable.
- .2 All walls shall be lined with rigidly installed 20 mm (3/4"), G1S (good one side) plywood, with the good side facing out. The plywood must be painted with two coats of light-colored Intumescent paint applied to all sides. If Treated Fire Rated Plywood is used, then the paint is not required to be intumescent. The full 8' length of plywood shall extend up from approximately 150mm height AFF. The plywood shall be professionally installed and fitted to the walls of the room. A poor-quality fitting and installation will not be accepted. Piecemeal installation of plywood will not be accepted, full length pieces must be used where they can. All plywood edges will be installed flush to each other to avoid ridges where the sheets meet. "Smash pins" are not an acceptable method of attachment as they are not flush with the finished plywood surface.
- .3 Install a drip tray(s) for any fluid carrying piping or sprinkler heads that are located above equipment racks.
- .4 The only access from adjacent ceiling spaces shall be by cable tray or conduit to allow connection to the horizontal and backbone pathways.
- .5 All power receptacles shall be centered at 300 mm AFF, or match mounting height of existing receptacles.
- .6 The lighting fixtures shall be mounted a minimum of 2900 mm AFF.
- .7 Unless specified to the contrary, a minimum of one equipment cabinet shall be supplied and installed in each active Communications room (not required for designated pass thru rooms). Exact placement and proposed layout of the equipment racks and required cable mangers shall be reviewed by UBC Information Technology Representative and must observe the required clearances around the cabinet.
- .8 UBC Information Technology Representatives will consult with the contractor regarding the final location of UTP/STP, coax, and fibre optic, terminating and distribution equipment at the time of installation.
- .9 A Flex or basket type cable tray shall be provided around the perimeter of the room and shall be attached to the Communications cable tray infrastructure as per standard drawing ITSTD-05. The tray shall be mounted @~2700 mm AFF. When used, wall-mounted tray brackets shall be securely bolted through the plywood into the wall structure behind it.
- .10 All conduit terminating in the ceiling space shall protrude into Communications rooms between a distance of 25 mm to 100 mm. The conduit stubs must be higher than the cable tray. Preferably installed with a small downward kick bend to assist in the waterfall of the cables in to the cable tray.
- .11 All conduit entry in to communications rooms will be above or below the installed plywood sheathing. Conduits should not penetrate directly through the plywood sheathing unless approved by UBC Information Technology.
- .12 The use of a pull pit in the Main Communications Room is not acceptable.
- .13 Communications rooms should not have drop ceilings or finished ceilings installed. The

room is intended to be open / unfinished ceiling for easy access to pathways.

2.0 DOORS

- .1 The supply of finish hardware on all new doors and frames are indicated on Architectural drawings and schedules. Retrofit existing hardware where directed on drawings. As a minimum, all existing doors shall be fitted with new accessible locksets.
- .2 Provide pressed steel frames and hollow metal doors C/W fire-rated door grilles.

2.1 KEYING

- .1 All Communication Rooms shall be “storehouse” keyed to the restricted access, ABLOY lock & key assemblies, as supplied and installed by the UBC Locksmith. The Contractor shall coordinate and arrange for installation of Communication Room locksets, prior to the installation of network equipment.

2.2 FLOORING

- .1 New Communication Room floor coverings shall be linoleum composite sheeting i.e. “Marmolium” as noted on drawings. Vinyl tiles are not acceptable. Sealed concrete is not acceptable. Epoxy seal floor finish is acceptable in a gray colour.
- .2 Re-use of existing flooring where applicable, shall be at the discretion of the UBC Information Technology Representative.

2.3 PAINTING AND FINISHING SCHEDULE

- .1 All plywood wall sheathing shall be treated with Intumescent paint if fire resistant plywood is not installed. Refer to MPI #64 listing and reference INT. 6.4S.

2.4 SIGNAGE

- .1 Provide room signage for all new or renovated Communications Rooms, closets or ancillary rooms created as part of the Communications infrastructure where these are accessed from a public corridor or where necessary to facilitate way-finding as per current Campus Community Planning Standards.
- .2 Remove and replace existing signage where this can be incorporated in the new work.
- .3 Communications spaces must not be referred to as Electrical rooms as this implies a different level of safety requirements and access controls.

2.5 SMOKE DETECTOR, HEAT DETECTOR, SPRINKLER SYSTEM

- .1 Sprinkler heads shall be high temperature type. For existing sprinkler system inside communications room area, replace existing sprinkler head with high temperature type.
- .2 Provide cage to sprinkler heads for mechanical protection.
- .3 Install a drip tray(s) for any fluid carrying piping or sprinkler heads that are located above equipment racks.

2.6 BACK-UP POWER AND POWER OUTLETS

- .1 The Contractor shall provide power to MCR and LCR from both stand-by generator power supply panel, if the building is so equipped, and standard building power.

- .2 The Contractor shall provide a minimum of (1) 30A 120 V AC circuit (non-switchable) outlet. This circuit is to appear in (1) double gang simplex electrical outlet located on the wall directly behind or beside the IT equipment cabinet in the MCR and each LCR. (Refer to Drawing ITSTD-4 & 11) The outlet receptacle is to be a NEMA L5-30R twist lock. If standby generator exists in the building, then a second 30A 120V AC circuit (non switchable) outlet will be installed beside the above indicated outlet using the same format box/ plug combination and location. The intent is to have (2) L5-30R outlets in the room near the equipment rack, one on generator, one on standard building power. This requirement repeats for each active network equipment rack in the room, for example if a room has 2 active network equipment racks then there will be (2) sets of (2) L5-30R outlets. Each L5-30R outlet will be labelled to indicate if it is supplied by Generator or regular power including the breaker panel and breaker position.
- .3 The Contractor shall provide (2) dedicated 15A, 120V AC (non-switchable) circuits. These circuits are to appear in double gang duplex convenience outlets located at not more than 6 ft intervals around perimeter walls of MCR and each LCR. Convenience outlets shall be identified and marked. These outlets are to be supplied from standard building power. (Refer to Drawing ITSTD-04 & 11) These outlets must be labelled with the breaker panel and breaker position.

2.7 FIRE-RATED DOOR GRILLS

- .1 Only when requested by UBC IT.

2.8 EQUIPMENT CABINETS

- .1 Equipment cabinets will be per approved manufacturers and associated part numbers supplied and detailed in Section 27 05 08.
- .2 Each equipment cabinet shall be plumbed and leveled, and solidly bolted to the floor with bolts, washers and brackets. Bonding of rack to ground per Section 27 05 26
- .3 Equipment cabinets shall be seismically restrained, as shown on ITSTD-36 and per UBC Campus Community Planning Standards.
- .4 Where two or more cabinets are mounted side by side; the racks shall be bolted together with the indicated vertical wire managers between the racks (if requested) or as directed by UBC IT. Provide side panels, front and rear doors, and cabinet top only when requested by UBC IT. See ITSTD-15 and 57.
- .5 Provide 1.5 meters access clearance in the front and 1-meter access clearance in the rear and one side of an equipment cabinet. Where several rows of racks are located side by side, the row spacing shall be a minimum of 1.5 meters. A minimum clearance of 150 mm shall be maintained between one side of an equipment cabinets and the wall.
- .6 Typical equipment cabinet data port capacity is 432 horizontal cables when the UPS is installed in the same cabinet. If the UPS is not present then the typical data port capacity is 576 horizontal cables.

2.9 HORIZONTAL CABLE

- .1 In a communications room, horizontal cables shall be bundled separately from entrance and riser cables.
- .2 A minimum of 5 meters slack shall be left on all unterminated cables in the communication room.

2.10 LABELING

- .1 Each MCR and LCR is identified with a unique terminal room number supplied by the UBC Information Technology Representative. (Refer to Section 27 05 53 and ITSTD32)

2.11 ENTRANCE CABLE PROTECTORS

- .1 Always leave space for location of entrance facility terminations and protectors in the main communications room of a building as per drawing ITSTD-06 and always co-ordinate this layout with the UBC Information Technology Representative. (Refer to Section 27 05 06)

2.12 COMMUNICATIONS ROOM VENTILATION

- .1 Each MCR and LCR is to be provided with a means of ventilation (heat abatement) sufficient to maintain an average ambient air temperature range of 20 C to 23 C, as measured at the midpoint of the front face of the installed equipment racks. This temperature range is to be maintained on a 24 hour a day by 365 day per year basis. Modulation of the communications room temperature or ventilation airflow (supply/exhaust) via in-building BMS systems is not allowed.
- .2 Where a centralized source of chilled water/fluid exists or will be provided within the building, each MCR/LCR should be provided with its own ceiling-mounted fan-coil unit, with wall-mounted thermostat for full local temperature control.
- .3 If no centralized source of chilled/fluid exists, a package precision-cooling chiller unit such as those from American Power Conversion (Network Air CM series or equivalent) or Liebert (Datamate, Minimate or equivalent) should be provided. Split systems are acceptable.
- .4 If there is mechanical room space available adjacent to the communications room, it is preferable to mount fan-coil or package chiller units within the mechanical room (and duct the supply and return thru wall penetrations) to avoid running water/glycol pipes within the communications room envelope.
- .5 Wherever possible, ventilation system supply/return air ducting is to be placed such that chilled supply air is directed to the front of installed equipment racks, and return/exhaust intakes are above the rear of the equipment racks. Ducting must be routed so as not to interfere with access to cable tray and equipment racks or any other installed communications infrastructure within the room.
- .6 Power supply to communications room ventilation systems should be provided with redundant power feed sourced from standby power systems where available.
- .7 Humidity inside the communications room must be maintained within the range of 20 % RH to 80% RH. Tighter control is not required unless specifically requested for by Information Technology, or where special circumstances mandate it.
- .8 Air filtration is to be provided at all air handling and mechanical ventilation plants servicing the communications room. Dry, replaceable type filter media is required.

2.13 LIGHTING

- .1 Each MCR and LCR is to be provided with energy efficient direct source lighting, so as to illuminate both the front and back areas of all equipment racks as well as interior walls where equipment is mounted.
- .2 Illumination levels are to be according to WSBC or similar Industry standards for safety and comfort.

- .3 On/off control of the lighting within the room must be dedicated for that room and located within the room.

END OF SECTION 27 05 05

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:

- 1.0 GENERAL
- 1.1 DOCUMENTS
- 1.2 SUMMARY
- 1.3 INTER-BUILDING FACILITIES - OVERVIEW
- 1.4 COORDINATION WITH UBC UTILITIES
- 1.5 COORDINATION WITH UBC INFORMATION TECHNOLOGY
- 1.6 DUCT SELECTION
- 1.7 CONTRACTOR SUPERVISION
- 1.8 APPROVED CONTRACTOR LIST – OP FIBRE
- 1.9 LABELING
- 1.10 RECORD DRAWINGS
- 1.11 ENTRANCE CABLE PROTECTORS

1.3 **INTER-BUILDING FACILITIES - OVERVIEW**

- .1 When installing cable in empty ducts, the installation of sub-ducting, as directed by the Engineer of Record, is optional. A pull rope shall be installed in each sub-duct or main duct. All pull ropes used when installing cables must be replaced with same or better strength and quality of pull rope.
- .2 Provide all necessary record drawings and permits as required by UBC Utilities.
- .3 Provide all required Engineering reports to Information Technology Representative and copy of permits as required.

1.4 **COORDINATION WITH UBC UTILITIES**

- .1 Richard Hugli

Senior Manager - Electrical Utilities, Engineering & Utilities
Energy and Water Services

Building Operations – UBC Utilities

Phone-604-827-5056
Cell--604-803-0035
richard@utilities.ubc.ca

1.5 COORDINATION WITH UBC INFORMATION TECHNOLOGY

Sarah Gardner sarah.gardner@ubc.ca	Project Manager 604-827-5242 bus	Connectivity Infrastructure
Stephen McKenzie stephen.mckenzie@ubc.ca	Project Manager 604-822-0535 bus	Connectivity Infrastructure
Tom Ziemiński tom.ziemiński@ubc.ca	IT Plant Coordinator 604-822-8659 bus	Connectivity Infrastructure
Blake Bridgewater blake.bridgewater@ubc.ca	Manager 604-827-3663 bus	Connectivity Infrastructure
Eric Bourdon eric.bourdon@ubc.ca	Senior Manager UBCNetwork and Infrastructure Facilities 604-822-0832 bus.	

1.6 DUCT SELECTION

- .1 UBC Utilities shall provide duct assignments in conjunction with the Information Technologies representative and the Engineer of Record.

1.7 CONTRACTOR SUPERVISION

- .1 Engineer of Record shall be responsible for all up to date certification, code and UBC standard compliances.
- .2 Engineer of Record shall provide manhole verifications and installation contractor supervision as required.

1.8 APPROVED CONTRACTOR LIST – Outside Plant

- .1 The following Contractors have been pre-approved by UBC Information Technology and are eligible to perform Outside Plant Communications Infrastructure work at the University of British Columbia – Point Grey campus:
1. West Net Communications Inc
 2. Dixon Networks Corp

1.9 LABELING

- .1 UTP Cable: After terminating, the cable shall be identified at each termination on BIX connector labels (Green).
- i.e. HA-6 represents Henry Angus Hub-site, Cable #6
- .2 Individual pairs are identified with a sequential number in increments of 25.
- i.e. 501-525.526-550, etc.
- .3 Fibre Optic Cable: After terminating, the cable shall be identified at the fibre distribution panel with three groups of characters. The first group represents the originating hub-site.

The second represents the cable type. The third represents the cables sequential appearance on the originating hub-site frame.

i.e. SSW-FO-01 represents School of Social Work Hub-site, fibre optic cable, #1.

.4 Individual fibres strands are further identified indicating type and sequence.

i.e. SM-01, SM-02 indicating single mode fibre strand # 1 and strand #2.

Strand numbering will re-start for each discreet cable.

1.10 RECORD DRAWINGS

.1 Provide routing and associated Manhole detailed drawings as required. These record drawings must be in the standard UBC Utilities format.

.2 Provide hard and soft copies to Information Technology Representative.

1.11 ENTRANCE CABLE PROTECTION

.1 Location of entrance facility terminations and protectors in the Main Communications room of a building shall be coordinated with the Information Technology Representative.
(Refer to Standard Drawings ITSTD-04, ITSTD-06)

END OF SECTION 27 05 06

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:
 - 1.0 GENERAL
 - 1.1 DOCUMENTS
 - 1.2 SUMMARY
 - 1.3 FORWARD
 - 1.4 REFERENCES
 - 2.0 PRODUCTS
 - 2.1 REQUIREMENTS
 - 2.2 MATERIALS
 - 3.0 EXECUTION
 - 3.1 INSTALLATION
 - 3.2 EXISTING PENETRATIONS
 - 3.3 MASONRY POINTING PATTERN
 - 3.4 INSPECTING AUTHORITIES
 - 4.0 TRAINING

1.3 FORWARD

- .1 Fire-stop systems installed by the Contractor shall meet the requirements of all applicable codes and ULC standards.
- .2 The Contractor shall fire-stop new Communication pathway and / or cable penetrations of building fire barriers with an approved fire-stop system.
- .3 The Contractor shall fire-stop with an approved fire-stop system, any holes created by the Work of this Contract.
- .4 The Contractor shall coordinate all Work with Division 26 and applicable Inspection departments.
- .5 The Contractor shall obtain inspection approval from the applicable Permits and Inspections department and shall be responsible for all associated costs.
- .6 The Contractor shall provide equipment, materials, labour, and services not specifically mentioned or shown which may be necessary to complete or perfect all parts of this installation and in compliance with requirements stated or reasonably inferred by the Contract Documents.
- .7 The intent of the section is to address the firestopping requirements of penetrations where:
 - .1 Telecommunications cables are physically involved in or are part of the penetration
 - .2 the interior dimension of a telecommunications designated pathway allow for air exchange across a fire rated barrier

- .8 This section does not attempt to address and should not be used to address fire barrier penetrations that are applicable to Div 26.

1.4 **REFERENCES**

- .1 BICSI – Current Edition, *Telecommunications Distribution Methods Manual (TDMM)*
- .2 Current Canadian Electrical Code
- .3 Current BC Building Code
- .4 CAN/ULC-S115-11

2.0 **PRODUCTS**

2.1 **REQUIREMENTS**

- .1 The Contractor shall submit to the UBC Information Technology Representative for approval, the following items relating to the fire-stop system if requested:
 - .1 Hilti manufacturer technical data for each product intended to be used on site including product description, specifications and storage requirements.
 - .2 Fire-stop design documentation shall include:
 - .1 Schedule indicating:
 - .1 Number of fire-stop locations
 - .2 Type of penetration
 - .3 Type of building construction at point of penetration
 - .4 Hourly fire-rating of floors and walls
 - .5 Fire-stop device or system proposed.
 - .3 Applicable fire-stop design drawings.
 - .4 Installation Procedures and Material Safety Data Sheets shall be included with products delivered to the job site.
 - .5 Maintenance manuals and maintenance data that may be published by Manufacturer.

2.2 **MATERIALS**

- .1 Only Hilti fire-stop products are approved for fire-stopping Communications infrastructure penetrations of fire barriers at UBC.
- .2 Hilti fire-stop products may be in the form of sleeves, caulk, putty, strips, blocks, plugs, or sheet material. The choice of fire-stop products depends on the type of penetration to fill

- such as holes, spaces, and voids, or cavities and whether the penetration has or will have cable passing through it.
- .3 The Contractor shall use fire-stop materials that have no irritating or objectionable odors, when fire-stopping occupied areas of existing buildings.
 - .4 Fire-stop products used in cross-sectional areas of the pathway such as inside sleeves, or cable tray penetrations of fire barriers shall be re-enterable type to enable future Moves, Adds, or Changes.
 - .5 Fire-stopping materials shall provide adhesion to substrates, and maintain fire and smoke seal under normal expected movements of substrates, conduits, and cables.
 - .6 The preferred Hilti Fire stop system for new installations is the Gang plate/ Speed sleeve system. CFS-SL GP and CP 653.

3.0 EXECUTION

1. Division 27 contractors are responsible for Firestopping the interior air space of all pathways that are designated for UBC IT Telecommunications and networking cables where firestopping is required.

3.1 INSTALLATION

- .1 The Contractor must receive training from the manufacturer on the proper installation of the fire stop system. The Contractor shall follow the manufactures instructions and guidelines for installation of the chosen fire stop system

3.2 EXISTING PENETRATIONS

- .1 In existing buildings, the Contractor shall fire-stop any gaps or cavities between penetrating cable tray, ducts, or sleeves and surrounding surface area
- .2 The Contractor shall fire-stop with an approved fire-stop system, the following existing penetrations of building fire barriers:
 - .1 Existing Communication pathway, cables, or holes that are not fire-stopped and are within 1m (3') of new Communication pathway, or cable penetrations of fire barriers.
 - .2 Existing Communication cables abandoned by the Work of this Contract.

3.3 MASONRY POINTING PATTERN

- .1 Where fire-stop systems penetrate masonry barriers, the Contractor shall make good surrounding area by replicating original pointing pattern and matching in quality of workmanship.

3.4 INSPECTING AUTHORITIES

- .1 The Contractor shall remove and expose fire-stop systems to the extent directed by Inspecting Authority for the purpose of carrying out the inspection.

- .2 The Contractor shall re-install fire-stop system and restore any affected building components removed for inspection, at no cost to the Owner.

4.0 TRAINING

- .1 The Contractor must receive training from Hilti and possess current Hilti certification prior to installing Hilti fire-stop products.

END OF SECTION 27 05 07

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:

- 1.0 GENERAL
- 1.1 DOCUMENTS
- 1.2 SUMMARY
- 1.3 OVERVIEW
- 1.4 DESCRIPTION OF SYSTEM
- 1.5 OTHERS IN INFORMATION TECHNOLOGY PATHWAY
- 2.0 PRODUCTS
- 2.1 MANUFACTURERS
- 2.2 MATERIAL
- 2.3 HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS
- 3.0 EXECUTION
- 3.1 PROTECTION OF OWNER'S FACILITIES
- 3.2 PRE-INSTALLATION SITE SURVEY
- 3.3 INSTALLATION - GENERAL
- 3.4 COMMUNICATIONS CABLE – GENERAL
- 3.5 UTP/STP INSTALLATION
- 3.6 MISCELLANEOUS CABLES
- 3.7 CABLE SUPPORT
- 3.8 BIX CONNECTORS
- 3.9 FIBRE OPTIC INSTALLATION
- 3.10 TERMINATIONS
- 3.11 TESTING

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 typical and is based on information supplied by the end user and the UBC Information Technology Representative.
- .2 The determination of typical communication outlet cable counts will be in consultation with UBC 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 UBC 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 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. Terminate the voice cables on GigaBIX termination blocks located in the same LCR / MCR. ITSTD-32
- .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 Voice backbone cabling shall consist of multiples of 25 pair Category 3 unshielded twisted pair cables and shall be installed from the Main Communication Room (MCR) to each Local Communication Room (LCR.) ITSTD-13, 32, 64
- .6 Fibre Data backbone cabling consisting of a minimum of 12 strands of multi-mode, laser optimized 50/125um OM4 and a minimum of 12 strands of single mode optical cable shall be installed from MCR to each zone LCR. Required strand count to be determined as needed per installation. It is expected that these are to be separate cables, one for each type of fibre. All connections regardless of fibre type will be SC, UPC form factor. ITSTD-32, 56, 63
- .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 - A minimum of (1) FTP Category 6A cable for data connection and (1) FTP Category 6A cable for voice connection shall be installed from MCR or LCR to specified demarcation locations for centralized BMS panels. There may be more than one location per building. ITSTD-22
- .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: a - on the communications room wall behind entrance door, b – in elevator machine rooms, c – above Proxsafe key lock boxes. However 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 and (1) FTP Category 6A cable for voice communications. 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, unless a third-party elevator communications system is used (for example a Webb System). If a third-party elevator communications system is used in a building, then one (1) FTP Category 6A cable for voice communications will be installed at a demarcation point agreeable to both UBC IT and the company installing the third-party system, typically the UBC IT MCR. Regardless of the inclusion of a third-party system the standard elevator communications demark cables shall be installed. ITSTD-22
 - 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 Meter - A minimum of (1) FTP Category 6A cable for data communication and (1) Category 6A cable for voice communication shall be installed 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. ITSTD-04, 11
- .16 The Contractor must finalize equipment layouts of Communication rooms with UBC 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 UBC 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 other 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 voice backbone (Riser) cables shall be Category 3, however termination hardware located in MCRs and LCRs shall be Category 6 - GigaBIX. The termination hardware shall be manufactured by BELDEN – GigaBIX IDC system.
- .3 All fibre cables and pigtails shall contain glass manufactured by Corning.
- .4 All fibre termination hardware shall be manufactured by Corning- CCH System, or as directed by UBC 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, GigaBIX blocks, and other Communications components used in Communications infrastructure installations at UBC.
- .2 The Contractor shall install and connect voice and 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 UBC 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)

Category 6A - T568-A SLX Jacks (USL10G-SHLD, A.WHT,760238128, Alpine White is default colour for field installation, metal or black colour is acceptable for comm room installation)

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)

Decora 2/3/4 -port strap kits (SL or 110, straight, Alpine white)

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

BELDEN - GigaBIX List

25 Pr 24 AWG CMR/P Cat 3 Backbone cable

GigaBIX 300 Pr Mounts (AX101472)

GigaBIX termination strips (AX101447, AX101448)

GigaBIX designation strips and labels (AX101483)

GigaBIX distribution rings (AX101478)

GigaBIX wire guards (AX101486)

CORNING List

24 strand (Typical count) MM laser optimized 50/125 micron MIC for backbone cables. All dielectric, OFNR/P – CMR/P, certified for 10 Gigabit @ minimum of 500 Meters, OM4.

24 stand (Typical count) SM 8.3 micron MIC for backbone cables. All dielectric, OFNR/P – CMR/P OS2.

2 strand MM or 4 strand MM composite OM4 MIC 50/125 micron CMR/P for horizontal cables if specified.

Pigtails must use Corning glass and SC connectors

Fibre panels shall be of the CCH System:

- Rack mounted distribution panels are typically CCH-02U or CCH-04U
- Multimode splice modules are typically CCH-CS12-E7-P00TE
- Singlemode splice modules are typically CCH-CS12-59-P00RE

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, tapped,

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.

Electron Metal – Part number CB4-0049378-001 Series 4000 cabinet – includes:

- 24" x 83" x 36" – 44RU
- 2 pairs of 19" mounting rails TAPPED 12-24 c/w RU markings
- 1 universal accessory channel
- 1 LH rear vertical cable manager
- 1 RH rear vertical cable manager
- Qty 100 12-24 screws
- No doors / No side panels / No top

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 unreel 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.
 - .5 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.
 - .6 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.
 - .7 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.
 - .8 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 BIX CONNECTORS

- .1 The Contractor shall install GigaBIX distribution rings to support jumper wire, in a configuration that allows for the future expansion of the bix field. See ITSTD-13 for details.
- .2 Only BIX punch tools shall be used when terminating cables on GigaBIX connector.
- .3 Multi-pair cable bundles entering GigaBIX mounts and the hinging of GigaBIX connectors shall be on the jumper side of the mount.
- .4 Backbone 25-pair UTP cables from the same Communication room must be grouped together and terminated sequentially on the GigaBIX connectors; group the cables from each Communications room together. Once the first riser is terminated and numbered, every other riser in its group continues the number sequence.
- .5 Backbone 4-pair UTP/STP cables are terminated directly on patch panels. Four-pair backbone cables are terminated sequentially.
- .6 Horizontal 4-pair UTP/STP cables are terminated with a maximum of six (6) cables per GigaBIX connector.
- .7 Space for the protectors shall be provided to the left of the GigaBIX connector mounts.

3.9 FIBRE OPTIC INSTALLATION

- .1 All fibre optic cable system work completed by the Contractor must meet quality approval as stipulated by the UBC 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 – laser optimized – OM4 50/125 micron multimode cable and 24 strand single mode cable. All fibre shall be terminated using SC UTP connectors or SC UTP pigtails. Only pre-polished connectors will be accepted, UBC will not accept on site polished connectors. There shall be spot inspections by the UBC 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.

3.10 **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 UBC Information Technology.

3.11 **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 CommScope Approved field tester with the appropriate permanent link adapters. Permanent link testing procedures shall be used to certify the system.
- .2 25-pair Category 3 backbone cable testing shall consist of testing each cable pair for opens, shorts, grounds, crosses and pair reversal. Only a 100% pair pass rate will be accepted.
- .3 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 850 nm and 1300 nm for multimode fibre optic cables.
 - .2 Testing procedures shall utilize "Method 1" – one jumper reference.
 - .3 Bi-directional testing of optical fibres is required.

- .4 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.
- .5 Supply a complete set of electronic test results for all UTP/STP and fibre optic tests performed.
- .6 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.
- .7 Dust caps must be present and installed on all fibre connectors and adapters that are not properly mated.

END OF SECTION 27 05 08

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:
 - 1.0 GENERAL
 - 1.1 DOCUMENTS
 - 1.2 SUMMARY
 - 1.3 WARRANTY OVERVIEW
 - 1.4 MANUFACTURER CERTIFICATION
 - 1.5 WARRANTY COVERAGE

1.3 WARRANTY OVERVIEW

- .1 The structured cabling Manufactures 25-year performance warranty shall be applied to all work performed. All manufacturer warranties shall be transferred to the Owner.
- .2 The warranties of each item shall be listed and submitted along with shop drawings to the Information Technology Representative.
- .3 Detail specific items, or equipment components that are subject to separate conditional warranties. Warranty proprietary equipment and systems involved in contracts during the guarantee period.
- .4 The Contractor shall supply to the Information Technology Representative a Certification Document issued by the cable/component manufacturer stating that the Category 6A structured cable system is proven to be performance compliant and covered under the manufacturer warranty.
- .5 The Contractor must also provide a Category 6A certificate issued by the cable/component manufacturer guaranteeing data transmission performance to support gigabit (1000Base-T) Ethernet applications for a period of 25 years.
- .6 Final payment shall not relieve the Contractor of these obligations.

1.4 MANUFACTURER CERTIFICATION

- .1 The Manufacturer certification must guarantee:
 - .1 That the cable design and installation delivered by the Consulting Engineer and Contractor, will not negate or void any part of the certified system.
 - .2 That all materials and labour are covered for the full certification period.
 - .3 Should the Contractor cease to be in business, the full certification remains valid.

1.5 WARRANTY COVERAGE

- .1 The Warranty coverage shall, as a minimum, include:
 - .1 Warranty against defects in materials and workmanship from the date of installation.
 - .2 25 years coverage.
 - .3 Repair or replacement of a failed component, covering materials and labour, at no cost to the Owner.
 - .4 Single point of contact for all warranty services.
 - .5 Upon request and without cost to UBC the Manufacturer must make available it's Technical Representative to conduct site visits and inspections to ensure complete technical compliance of the installed system.

END OF SECTION 27 05 09

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:
 - 1.0 GENERAL
 - 1.1 DOCUMENTS
 - 1.2 SUMMARY
 - 1.3 DESCRIPTION OF WORK
 - 1.4 REFERENCE
 - 1.5 STATUTORY AUTHORITY – ELECTRICAL SAFETY
 - 2.0 PRODUCTS
 - 2.1 COMPONENTS
 - 3.0 EXECUTION
 - 3.1 INSTALLATION

1.3 DESCRIPTION OF WORK

- .1 Grounding and bonding practices at UBC shall comply with all applicable codes.
- .2 All new Communications metallic raceway shall be bonded to the Telecommunications Main Grounding Busbar (TMGB) in Main Communications Room or Telecommunications Grounding Busbar (TGB) in Local Communications Rooms.
- .3 In existing buildings, bond all existing Communications metallic raceway to be reused or modified to the nearest TMGB or TGB.
- .4 All power, service, and communications grounds shall be bonded. Bonding conductors shall be as short as possible and routed with a minimum of bends. All bends made on the conductor shall be sweeping bends.
- .5 Where practicable, all bonding conductors shall be installed without a splice. Where a splice is necessary, it should be accessible and located in a communications space. Conductors shall be spliced using irreversible compression-type connectors, exothermic welding, or equivalent. All joints shall be adequately supported and protected.
- .6 Bonding connections shall be made with bolts, crimp connectors, clamps, or lugs specifically designed for the purpose.
- .7 The following bonding conductors shall be connected to the TMGB
 - .1 The metallic jacket of all entrance cable,
 - .2 Cable protectors.
- .8 The following ground conductors shall be connected to the nearest TGB:
 - .1 All Communications metallic raceways,

- .2 The metallic jacket of shielded Intra or Inter -building backbone cable.
- .3 Equipment racks.
- .4 The shields of all FTP / STP communications cables where they appear in all communications rooms/ closets/ remote cabinets or consolidation points. The field ends of these cables are not to be bonded to ground.
- .9 The Communication grounding and bonding shall be independent from the building ground system except for a single connection between the to the main Electrical room ground busbar.

(Refer to Standard Drawings ITSTD-16, ITSTD-17)

1.4 **REFERENCE**

- .1 Canadian Electrical Code, Part 1.

1.5 **STATUTORY AUTHORITY – ELECTRICAL SAFETY**

- .1 Current Canadian Electrical Code, Part 1.
- .2 Current B.C. Electrical Code Regulation.

2.0 **PRODUCTS**

2.1 **COMPONENTS**

- .1 Main Communications Room: Copper busbar – (TMGB), c/w two (2) 50 mm insulated standoffs, with a minimum dimension of 100 mm wide X 300 mm long X 6 mm thick.
- .2 Local Communications Room: Copper busbar (TGB), c/w two (2) 50 mm insulated standoffs, with a minimum dimension of 50 mm wide X 300 mm long X 6 mm thick.
- .3 Cabinet bonding will be achieved with the use of a vertical bonding strip mounted on the front rail between equipment and cabinet rail.

Panduit RGS134-1Y or equivalent.
- .4 All busbars shall be pre-drilled with standard NEMA 10-32 bolt hole. Allow space for the connectors used.
- .5 Bonding conductor shall be green PVC jacketed, stranded copper, soft conductor, unless otherwise noted. (bare #6 AWG. in cable tray) Unless installed in conduit system, bonding conductor jacket shall be minimum CMR rated.
- .6 All bonding conductors and connectors shall be approved as defined in CSA C22.1.
- .7 Bonding conductors shall be identified on both ends of the conductors, with data plate cable marker complete with double straps, to indicate where the destination end of the conductor is located, such as 'Comm. Rm. 011' or ' Cable tray in Rm. 123'.

- .8 All FTP /STP communications cables will have appropriate matching connecting hardware (patch panels, jacks) that preserve the bonding continuity from the cable shield through to the bonding conductor of the rack / cabinet/ closet/ remote cabinet / or consolidation point.

3.0 **EXECUTION**

3.1 **INSTALLATION**

- .1 Install a complete, permanent, and continuous bonding and grounding system for Communications infrastructure and, equipment, including all necessary conductors, connectors and accessories, as indicated in IT drawings and this document, and to conform to requirements of Provincial Electrical Inspection Department and Canadian Electrical Code.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 The TMGB shall be connected to the building main Electrical ground busbar with a # 1/0 AWG green PVC jacketed stranded copper conductor.
- .4 All TGB's shall be connected to the TMGB with a #2 AWG green PVC jacketed stranded copper conductor installed in conduit.
- .5 Label conduit every 3 M with the description: "Communication Ground Only".
- .6 Bonding conductors placed in metallic conduits longer than one meter must be bonded to each end of the conduit with the appropriate bonding bushing.
- .7 Where the Communication rooms are stacked then the bonding conductor shall be a common riser bonding conductor for connection to the stacked Communication rooms.
- .8 In all cases the bonding conductors shall always be larger to smaller gauge from the building main Electrical busbar out to the last TGB.
- .9 Where Communication rooms are not stacked then install a separate bonding conductor from the MCR to LCR.
- .10 Bonding conductors shall be fixed to the walls and neatly formed around the perimeter of rooms.
- .11 A bonding busbar shall be placed in the center of the terminal wall in each Communication room, centered @ 250 mm AFF and mounted to the wall with insulating stand-offs. The location of the bus bar must not interfere with wall space designated for vertical riser cables or be mounted above or behind riser conduits and sleeves.
- .12 A lug shall be crimped to each end of the bonding conductor. Bonding conductors shall be bolted on the appropriate ground busbar with a 6 mm copper alloy bolt and nut.
- .13 Leave 6 spare connectors in the Main Communication room and 4 spare connectors in each Local Communication room.

- .14 Prior to attaching a lug to a painted or galvanized surface, the paint shall be scraped off to bare metal, to provide maximum contact. Flat washers and lock washers shall be used with the bolts.
- .15 Install a bare #6 AWG copper stranded conductor, in the entire length of surface raceway or cable tray and bond to the telecommunications grounding system.
- .16 The cable tray bonding conductor shall be bonded to cable tray by a bonding clamp at each straight length of tray regardless of length and each elbow and T-fittings.
- .17 All splices of bonding conductors shall be outside of the cable trays.
- .18 Conduits for individual outlet shall be bonded using a #12 AWG stranded insulated copper conductor from the conduit bonding bushing to the cable tray bonding conductor.
- .19 The metallic jacket of all inter-building cable shall be bonded with a #6 AWG green PVC jacketed stranded copper conductor at the jacket opening at both ends of the cable, using a bonding clamp designed for the cable used.
- .20 The metallic jacket of metallic shielded intra-building backbone cable shall be bonded with a #6 AWG green TW jacketed stranded copper conductor at the jacket opening, using a bonding clamp designed for the cable used.
- .21 Cable protectors shall be bonded with a #6 AWG green TW jacketed stranded copper bonding conductor.
- .22 Communication equipment shall be bonded through power receptacle's ground conductor
- .23 Equipment Racks and metal items in the Communication rooms shall be bonded to the appropriate ground busbar. Power panels and outlets in Communication rooms will be bonded to their supply side only.
- .24 All Communication conduit and tray leaving the Communication room shall be bonded at the supply side only.
- .25 There shall be no interconnecting bond wires between local Communication rooms on the same floor level.
- .26 All Communication outlet boxes and conduits shall be bonded via the communications bonding infrastructure.
- .27 Install #12 AWG insulated stranded copper bonding conductor to Wiremold surface raceway and bond to the building and telecommunications grounding systems for joint-use power and Communications applications. Bond to telecommunications grounding system if the raceway is dedicated only for Communications use.
- .28 Protect exposed bonding conductors from mechanical damage.

END OF SECTION 27 05 26

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:

- 1.0 GENERAL
- 1.1 DOCUMENTS
- 1.2 SUMMARY
- 1.3 REFERENCES
- 1.4 INSTALLATION
- 1.5 CUTTING AND CORING
- 1.6 CABLE TRAY SYSTEM
- 1.7 SURFACE RACEWAY SYSTEMS
- 1.8 LOCATION OF OUTLETS
- 1.9 MOUNTING HEIGHTS
- 1.10 AVOIDING ELECTROMAGNETIC INTERFERENCE (EMI)
- 1.11 ENTRANCE AND BACKBONE DUCTS
- 1.12 CONDUIT
- 1.13 PULL BOXES
- 1.14 SURFACE RACEWAYS
- 1.15 SURFACE RACEWAY PRODUCTS
- 1.16 SURFACE RACEWAY INSTALLATION
- 1.17 COMMUNICATION SYSTEM OUTLET BOXES
- 1.18 PRODUCTS
- 1.19 EXECUTION
- 1.20 COMMUNICATION SYSTEM OUTLET PLATES

1.3 **REFERENCES**

- .1 Current Canadian Electrical Code
- .2 Current B.C. Electrical Code

1.4 **INSTALLATION**

- .1 Provide cable trays in approximate location and general routing as shown on drawings – optimize routing to minimize cable lengths and provide best access for future installations.
- .2 The Contractor shall supply and install a system of cable raceways consisting of a combination of cable tray, conduit and in certain circumstances, J hooks. The cable trays extend horizontally from the Communications rooms, down the hallways or corridors to become the backbone or main pathway to support communication cables. Each Communications outlet shall be connected to the nearest cable tray with conduit or in certain circumstances, J hooks, depending on site access conditions and type of job. J-hooks are not be used on major large scale Renew, Renovation, or New Construction projects unless specifically allowed by UBC IT. (Refer to Section 27 05 08 and Standard Drawing ITSTD-29)

- .3 All raceway, J hooks shall be installed parallel to the building lines, keeping cable run length at an absolute minimum.
- .4 In open office environments, the preferred method of extending the conduit from the outlet to the cable tray is via perimeter walls. If this is not possible then use Pac poles or run in "pony" walls.
- .5 Where raceway size is not specified, the raceway shall be sized to not exceed a 40% fill ratio after all the cables are installed including shared access non IT cable systems that have been installed by others (for example Security cables). Where there are zero bends in the raceway, the fill ratio may be increased to 50%. The minimum pathway size will be 21mm regardless of fill ratio.
 - .1 Where isolated renovations are re-using existing building pathways – cable overflow situations can be acceptable depending on the circumstances, as this is the expected use case of the building zone pathway systems. Each situation will be reviewed and approved by UBC IT representative as needed.
- .6 A pull tape shall be left in all raceways after installation of the cables. Pull tape shall be Greenlee 4435 or approved equal.
- .7 All empty raceway shall be clearly and permanently marked at both ends to indicate destination and function.
- .8 In existing and residential buildings without a common corridor it is acceptable to install a zoned conduit and pull-box system instead of cable tray. A maximum of two (2) outlets may share a single drop conduit. Daisy chaining outlets is a practice that is to be minimized to special circumstances and used only with the approval of UBC IT.
- .9 When zone conduit is used, install in each room ceiling space entered a minimum 300 mm x 300 mm x 150 mm deep pull-box. Conduit to communication outlet shall be from this pull-box.
- .10 Cable trays are usually installed in the false ceiling space of hallways and located to keep conduit lengths to a minimum. When raceway is not installed in a readily accessible false ceiling space, access hatches shall be installed at a nominal spacing of 9 Meters. Additional access hatches must be provided at all sections of tray where a change of direction occurs. Additional hatches must be provided wherever there are drop conduits intersecting the tray.
 - .1 *Cable trays that will be installed in the ceilings of classrooms and are also zone pathways for the purpose of servicing areas outside and beyond the classroom itself, must be installed so that cables can be pulled through and past the classroom without needing to access the ceiling of that classroom. The intent is to allow future servicing without disturbing the class in session, while also avoiding after-hour servicing requirement. In essence the cable tray is to be installed in a straight line, through the classroom with no bends or changes in elevation or interruptions, with access to the tray from the adjoining spaces. Multiple classrooms as adjoining spaces will simply lengthen the straight section of cable tray spanning across all classrooms. Alternative solutions will be considered, please consult UBC IT.*

- .11 Conduits and cables containing line voltage conductors (including branch circuit wiring) shall not be supported from the supports used for communication cable trays or from the communication cable trays themselves.
- .12 Provide cable support dropouts at locations where cables exit the cable tray and the combined weight of the cables can cause deformation in any of the cables in that bundle.
- .13 Cable trays may require installation of risers, bends, etc. to adjust tray up or down as well as sideways for the tray routing to fit within limits of space available, and to clear other services, ducts, pipes etc. along the route. Routing may be adjusted somewhat as necessary to enable installation of services under other trades. The above field adjustments are to be done at no extra cost to the Owner.
- .14 Where tray runs change elevation; proper rise and fall sections must be fashioned according to manufacturer's guidelines for that tray system.
- .15 Tray fittings required for change in elevation, direction, waterfall assemblies and cable drop out must be provided as part of the contract and at no additional cost to the Owner.
- .16 See Section 27 05 07 for fire stop of tray penetrations at fire rated walls and floors.
- .17 Trays shall be positioned to allow the best access for future installations and minimize cable lengths. If during construction tray section become inaccessible due to congestion, UBC IT must be notified.
- .18 Install ventilated or basket type tray in corridors and as vertical risers. Cable tray shall not be penetrated or impeded by other services. Cable tray capacity must not be diminished by other systems. If during construction, tray section become obstructed due to infringement by other systems, UBC IT must be notified
- .19 Sharp metal edges in cable trays which could cut the cable shall be smoothed and the cable dressed away from these edges.
- .20 The contractor shall supply approved dedicated pathway for supporting cables that vertically drop to a location when that location is without wall support.
- .21 J-Hooks and hangers must be firmly affixed to or hung from, building structure and shall not be affixed to or hung from building services, i.e. ducts, pipes, electrical conduits, sprinkler pipes, etc. Install fastenings and supports at regular intervals as required for each type of equipment, cables and conduits, and in accordance with manufacturer's installation recommendations.
- .22 Uses of explosive drive pins will not be allowed without prior approval of the Consulting Engineer and UBC Information Technology Representative. All anchors to be metal expansion type in pre-drilled holes. The Contractor shall not use plastic expansion inserts or fittings for metallic based pathways. The Contractor shall use coach screws, lag screws or wood screws, minimum 25 mm long, in wood construction.
- .23 The Contractor shall provide supports for equipment and materials supplied. The Contractor shall provide all anchor bolts and other fastenings, where shown on or in tile walls. On walls inadequate to support the equipment, provide angle or channel iron supports to bear the equipment weight, independent of the wall or conduit. All hangers, supports and brackets shall be provided and installed to be consistent with the requirements of the B.C. Building Code.

- .24 The Contractor shall provide seismic bracing of tray. Following installation of all equipment and fixings, the Contractors shall provide a seismic restraint structural review of the fixings of all devices which form part of the communications infrastructure installation. A structural engineer registered with the APEGBC will be provided to sign and seal the report. The Contractor shall reinstall, if necessary, supports for the equipment and fixings to the satisfaction of the structural engineer, at no additional cost to the Owner.
- .25 The Contractor shall:
- .1 Use schedule 40 steel pipe sleeves for penetrations through exterior masonry/concrete walls and foundations, concrete floor slabs on grade and above grade, and concrete-filled decks and/or Hilti Gang plate/ Speed sleeve system product.
 - .2 Use only fire-rated listed assemblies for the type of sleeve being installed through CMU walls or gypsum walls for Communications penetrations. Sleeve type shall be electrical metallic tubing or Hilti Gang plate / Speed Sleeve system (preferred).

1.5 **CUTTING AND CORING**

- .1 This Scope of Work includes the upgrade and installation of new networking systems.
- .2 Where floor cutting is necessary for installation of conduits and cable trays, obtain the services of a reputable x-ray service company, have the floor x-rayed and review for interference. Submit x-ray report and detail sketch on proposed infrastructure routing to the Consulting Engineer for review prior to cutting. Ground Penetration Radar” (GPR) in lieu of X-ray to detect conduit and rebar in slab is recommended. However, it is the contractor’s responsibility to choose the suitable method for different type of existing site conditions. Under certain situation, the GPR may not perform, such as when steel mesh is embedded inside the concrete.
- .3 Ensure that all penetrations through floors or walls are patched to match adjoining finish. Penetrations through concrete are to be sealed with approved fire-stop material. Use of Hilti Gang plate/ speed sleeve system is preferred.
- .4 See Asbestos Section in Division 1 for cutting methods through asbestos areas.
- .5 It is the contractor’s responsibility to investigate existing building conditions for taking X-ray and other activities. Existing drawings are available from UBC Campus & Community Planning.
- .6 Cutting and patching are to be done to architectural standards and will be inspected by the architect. Refer to the architectural specifications. It is expected that tradesmen skilled in their trades will do the work of that trade. Electricians performing painting, dry walling or carpentry work will not be accepted.
- .7 Refer to the Architectural detail for fire-stopping. In general, conduit penetrations through walls are to be fire-stopped to within 25 mm of the face of the wall and then mudded and painted over. Hilti Gang plate / Speed Sleeve system is preferred.
- .8 Carpet at core locations is to be precision cut so that no gap is visible between the wall of the conduit and the carpet.

1.6 CABLE TRAY SYSTEM

- .1 Provide cable trays, fittings, brackets and hangers for the communication cables. Match existing installs in all retrofit conditions.
- .2 Canstrut, Flex, or basket cable tray and fittings are specified.
- .3 Flex/ basket, ventilated ladder and solid type, Class C1 to CSA C22.2 No.126-M1980 are all acceptable when not specified. Flex/ basket is the preferred product.
- .4 Install flex/ basket tray complete with drop outs for cabinet / termination locations around the perimeter of Communications rooms and above cabinet rows as required. ITSTD-05. Confirm proposed layout method with UBC Information Technology Representative.
- .5 Connect the new cable tray system to the existing cable tray (if exists). Re-work existing tray ends to suit tie-in.

1.7 SURFACE RACEWAY SYSTEMS

- .1 Confirm all surface raceway with UBC Information Technology Representative before use.

1.8 LOCATION OF OUTLETS

- .1 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .2 Change location of outlets at no extra cost or credit, provided distance does not exceed 1 M, and information is given before installation.

1.9 MOUNTING HEIGHTS

- .1 Mounting height of infrastructure is from finished floor to centre line of equipment unless specified or indicated otherwise.
- .2 If mounting height of infrastructure is not specified or indicated, verify with Consultant before proceeding with the installation.
- .3 Install infrastructure at the following heights unless indicated otherwise:
 - .1 Wall receptacles for IT use:
 - .1 General: 300 mm or match mounting height of existing receptacles.
 - .2 Communication room: 300 mm or match mounting height of existing receptacles.
 - .3 Above top of continuous baseboard heater: 200 mm
 - .4 Above top of counters or counter splash back: 150 mm
 - .5 In mechanical rooms: 1067 mm
 - .2 Voice/data outlets:
 - .1 above finished floors – generally 300 mm, or match mounting height of existing voice/data outlets
 - .2 above counters splash backs - 150 mm.
 - .3 residential bedrooms: 850 mm

1.10 AVOIDING ELECTROMAGNETIC INTERFERENCE (EMI)

- .1 Installations of communications cable pathways must avoid close proximity to potential sources of electromagnetic interference (e.g., motors and transformers that share distribution space, copiers used in work areas).
- .2 To avoid electromagnetic interference the following minimum clearances shall be provided:
 - .1 clearance of 1200 mm from large motors or transformers.
 - .2 clearance of 300 mm from conduit and cables used for electrical power distribution.
 - .3 clearance of 120 mm from fluorescent lighting or UTP cabling manufacturer installations guidelines, whichever is greater
 - .4 Pathways should cross perpendicular to fluorescent lighting and electrical power cables or conduits or avoid the areas entirely

1.11 ENTRANCE, INTERCONNECTING, AND RISER DUCTS

- .1 Entrance ducts, interconnecting ducts and any floor penetrating conduits in all communication rooms shall be positioned against a wall and not interfere with any open floor space –see ITSTD-06. The exact location shall be verified with UBC Information Technology Representative before installation. The use of a pull pit in the communication rooms is not acceptable. (Refer to Section 27 05 05).
- .2 The riser system connecting the stacked Communications rooms shall consist of a minimum of four (4) 100mm ducts, Hilti Gang plate / speed sleeve system (preferred) or as indicated on drawings.
- .3 Ducts shall protrude exactly 100 mm above finished floor level and shall be encased in concrete. Hilti Gang plate / speed sleeve system (preferred)
- .4 Riser ducts connecting vertically stacked rooms may consist of a sleeve that protrudes exactly 50 mm through the ceiling of the lower room and exactly 100 mm through the floor of the upper room or use the preferred Hilti Gang plate/ Speed sleeve system. The resulting gap will be bridged with vertically mounted flex/ basket tray over plywood.
- .5 After installation of the inter-building cables in the Main Communication Room, the ducts shall be closed with an approved re-enterable sealing material.

1.12 CONDUIT

- .1 Each drop conduit or Communications outlet shall be connected to the nearest cable tray or approved J-Hook system with a 27 mm conduit, minimum.
- .2 The use of 21mm conduit for communications pathways is acceptable in specific situations:
 - Residential bedrooms
 - Single occupant offices
 - Building service demarcations if not combined - i.e. elevator, meters, fire alarm
- .3 In slab conduit is not acceptable, except when supplying floor boxes where conduit poke through from the floor below is not practical. In this case, minimum 27mm ridged PVC will be accepted. Conduits are to leave the slab and rise up or down to ceiling space cable tray

- as soon as practical. Coreline product is not acceptable in any circumstances and is not to be used for IT pathways at UBC.
- .4 Conduit installations will have:
 - a maximum of 9000 mm between pull boxes.
 - a combined maximum of 180 degrees in bends between pull boxes.
 - .5 Conduit shall be EMT or rigid steel. Where no specific allowance is made or no description offered, the default conduit size shall be 27 mm.
 - .6 Unless specified to the contrary by the UBC Information Technology Representative, flexible metal and PVC jacketed conduit shall not be used.
 - .7 All conduits shall have sweeping bends with inside radius being no less than six (6) times the internal diameter of the conduit. For conduit 50mm or larger, the radius shall be no less than ten (10) times the internal conduit diameter. Fittings such as LB type joints are not acceptable for communications pathways. Use of a pull box in these situations will allow for a tight corner transition and provide the proper bending radius.
 - .8 When cable trays are used, conduit shall be attached to the edge of the tray with a conduit bracket designed for this purpose. If this is not possible, conduits shall be stubbed within 150 mm above the tray and terminate in a bonding type bushing. All drop conduits must be bonded to the cable tray.
 - .9 Where conduits meet a cable tray, they will be installed and routed so that the conduits end within 1 meter of an accessible ceiling area or hatchway or an access hatch must be provided for each conduit location. Minimizing cable lengths will take priority over routing conduits to existing ceiling hatches.
 - .10 Provide a maximum of 45-degree bends where conduits meet cable trays and cables are running free air from the conduits to cable trays. This will create a waterfall effect to reduce the strain on cables.
 - .11 Install conduit and sleeves, Hilti Gang Plate/ Speed Sleeve system, where required prior to pouring concrete. Install conduits and fittings to be embedded or plastered over, neatly and close to building structure to keep furring to a minimum.
 - .12 In rooms where conduits are exposed locate them so as not to interfere with the installation of the white boards, wall details or other obstructions. New walls will have conduits installed inside the wall cavity.
 - .13 Where Wiremold raceway has been used on existing walls; continue to use Wiremold raceway.

1.13 **PULL BOXES**

- .1 Unless otherwise specified, the minimum size of a pull box shall be 300 mm X 300 mm X 150 mm deep. UBC Information Technology Representative shall be consulted in all cases.
- .2 All pull boxes must be positioned and installed in such a way that they are within 1 m of an accessible ceiling area or hatchway or an access hatch must be provided for each pull box location.

- .3 Locate access panels in service areas wherever possible.

1.14 **SURFACE RACEWAYS**

- .1 Provide Wiremold or Panduit for voice and data outlets.
- .2 Multi-outlet surface-mounted raceway shall be installed where large numbers of outlets are required to be located in close proximity to each other.
- .3 Surface raceway and/or flush mount outlet in conjunction with flexible conduit can be used to feed modular furniture.
- .4 Work area outlets shall be located so that the equipment will be no further away than 5 Meters from the outlet as per current TIA/EIA Standards.
- .5 Surface raceways for communication systems shall be minimum 120 mm X 90 mm deep raceways with cut-outs and hardware for mounting faceplates. When the surface raceway is used to distribute power and communication cables, a manufactured barrier, separating communication cables from power cables shall be installed in the center of the raceway.
- .6 For individual outlets where recessed conduit is not possible (i.e. exposed concrete walls) 27 mm surface raceway shall be used.
- .7 Non-metallic raceway may be used as per current building codes or as specified on drawings. Panduit T70 may substitute Wiremold 3000 and Panduit LPD-10 may substitute Wiremold 2100.

1.15 **SURFACE RACEWAY PRODUCTS**

- .1 Where metallic raceway is required it shall be as manufactured by Wiremold. The colour shall match existing Wiremold installation. Where contradiction exists between colour noted on drawing and on site, the colour of onsite existing Wiremold shall take precedence.
- .2 For large number of cables and multiple outlets adjacent to each other, use Wiremold V-4000 or V-6000 as appropriate. For Wiremold V-4000, Fibre ready elbow V4011f0 shall be used for flat 90-degree bends.
- .3 For individual outlets use Wiremold V-3000 or V-2100 raceway as indicated on drawings. For V-3000 fibre ready elbow V3011F0 shall be used for flat 90-degree bends.
- .4 Match existing Wiremold raceways in rooms that require additional raceway to be added in terms of type and colour.
- .5 Non-metallic surface raceway shall be manufactured by Panduit or approved equal. Except as noted, colour of Panduit shall be off-white on painted surfaces and grey on unfinished concrete surfaces.

1.16 **SURFACE RACEWAY INSTALLATION**

- .1 The surface raceway shall parallel building lines and hug ceilings, baseboards, and corners. Raceway length shall be kept to a minimum.
- .2 The surface raceway base shall be mechanically fastened to walls and supporting structures. Use of double-sided tape alone is not acceptable. For non-metallic surface

raceway the maximum spacing of fastener is 400 mm. The recommended fasteners are as follow:

- .1 Masonry surface – Tapcon masonry type fastener, 6 mm diameter.
 - .2 Dry wall with no stud – Toggle AF “Alligator type” anchor. AF8 or AFG6.
 - .3 Dry wall with stud – Dry wall screw
- .3 The surface raceway shall maintain its integrity when passing through a wall or supporting structure. The raceway cover shall be cut 100 mm from either side of the penetration.
 - .4 Surface raceway extending into the ceiling shall connect to the conduit extending from the cable tray with the appropriate fitting or pull box.
 - .5 When installing surface raceway, manufactured bends and fittings must be used. Installation shall be in accordance with the manufacturer's instructions.
 - .6 Wire clips shall be installed in two-piece surface raceway installations at 450 mm intervals. Additional wire clips shall be used when the raceway is secured to a ceiling or large amount of cables are installed.
 - .7 When installing cable in surface raceway, cable fill shall not exceed 40%.

1.17 COMMUNICATION SYSTEM OUTLET BOXES

- .1 A Communications outlet is the point at which the Communications equipment is connected to the University networks. The outlet consists of an outlet box and cover plate, connecting conduit, several jacks or outlets, and its connecting cables.
- .2 Unless specified on the drawings all outlet boxes *will follow this selection matrix:*

<i>Cable count</i>	<i>Box type</i>	<i>Gang count</i>	<i>Mud ring size</i>
<i>1 Cable</i>	<i>4x4 or MBD</i>	<i>1</i>	<i>single</i>
<i>2 - 6 cables</i>	<i>4x4 or MBD</i>	<i>2</i>	<i>double</i>
<i>7 - 9 cables</i>	<i>MBD</i>	<i>3</i>	<i>N/A</i>
<i>10 - 14 cables</i>	<i>MBD</i>	<i>4</i>	<i>N/A</i>
<i>More than 14 cables require multiple boxes</i>			

1.18 PRODUCTS

- .1 Flush-Mount Box

Each Communications outlet shall be housed in a deep masonry box with a depth of approximately 90 mm *or a standard 4x4 box, as needed*. Approved low voltage Communications rings can be used where specified *and approved by UBC IT*.

- .2 Surface-Mount Box

Manufacturers:

Wiremold V5744-2 (dual-gang for use with conduits)
 V2144-2 (dual-gang for use with V2100)
 V3044-2 (dual-gang for use with V3000)

Hubbell HWPFSCS/HBLFSCS series c/w cover (surface floor box)

Panduit JBP2D1W (132mmx132mmx70mm dual-gang for use with Panduit)

Or approved Equivalent

1.19 **EXECUTION**

- .1 Flush mounted outlet boxes shall be mounted flush to the surface of the wall and all gaps at the edges of the outlet box shall be filed and finished before the installation of the faceplates. Filling and finishing of walls to installed faceplates is not to be used as a typical practice.

1.20 **COMMUNICATION SYSTEM OUTLET PLATES**

- .1 General
 - .1 Unless specified to the contrary, all outlet plates shall be plastic or stainless steel with appropriate cutouts and permanently marked designations, as specified in the outlet specifications of the related sections.
 - .2 All stainless-steel outlet plates shall be an approved product of the cabling system in use.
 - .3 Where plastic plates are specified they shall be the same colour as determined for the power outlets or Uniprise SLX Series Alpine White. Decora straps with plastic plates / stainless plates are interchangeable for solid plastic plates.
 - .4 Ensure that total depth of raceway and outlet plate is sufficient for terminating category 6A cable and jacks.
- .2 Execution
 - .1 Unless specified otherwise, all communication outlets shall be flush mounted with the finished wall.
 - .2 Communication outlets shall be mounted at the same height as power receptacles, except where otherwise noted.
 - .3 All outlets shall be positioned to enable easy, unobstructed access.
 - .4 All outlets shall be positioned to clear millwork and furniture.
 - .5 Outlets shall be positioned in close proximity to the Communication equipment.
 - .6 Surface Raceway and Pack Pole Mounted Outlets
 - .1 Outlets on large surface raceway shall be dual duplex or rectangular cutouts and not bushed holes.
 - .2 Outlets in joint use surface raceway shall be single gang duplex, or rectangular cutouts and not bushed holes. They shall be mounted staggered with power outlets.
 - .3 When installing outlets in joint Power / Communications surface raceway, pack poles or modular furniture, each individual outlet requirement shall be maintained. i.e. where a dual gang outlet is specified two single gang outlets are required. Exact details will be determined on site with the UBC Information Technology Representative.

- .3 Modular Furniture Mounted Outlets
 - .1 Modular furniture with pre-installed telecom cable is not acceptable.
 - .2 The two preferred methods of servicing IT in modular furniture are:
 - .1 Terminate telecom cables on wall outlets near modular furniture area and extend through furniture to user work areas with patch cords.
 - .2 If the modular furniture is specifically designed to accommodate high performance communications outlets then the telecom cables can be extended through the furniture to the user work area.
 - .3 Pac poles must be split channel or dedicated low voltage.
 - .4 Pac poles must not contain IT outlets unless specifically designed to accommodate high performance communications outlets.
- .4 Floor Boxes
 - .1 Floor boxes must be specifically designed to accommodate high performance communications outlets.
 - .2 Floor boxes must have Uniprise SLX Series compatible outlet mounting points.
 - .3 Floor box selection must be confirmed with UBC Information Technology during the design phase.
 - .4 Floor boxes will have a dedicated 27mm conduit for the sole use of UBC IT for Voice and Data services. Other systems (such as AV, Security, etc.) must use separate pathway.

END OF SECTION 27 05 28

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:
 - 1.0 GENERAL
 - 1.1 DOCUMENTS
 - 1.2 SUMMARY
 - 1.3 OVERVIEW
 - 1.4 PRODUCTS
 - 2.0 EXECUTION
 - 2.1 COMMUNICATION ROOMS
 - 2.2 UTP HORIZONTAL CABLE
 - 2.3 BACKBONE CABLING
 - 2.4 ENTRANCE CABLING

1.3 OVERVIEW

- .1 Unless specified otherwise, designation labels on outlet plates shall be printed on designation strips located behind label windows on plastic plates, as detailed in these and related specifications. Alternate methods must be submitted to the Information Technology Representative for approval. Lamacoid labels will not be accepted.
- .2 After terminating and identifying a Communications cable, each cable shall be identified with a unique cable number, as detailed in these and related specifications. A circuit (CCT) starting number and range will be provided to the contractor by the UBC Information Technology Representative. A sample database sheet for circuit (CCT) numbering is included in Appendix B. The Contractor shall follow the sample database format without any modification and provide one database file in same format for each building.
- .3 The Contractor shall supply CCT data sheets produced from the UBC IT supplied database file, to the UBC Information Technology Representative. This is to be done following termination of the voice and data cables within a Communication room, and regardless if cutover of field ends are completed or not. The data sheets shall identify whether an outlet is new, existing being replaced, or is part of special services such as pay phone, emergency phone, elevator phone, BMS, fire alarm monitoring, security, clock etc. The data sheet will also identify all Access Point cables with the designation "AP". As the Access point cables are installed in pairs, the two associated cables will be identified as paired to each other with a comment in the last comments field. All AP cables that connected to the site installed APs must include the UBC IT provided AP Network Name in the alternate comment field. AP radio names are also required to be populated in the CCT data sheet submission if the contractor has installed the APs as part of the project. In addition, all other special service cables should be identified in the comments field with a description of the special service. Some, but not all, examples of special services are cameras, fire alarm, elevator, clock, emergency phone, etc.

- .4 The Contractor will be responsible to correct any labeling errors that may result by pre-labeling the cables before submitting the CCT data sheet to the UBC IT representative for approval.
- .5 All Communication rooms will be assigned a unique terminal ID number (which is not the room number). The number will be displayed in the form of a stick-on plastic labels as approved by the UBC Information Technology Representative. Only (1) character will be displayed on each label, which will be 50 mm high and shall have permanent Blue or Black digits on a Yellow or Orange background. The Contractor shall install these labels in all Communication rooms to the satisfaction of the UBC Information Technology Representative. Alternative labels to be approved by UBC IT before use.
- .6 Before commencing the labeling, the Contractor shall supply samples of methods of labeling and materials used for approval by the UBC Information Technology Representative.

1.4 **PRODUCTS**

- .1 Labels for GigaBIX terminals.
- .2 Labels are supplied in sheets:

Green label	Entry connect	P0748012
Blue label	Horizontal 4-pr	P0748006
Purple label	Backbone 100-pr	P0748017
	Backbone 4-pr	P0748008
Brown label	Inter-building 100-pr	P0748018
	Inter-building 4-pr	P0748010
Grey label	2 nd level BB 100-pr	P0748019
	2 nd level BB 4-pr	P0748011

SUBSTITUTES ARE NOT ACCEPTED

2.0 **EXECUTION**

1. Review labeling methods and procedure with the Information Technology Representative prior commencement of labeling.
2. Labeling shall conform to standard Drawing ITSTD-32, 34, 63, 64 & 65.
3. Panduit numbered label strips or equal shall be approved by the UBC Information Technology Representative. The Contractor shall label each outlet with 9 mm black on white mechanical label.
4. The Contractor shall label each cable with permanent self-adhesive label with minimum, 3 mm high characters, in the following locations:
 - i. Inside outlet box at the work area
 - ii. Behind the Communications room data patch panel, or voice punch down block.

5. The Contractor shall install colour-coded labels for each GigaBIX termination field on a BELDEN/CDT GigaBIX designation strip. BELDEN/CDT colored labels shall conform to ESTD drawings.
6. NORDX/CDT – IBDN labeling system is produced by SILVER FOX LTD.

2.1 COMMUNICATION ROOMS

.1 MCR / LCR TERMINAL ID ASSIGNMENTS

All Communication rooms shall have unique terminal numbers assigned:

B21 will be second basement level – representing 1st Communications Room.

B11 will be first basement level – representing 1st Communications Room.

001 will be ground level – representing 1st Communications Room.

011 will be 1st floor level – representing 1st Communications Room.

021 will be 2nd floor level – representing 1st Communications Room.

022 would then be 2nd floor level – representing 2nd Communications Room on that level.

2.2 UTP/STP HORIZONTAL CABLE

.1 Data

.1 Data horizontal cable shall be identified at each termination with a unique number at the cable jacket end.
i.e. CCT001258-011-P1-4

CCT001258 Range supplied by UBC Information Technology
Representative

011 Represents assigned MCR/LCR Terminal ID

P1-4 Represents patch panel and jack position.

.2 Voice

.1 Voice horizontal cables shall be identified at each termination with a unique number at the cable jacket end.

i.e. CCT001258-011-052

CCT001258 Range supplied by UBC Information Technology
Representative

011 Represents assigned MCR/LCR Terminal ID.

052 Represents GigaBIX connector cable position.

.2 GigaBIX connector positions will increase sequentially without repeating starting with position number 1 and continuing through 72 then starting on the next frame with position 73, through position 144 then 145 to 216 and so on.

.3 GigaBIX terminated cables with specific functions must include this function label on the GigaBIX label strip. i.e. – a GigaBIX terminated cable that services the elevator phone must have the word ‘Elevator’ and the field end room number “Rmxxx” on the GigaBIX label in addition to the GigaBIX position. This would apply to all special services including, among others – elevator, fire alarm, BMS, security, clock, bell.

2.3 BACKBONE CABLING

.1 Data Copper

- .1 Typically UBC IT does not require Copper backbone cables for data purposes. When the Contractor has been instructed to install CAT 6A UTP/STP cables in the Backbone these cables shall be grouped in counts of six and identified on each cable and patch panel termination with a label and purple icons.

NOTE:

Backbone cables are grouped onto the same patch panel and not mixed with horizontal cable terminations patch panels. (Refer to Standard Drawing ITSTD-32)

- i.e. 011 Rm xxx to 012 Rm xxx Port1-6
011 Rm xxx - represents MCR Terminal ID and room number
012 Rm xxx - represents LCR Terminal ID and room number
Port1-6 - represents which ports of the patch panel are included.

.2 Voice Copper

- .1 When the Contractor has been instructed to install multiples of 25 pair CAT 3 UTP cable in the Backbone from MCR to each of the LCR's, these Backbone cables shall be identified at both ends and on the GigaBIX designation strips. (Refer to Standard Drawing ITSTD-32)
- .2 On the GigaBIX designation strip in the Communications room, the Backbone cable pair count will be indicated starting with 01 and sequentially increasing until the end of that cable (typically 25). The pair count restarts for each cable.
- i.e. 011 Rm xxx to 012 Rm xxx 25PR
011 Rm xxx - represents MCR Terminal ID
012 Rm xxx - represents LCR Terminal ID.
25PR - represents the total pair count going to that room.

.3 Fibre

- .1 When the Contractor has been instructed to install fibre (24SM typical) cable from the MCR to each LCR, each end of the cable and termination panel will be labeled with a "From - To" Label. (Refer to Standard Drawing – ITSTD-32)

Fiber Cable Label and Fibre Panel Card Label

- i.e. 011 Rm xxx to 012 Rm xxx 24MM
011 Rm xxx represents MCR Terminal ID
012 Rm xxx represents LCR Terminal ID
24MM represents 24 multi-mode strand cable

2.4 ENTRANCE CABLE

(Refer to Section 27 05 06 – by Others)

END OF SECTION 27 05 53

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:
 - 1.0 GENERAL
 - 1.1 DOCUMENTS
 - 1.2 SUMMARY
 - 1.3 OVERVIEW
 - 1.4 WORK INCLUDED
 - 1.5 FIBRE QUALITY ASSURANCE
 - 1.6 FIBRE TESTING SCOPE
 - 1.7 TESTING OPTICAL FIBRE CABLE
 - 1.8 OPTICAL LOSS TESTING
 - 1.9 COPPER TESTING SCOPE
 - 1.10 TESTING CAT 6 INSTALLATION
 - 1.11 OPTIONAL REQUIREMENTS

1.3 **OVERVIEW**

- .1 The Contractor shall allow in the Tender for the presence of qualified test Personnel for all testing.
- .2 Test equipment shall be approved by the UBC Information Technology Representative in writing before it can be used to test the structured cabling systems.
- .3 Final details of all test parameters, scope, and methodology to be performed by the Contractor, as described in this Testing Section, shall be verified with the UBC Information Technology Representative.
- .4 All terminations shall be completed and all Communications equipment installed before the tests are performed.
- .5 The UBC Information Technology Representative shall determine at time of testing, and which terminations shall be included in the performance test.
- .6 UBC Information Technology reserves the right to monitor the testing process as it happens.
- .7 The UBC Information Technology Representative reserves the right to verify the Contractors' test results. In case of a discrepancy between the UBC Information Technology Representative's test results and the Contractor's test reports, then UBC Information Technology Representative's test results shall be considered accurate. In this instance, the Contractor shall correct any deficiencies at no cost to UBC.

1.4 **WORK INCLUDED**

- .1 Provide all labour, materials, tools, field-test instruments and equipment required for the complete testing, identification and administration of the work called for in the Contract Documents.
- .2 In order to conform to the overall project event schedule, the cabling contractor shall monitor work progress and coordinate cable testing with other applicable trades.
- .3 In addition to the tests detailed in this document, the contractor shall notify the-UBC Information Technology Representative of any additional tests that are deemed necessary to guarantee a fully functional system. The contractor shall carry out and record any additional test results at no additional charge.

1.5 **FIBRE QUALITY ASSURANCE**

- .1 All testing procedures and field-test instruments shall comply with applicable requirements of:
 - .1 All applicable ANSI TIA/EIA standards for safe use and testing of Fibre Systems
 - .2 Trained technicians who have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof shall be allowed to execute the tests. These must be issued by any of the following organizations or an equivalent organization:
 - .1 Manufacturer of the Fibre optic cable and/or the Fibre optic connectors.
 - .2 Manufacturer of the test equipment used for the field certification.
 - .3 Training organizations (e.g., BICSI)
- .3 A UBC Information Technology Representative shall be invited to witness and/or review field-testing.
 - .1 A UBC Information Technology Representative shall be notified of the start date of the testing phase five (5) business days before testing commences.
 - .2 The UBC Information Technology Representative will select and test a random sample of 5% of the installed links. The results are to be stored in accordance with Part 3 of this document. The results obtained shall be compared to the data provided by the installation Contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the Installation Contractor under supervision of the UBC Information Technology Representative shall repeat 100% testing at no cost to the UBC.

1.6 **FIBRE TESTING SCOPE**

- .1 Initially test every strand within the fibre optic cable with a light source and power-meter utilizing procedures as stated in current ANSI/TIA/EIA standards. 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 Information Technology.
- .2 All tests performed on optical fibre cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with current ANSI standards.

- .3 All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work. The following test parameters shall be adhered to

:

- .1 Multimode fibre optic cables shall be tested at 850 nm and 1300 nm.
- .2 Testing procedures shall utilize "Method 1" – one jumper reference.
- .3 Bi-directional testing of optical Fibres is required.
- .4 Submit all fibre optic test results in electronic format for all fibre optic strand tests performed, in addition to the required hard copy.

1.7 **TESTING OPTICAL FIBRE CABLE**

- .1 Field-test instruments shall have the latest software and firmware installed.
- .2 Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative (reports) may be generated.
- .3 If required, fibre end faces shall be optically inspected at 250X magnification. Scratched, pitted or dirty connectors shall be diagnosed and replaced at no cost to UBC.
- .4 End face images shall be provided electronically.
- .5 Testing shall be performed on each cabling segment (connector to connector).
- .6 Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use as per Information Technology' instructions.
- .7 Testing of the cabling shall be performed using high-quality test cords of the same Fibre type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 M length. The test cords for OTDR testing shall be at least 100 meters for the launch cable and at least 25 meters for the receive cable.

1.8 **OPTICAL LOSS TESTING**

.1 Backbone Link

- .1 Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method 1, One Reference Jumper or the equivalent method.
- .2 Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
- .3 Use the One Reference Jumper Method specified by current ANSI/TIA/EIA standards or an equivalent method. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.

.2 Horizontal (multimode) link

- .1 The horizontal optical Fibre cabling link segments need to be tested at only one wavelength. The horizontal link should be tested at 850 nm or 1300 nm bi-

directional in accordance with current ANSI/EIA/TIA standards or the equivalent method.

.3 Centralized (multimode) link

- .1 The centralized optical Fibre cabling link segments need to be tested at only one wavelength. The centralized link should be tested at 850 nm *or* 1300 nm bi-directional in accordance with current ANSI/EIA/TIA standards or the equivalent method.

1.9 COPPER TESTING SCOPE

- .1 Category 3 Intra and Inter backbone cable testing shall consist of testing each cable pair for opens, shorts, grounds and pair reversal. Only a 100% pair pass rate will be accepted.
- .2 Random testing on all cabling mediums shall be done by the UBC Information Technology Representative. Where any portion of the system does not meet testing specifications, the Contractor shall correct the deviation and repeat all applicable testing at no additional cost to the Information Technology.
- .3 The following items shall be submitted to UBC Information Technology Representative upon completion of testing the installed cables:
1. Supply a complete set of UTP/STP test results in electronic format.

1.10 TESTING CATEGORY 6A INSTALLATION

- .1 Category 6A UTP/STP testing shall conform to current ANSI/ TIA/EIA - T568-C standard. Testing shall be accomplished using a CommScope approved Cable Analyzer field tester with appropriate permanent link adapters. Permanent link testing procedures shall be used to certify the system.
- .2 All links must attain a "PASS" certification, unless otherwise released from this requirement by the UBC Information Technology Representative.
- .3 Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall be allowed to execute the tests. Appropriate training programs are limited to installation certification programs provided by BICSI and its authorized training partners, the Association of Cabling Professionals (ACP) and recognized cabling manufacturers in the industry.
- .4 The tester shall be within the calibration period recommended by the tester manufacturer in order to achieve the vendor-specified measurement accuracy and be acceptable to UBC Information Technology.
- .5 All FTP Category 6A cable test results must show continuity of shield from end to end.

1.11 OPTIONAL REQUIREMENTS

- .1 A representative of the end-user shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase 5 business days before testing commences.
- .2 A UBC Information Technology Representative will select a random sample of 5% of the installed links for testing and storing the results in accordance with the prescriptions in

the current TIA/EIA Standard. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of UBC Information Technology Representative shall repeat 100% testing at no cost to UBC.

END OF SECTION 27 08 00

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:

- 1.0 GENERAL
- 1.1 DOCUMENTS
- 1.2 SUMMARY
- 1.3 OVERVIEW
- 2.0 CATEGORY 3 VOICE INTRA BACKBONE CABLES
- 2.1 CATEGORY 6A DATA INTRA BACKBONE CABLES
- 2.2 DATA FIBRE INTRA BACKBONE CABLES
- 2.3 FIBRE OPTIC CABLES

1.3 **OVERVIEW**

- .1 The backbone configuration shall be a two level hierarchical star structure with separate dedicated cables from the Main Communication Room to each Local Communication Room and between each Communications room.
- .2 In a Main Communication Room (MCR), Intra Backbone cables shall be bundled separately from Entrance and Horizontal cables.
- .3 In a Local Communication Room (LCR), Horizontal cables shall be bundled separately from Intra Backbone cables.
- .4 Where it is specifically noted that a Backbone cable is not terminated in a Communication Room, a minimum of 5 meters slack shall be left. The starting point of measurement shall be defined at time of installation by the Information Technology Representative.

2.0 **CATEGORY 3 VOICE INTRA BACKBONE CABLES**

- .1 Voice backbone cabling consisting of multiples of 25 pair Category 3 unshielded twisted-pair shall be installed by the Contractor, from the Main Communication Room (MCR) to each zone LCR as directed by the Information Technology Representative.
- .2 Multi-pair cable bundles entering GigaBIX mounts and the hinging of GigaBIX connectors shall be on the jumper side of the mount.
- .3 Backbone Category 3, 25-pair UTP cables from the same communication room must be grouped together and terminated sequentially on the GigaBIX connectors; group the cables from each communications room together. Once the first riser is terminated and numbered, every other riser in its group continues the number sequence. (Refer to Standard Drawing ITSTD-32 & 64.)
- .4 Wall space for the lightning protectors shall be provided to the left of the GigaBIX mounts. (Refer to Standard Drawing ITSTD-06)

2.1 CATEGORY 6A DATA INTRA BACKBONE CABLES

- .1 Data backbone cabling, when specified, will consist of a minimum of six (6) x 4 pair FTP Category 6A twisted-pair cables and shall be installed by the Contractor from the MCR to each LCR if the distance between is less than 90 meters. These cables are grouped in counts of six and identified on each cable and patch panel termination with a label and purple icons. Backbone cables are grouped onto the same patch panel and not mixed on horizontal cable patch panels unless of a small count (12 or less).
- .2 6 x FTP Category 6A backbone riser cables in MCR, when specified, shall be terminated sequentially on patch panels for each zone LCR. A purple icon shall be applied to patch panel BB jack locations both ends. (Refer to Standard Drawing ITSTD-3 & 32)

2.2 DATA FIBRE INTRA BACKBONE CABLES

- .1 Data backbone cabling consisting of a minimum of 24 strand - 50/125 µm laser optimized multi-mode optical fibre cable shall be installed from the MCR to each LCR. Certified for 10 Gigabit @ a minimum distance of 500 meters OM4. (Refer to Standard Drawing ITSTD – 32 & 63)

2.3 FIBRE OPTIC CABLES

- .1 All fibre optic cable system work completed by the Contractor must be approved by the UBC Information Technology Representative.
- .2 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. Store in areas as directed by the Information Technology Representative or General Contractor. Installation includes setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components where 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 manufacturers' printed instructions.
 - .3 Adhere to manufacturers' published specifications for dressing spliced fibre pigtails in fibre panel, pulling tension, minimum bend radii and sidewall pressure when installing cables.
 - .4 No manual fusion splicing shall be performed.
 - .5 Fibre cable preparation, pigtail routing, and forming within the splice or distribution panel shall be as per manufacturer printed instructions.
 - .6 When splicing all 900um fibre strands transitioning from cable sheath to splice tray and splice tray to bulkheads must be bundled inside protective tubing.

- .7 Acceptable MM terminations are:
- Pigtail with Corning glass – SC connector
 - Corning Unicam pre-polished stub – SC connector
 - Corning CCH Cassette with Pigtails – SC connector (preferred solution)

END OF SECTION 27 13 00

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:
 - 1.0 GENERAL
 - 1.1 DOCUMENTS
 - 1.2 SUMMARY
 - 1.3 OVERVIEW
 - 1.4 CATEGORY 6A HORIZONTAL CABLE INSTALLATION
 - 1.5 GigaBIX DISTRIBUTION
 - 1.6 REMOVAL AND REPLACEMENT OF EXISTING CEILINGS
 - 1.7 ACCESSIBILITY
 - 1.8 MISCELLANEOUS CABLES

1.3 **OVERVIEW**

- .1 The horizontal configuration shall be a star structure with separate dedicated cables run 360 degrees from the servicing zone Local Communication Rooms to the outlets.
- .2 The maximum length of horizontal cable shall not exceed 90 meters in any 360 degree direction.
- .3 In a Communication Room, horizontal cables shall be bundled separately from Entrance and Interconnecting backbone cables.
- .4 Where it is specifically noted that the horizontal cable is not to be terminated, a minimum of 600 mm cable slack shall be coiled inside the outlet box. A minimum of 5 meters slack shall be left in the Communication Room.
- .5 Velcro straps shall be used to support the cables. The straps shall be loosely tightened in such a manner that it can slide around cable bundle.
- .6 Minimum length of the cables between the Communication Room termination point and a consolidation point shall be 15 meters. The UBC Information Technology Representative must be consulted to approve all designs implementing consolidation points.
- .7 Each cable shall be terminated at workstation outlets on eight-position modular jacks with pin/pair assignment wired to T568A.
- .8 The Contractor shall leave manufacturer recommended amount of slack in the cable, at 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.
- .9 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.

- .10 The cable pair twist must be maintained as per the Manufacturer specifications at the point of termination.
- .11 Refer to the following documents for guidelines on installation:
 - .1 Manufacturer Installation Guideline Documentation.
 - .2 Current TIA/EIA-568-C documents.

1.4 **CATEGORY 6A HORIZONTAL CABLE INSTALLATION**

- .1 Approved cable shall be CommScope Uniprise SLX Series Category 6A, UTP or STP, 23AWG, 100ohm solid copper, CMR-rated. CMP or LS0H rated cables shall be used if required by code.
- .2 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. Store in areas as directed by the UBC Information Technology Representative or General Contractor. Installation includes setting in place, fastening to walls, floors, ceilings or other structures where required, interconnecting wiring 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 manufacturer printed instructions.
 - .3 Adhere to manufacturer published specifications for pulling tension, minimum bend radii and sidewall pressure when installing cables.
 - .4 Install horizontal cabling from outlets to the nearest Communication Room or Closet in a continuous run and without a splice, unless otherwise noted.
 - .5 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.
- .3 Most designs call for a cable tray/zone conduit, and conduit or J-hook support structure to facilitate cable system installation.
- .4 Where J-hook systems are used to distribute horizontal cables the J-hooks shall be spaced at maximum intervals of 1200 mm following building lines. The Contractor shall install infrastructure to support all cables installed above removable ceilings.
- .5 Cable forming and termination procedures shall conform to the following requirements:
 - .1 All cable installation shall be done in a neat and tidy fashion. All cable forming within the MCRs and LCRs shall follow building lines.

- .2 Cable shall be formed 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 shall be formed 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 UBC.
- .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 correct cable termination tool must be used for all Cat 6A terminations. Use of 110 Impact tools is not allowed.
- .4 Cables shall be terminated in sequential order on patch panels and on GigaBIX termination hardware in Communications Rooms.
- .5 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 can result in testing failures and too little slack can compromise future maintenance.
- .6 The UBC Information Technology Representative must give final approval to cable forming, and termination quality before the Contractor can deem the Communication room or outlet work complete.
- .7 The Contractor shall attend a mandatory site visit during the Tender period to a previously completed Communication Room showing clearly the level of workmanship required to meet UBC expectations and acceptance.
- .8 In Communication Rooms, horizontal cables shall be bundled and terminated on 24 port patch panels only.
- .9 All wireless Access Point cables must be mixed with the regular horizontal cables and terminated "where they fall" in the patch panel field. Do not group the AP cables as this will create a disproportionate power load on one network switch.
- .10 Cable shall be installed in accordance with the manufacturer recommendations and standard industry practices.
- .11 Cable pathways shall not be filled greater than the maximum fill recommendation for the particular pathway type – typically 40%.
- .12 At no point shall cables rest on acoustic ceiling grids, panels, mechanical equipment, or supports for other services.
- .13 Horizontal distribution cables shall be bundled in no more than 40 cables. Cable bundles in excess of 40 cables may cause deformation of the bottom cables within the bundle. Cable distribution in a comm room will not exceed 24 cables per bundle.
- .14 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to UBC.

- .15 UTP/STP 4 pair cable shall be installed so that there are no bends less than four times the cables outside diameter (4 x cable O.D.) at any point in the run. Pulling tension shall not exceed 25-foot/pounds for a single cable.
- .16 All cables shall be terminated in Communication Rooms and at Communications outlets. Leave no cables un-terminated unless specified in IT drawings or as directed by the UBC Information Technology Representative.
- .17 Before commencing with the installation and termination of a communication system, provide the UBC Information Technology Representative with termination details in the form of shop drawings if requested.
- .18 As the layout and termination of Communications systems is a critical component of the contract work, compliance with materials specifications and execution methods are mandatory.

1.5 **GigaBIX DISTRIBUTION**

- .1 Install GigaBIX distribution rings to support jumper wire.
- .2 Only BIX punch tools shall be used when terminating cables on a GigaBIX connector.
- .3 Multi-pair cable bundles entering GigaBIX mounts and the hinging of GigaBIX connectors shall be on the jumper side of the mount as per NORDX/CDT standards.
- .4 Horizontal 4-pair UTP/STP voice cables are terminated with a maximum of six (6) cables per GigaBIX connector.
- .5 Space for the entrance protectors shall be provided to the left of the GigaBIX connector mounts. (Refer to Standard Drawing ITSTD-06)

1.6 **REMOVAL AND REPLACEMENT OF EXISTING CEILINGS**

- . 1 Due to current architectural trends and the installation of overly large ceiling tiles in new buildings, Contractors are to review with the UBC Information Technology representative if they are to attempt the removal of any larger than normal ceiling tiles.
- .2 Carefully remove existing ceiling as required to perform the Work. Store removed tiles in an area designated by the Owner. Modify and augment existing suspension systems as necessary. Restore ceiling system to their original finish.
- .3 Repair any damage to ceilings due to modifications, removal, and replacement of same. Replace damaged ceiling tiles, including tiles with holes or openings left as a result of demolition, with similar materials.
- .3 The contractor will be held responsible for any damaged or missing tiles in the area of work at the conclusion of the job. The Contractor is advised to document the conditions of existing ceilings in the area of work, noting any missing or damaged tiles with date-stamped photographs delivered to the UBC Information Technology Representative prior to start of construction.
- .4 The Contractor will be held responsible at the conclusion of the job for any damaged or missing tiles in the area of work that cannot be proven to be existing prior to his site possession. If at the conclusion of the work, holes remain in the spline ceilings for which

no replacement tiles can be found, or if in the opinion of the Architectural Consultant, the spline ceiling tiles have been damaged to the extent that they must be replaced, then the Contractor is required to replace these tiles from another room with similar tiles and in that room from where the replacement tiles come from, replace the entire ceiling with a T-Bar and 600 mm x 1200 mm acoustical tile system. The choice of this room is subject to the approval of the Architectural Consultant.

- .5 As 600 mm x 600 mm spline ceiling tiles are no longer commercially available, the contractor is advised to take extreme care when removing and replacing these tiles since they are fragile and easily broken. The spline tiles to be removed and replaced with 600 mm x 1200 mm acoustic tiles must be carefully removed and stored. They may be used for patching other areas of spline tile ceiling. The remainder are to be turned over to the UBC Information Technology Representative.
- .6 After removal of existing ceiling, the Contractor shall temporary support and protect all electrical and non-electrical devices that are not properly supported

1.7 **ACCESSIBILITY**

- .1 Install all work in a manner that allows easy accessible for adjustment, operation and maintenance. Provide access panels where required to allow access to junction boxes and devices for maintenance purpose.

1.8 **MISCELLANEOUS CABLES**

- .1 UBC Information Technology will not accept and does not employ hybrid or under-carpet cabling.

END OF SECTION 27 15 00

1.0 GENERAL

2.0 DOCUMENTS

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

3.0 SUMMARY

3.1 SECTIONS

- 1.0 GENERAL
- 2.0 DOCUMENTS
- 3.0 SUMMARY
- 4.0 WIRELESS ACCESS POINT LOCATION SPECIFICATIONS
- 5.0 PHYSICAL SECURITY
- 6.0 INDOOR LOCATIONS
- 7.0 OUTDOOR LOCATIONS
- 8.0 APPENDICES

4.0 WIRELESS ACCESS POINT LOCATION SPECIFICATIONS

- 4.1 These specifications are tailored for the wireless equipment that the University of British Columbia is deploying as of the date of last revision of this document.
- 4.2 The following criteria must be met regardless of mounting type and location:
- 4.2.1 Two (2) category 6A cable runs shall be provided to each AP location.
 - 4.2.2 The length of each category 6A cable run to each AP location shall not exceed 90 meters.
 - 4.2.3 All APs shall be mounted in the horizontal plane.
 - 4.2.4 Mounting APs in the vertical plane (e.g., on walls, pillars, etc.) shall be avoided. If site conditions necessitate vertical electrical boxes, a right-angle wall mounting bracket (see Reference Section 8.1) shall be used.
 - 4.2.5 The preferred location for AP outlets is on ceilings unless the ceiling height exceeds 4572mm. In the event that ceiling heights exceeds the specified limit, consult with UBC IT Wireless group for alternative options.
 - 4.2.6 All wireless access points shall be installed such that the line of sight between the access point and its coverage area is not obstructed by other building components (architectural elements, HVAC ducting, plumbing, cable tray, lighting, ceiling fixtures, etc.) Contractors and Consultants shall take this requirement into consideration when scheduling the installation of conduit and access points in new buildings to ensure that AP installations do not become obstructed as other building components are installed. Regardless of reason, any AP that must be moved more than 1 meter from the designated spot on the drawings, must receive approval from UBC IT.
 - 4.2.7 For all outdoor access point installations, the required CEC and BCBC codes shall govern for locating, mounting, grounding, servicing cable and enclosures used.

- 4.2.8 All UBC drawings will clearly indicate AP locations with the standard data outlet symbol with the additional “AP” lettering.
- 4.2.9 The Contractor shall install category 6A cables “where they fall” on patch panels in Local or Main communications rooms as dictated by a maximum run distance of 90 meters. AP cables shall not be purposely grouped together as this may cause unbalanced power loading on switches.
- 4.3 Special Rooms and Areas
 - 4.3.1 Rooms such as Lecture Theaters, class rooms, and large capacity study areas must receive special consideration. These areas receive a high density of student population at times and can overwhelm a single AP regardless of signal coverage. Additional APs must be installed to handle the potential capacity of the room or area.
 - 4.3.2 A rough guideline for design is 1 AP installed per 70 seats or per 100 meters squared of common study area.

5.0 **PHYSICAL SECURITY**

- 5.1 When APs are located in common, public or secluded areas, all reasonable measures to hide or protect the AP from theft and vandalism without affecting the APs’ signal propagation shall be considered. The use of an external enclosure should be considered a last resort.

6.0 **INDOOR LOCATIONS**

6.1 T-BAR CEILING MOUNT

- 6.1.1 APs will be installed below the ceiling grid at a maximum height of 3658mm.
- 6.1.2 A minimum of 3000mm of cable slack shall be coiled at the specified AP location.
- 6.1.3 Coiled cable must be supported by a J-hook above the specified AP location.
- 6.1.4 Where possible, access points shall be installed at the intersection of ceiling T-rails, such that the ceiling grid clip straddles the T-rail intersection. (see Reference Section 8.3)
- 6.1.5 Patch cables shall be routed such that they are not visible from below the access point.
- 6.1.6 All access points in T-bar ceilings will have some method to supply a secure and stable mounting point for UBC’s current type of APs.

6.2 STRUCTURAL OR SOLID CEILING MOUNT

- 6.2.1 APs will be installed below the ceiling structure at a maximum height of 4572mm.
- 6.2.2 In the case of Structural ceilings where surface raceway systems are to be used the following criteria must be met:
 - 6.2.2.1 Cables shall be terminated in deep double-gang sized Wiremold or Panduit box, with appropriate mud ring.
 - 6.2.2.2 All installed surface boxes must use reinforced mounting points.
 - 6.2.2.3 For surface-mounted access point, cables shall be routed to location via surface mounted raceway and side entry double gang box. Double gang box cannot be located less than 2000mm AFF.

- 6.2.2.4 Ceiling surface mounted electrical boxes shall not be installed less than 500mm from any adjoining walls.
- 6.2.3 In the case of structural ceilings where concealed 27mm conduit is used, a double gang deep masonry back box (MDB-2) or double gang deep back box and mud ring shall be installed.
- 6.2.4 Ceiling electrical boxes shall not be installed less than 500mm from any adjoining walls
- 6.3 WALL MOUNT
- 6.3.1 APs will be installed below a maximum height of 4500mm and typically are installed at a height of 3048mm.
- 6.3.2 Wall mounting is to be avoided if possible as it puts the AP in a horizontal plane which is problematic for signal propagation.
- 6.3.3 Coordinate with UBC IT for assistance in avoiding wall mounts.
- 6.3.4 If wall mounting is unavoidable, right-angle AP mounting brackets (see Reference Section 8.1) will be supplied.
- 6.3.5 Electrical boxes on walls or pillars shall not be installed less than 500mm from any adjoining wall or ceiling.
- 6.3.6 All wall mounted locations will use a single gang back box.

7.0 OUTDOOR LOCATIONS

- 7.1 Selection of locations for outdoor wireless access points shall be based on the following sequence of preferences:
- Street-level pole mount
 - Exterior building wall mount
 - Exterior building pole mount (soffit)
 - Roof mount
- 7.2 STREET LEVEL POLE MOUNT
- 7.2.1 Cable terminations shall be routed and completed to the nearest building communications rooms with 27mm solid PVC conduit, enclosed in an outdoor NEMA Type 4 rated junction box or similar enclosure.
- 7.2.2 Constant 110V AC power and SM optical fibre cable will be required if the distance between the building communications room and the pole-mounted access point exceeds 90 meters. AC power will not be required and Outdoor rated Category 6A Shielded copper cable can be used if the location is within the 90m distance limitation.
- 7.2.3 If power is provided, the appropriate outdoor-rated GFCI receptacle shall be installed.
- 7.2.4 APs shall be mounted to poles according to the design of the pole, within a 3000 to 7500mm range, with ideal mounting height at 5000mm.
- 7.3 EXTERIOR BUILDING WALL MOUNT
- 7.3.1 Provided that the cable length limit of 90 meters is met, outdoor rated category 6A shielded cable to the mount point will be sufficient.
- 7.3.2 Provision shall be made in the building design for the attachment of a 6 * 6 * 4 NEMA Type 4 rated junction box (see Reference Section 8.4) to which outdoor AP

- mounting brackets (such as the type described in Reference Section 8.5) can be affixed flush to the building.
- 7.3.2.1 If building material prevents flush mounting of junction box, proceed to install NEMA rated junction box directly to building exterior. AP shall be mounted flush to the junction box.
 - 7.3.2.2 Cable termination shall be completed within the exterior mounted junction box.
 - 7.3.3 APs shall be mounted at a height of between 3000 to 7500mm, with ideal mounting height at 5000mm.
 - 7.3.4 APs shall not be mounted on walls in areas where signals may be attenuated by external building elements (e.g., large canopies, balconies, design elements that impinge on the line-of-sight between the AP and the ground level.)
 - 7.3.5 In the event that the prior conditions cannot be met, consult with UBC IT Wireless group for alternative options.
- 7.4 EXTERIOR BUILDING POLE MOUNT (SOFFIT)
- 7.4.1 In areas that an AP cannot be mounted to the building wall, install pole mount to underside of soffit.
 - 7.4.1.1 APs shall be mounted at a height of between 3000 to 7500mm, with ideal mounting height at 5000mm.
 - 7.4.1.2 Pole mount shall be 50.8mm – 76.2mm in diameter at a minimum length of 305mm from the underside of soffit.
 - 7.4.1.3 Cabling shall be terminated in a NEMA Type 4 rated junction box at the bottom end of the pole mount
 - 7.4.2 Pole mounts shall not be mounted on soffits in areas where the affixed AP's signals may be attenuated by external building elements (e.g., large canopies, balconies, design elements that impinge on the line-of-sight between the AP and the ground level.)
 - 7.4.3 In the event that the prior conditions cannot be met, consult with UBC IT Wireless group for alternative options.
- 7.5 ROOF MOUNT
- 7.5.1 Roof mount locations shall be considered if the building height is no greater than 10500mm. Buildings with a roof exceeding the specified limit should use exterior wall mount locations for the external APs.
 - 7.5.2 For each of the indicated roof top AP locations provide one 27mm conduit stub up/ out terminated in an outdoor NEMA Type 4 rated junction box or similar enclosure in the vicinity of the indicated roof top AP location.
 - 7.5.3 The conduit stub up/ out shall be capable of preventing rodent ingress.
 - 7.5.4 Roof top masts are to be parapet mounted at the building edge to minimize the radio shadow at the base of the building.
 - 7.5.5 If parapet mount is not an option, NPRM shall be seismically braced to roof.
 - 7.5.6 In the event that the prior conditions cannot be met, consult with UBC IT Wireless group for alternative options.
 - 7.5.7 All roof top location masts and associated hardware are to be supplied and installed by Div 26.

8.0 REFERENCE

- 8.1 Right-angled indoor wall mounting bracket
 - 8.1.1 Drawing ITSTD - 50
 - 8.1.2 <https://oberoninc.com/products/1011-00-wh/>

- 8.2 Indoor wall mount location drawing
 - 8.2.1 Drawing ITSTD-51
 - 8.2.2 <https://oberoninc.com/products/1008-00-wh/>

- 8.3 Indoor T-Bar ceiling location drawing
 - 8.3.1 Drawing ITSTD - 53
 - 8.3.2 http://www.cisco.com/c/en/us/td/docs/wireless/access_point/mounting/guide/apmount.html

- 8.4 Outdoor AP NEMA rated junction box like:
 - 8.4.1 http://www.cantexinc.com/Products/NM_Fittings_Accessories/Junction_Box/Cover.php

- 8.5 Outdoor AP mounting bracket
 - 8.5.1 Drawing ITSTD – 52
 - 8.5.2 http://www.cisco.com/c/en/us/td/docs/wireless/access_point/1530/quick/guide/ap1532qsg.html

- 8.6 Wireless MESH detailed installations drawings – ITSTD – 54, 55, 56, 57.

END OF SECTION 27 21 33

APPENDIX A

COMMUNICATIONS STANDARD DRAWINGS - ITSTD

Drawing No.	Descriptions	
ITSTD-01	Communications Voice/Data outlet drawing symbols	
ITSTD-02	N/A	
ITSTD-03	Communications Intra Data Riser 6 x CAT6 when distance is 90M or less	
ITSTD-04	Communications Main Communications room plan view (typical)	
ITSTD-05	Communications Main Communications room Reflected ceiling plan (typical)	
ITSTD-06	Communications Main Communication room UTP terminal (typical)	
ITSTD-07-09	N/A	
ITSTD-10	Communications Main Communications room details A & B (typical)	
ITSTD-11	Communications Local Communications room Plan view (typical)	
ITSTD-12	Communications Local Communications room reflected ceiling plan (typical)	
ITSTD-13	Communications Local Communications room UTP termination (typical)	
ITSTD-14	N/A	
ITSTD-15	Communications Equipment Cabinet typical equipment placement	
ITSTD-16	Communications Room ground bus bars	
ITSTD-17	Communications Room grounding and bonding (typical)	
ITSTD-18	Communications Stacked Communications room & pathways in Academic Buildings (typical)	
ITSTD-19	Communication riser & pathways in Academic building (typical)	
ITSTD-20	N/A	
ITSTD-21	Communications port voice-data outlet flush mount & wiremold mounted	
ITSTD-22	Communications demarcation for special services (typical)	

ITSTD-23	Communication Demark for IP Cameras in T-Bar (typical)	
ITSTD-24	Communication Demark for IP Cameras in Solid Ceiling (typical)	
ITSTD-25	Communication Demark for IP Cameras in Solid Ceiling, Outlet in T-Bar (typical)	
ITSTD-26	Communications Wiremold 4000 & 6000 Series - Details	
ITSTD-27	Typical Key Lock Box Installation Details	
ITSTD-28-31	N/A	
ITSTD-32	Communications Labelling Diagram	
ITSTD-33	N/A	
ITSTD-34	Communications Typical Voice Data Labelling	
ITSTD-35	N/A	
ITSTD-36	Communications Seismic restrain Details for Data Cabinets	
ITSTD-37-48	N/A	
ITSTD-49	Communications Panduit LDP-10 Series Details	
ITSTD-50	Communications Typical Right Angle Bracket Wireless	
ITSTD-51	Communications Typical Right Angle Bracket Spacing Wireless	
ITSTD-52	Communications Typical Cisco 1532 Mounting Bracket	
ITSTD-53	Communications Typical Cisco AP T-Bar Mounting	
ITSTD-54	Wireless MESH – Soffit Mast Mount	
ITSTD-55	Wireless MESH – Exterior Sidewall Mount	
ITSTD-56	Wireless MESH – Roof Top Mast Installation	
ITSTD-57	Wireless MESH – Parapet Mast Mount	
ITSTD-58-59	N/A	
ITSTD-60	Communications Patch Panel numbering, Two Equipment Cabinet Layout	
ITSTD-61-62	N/A	

ITSTD-63	Communications Intra Fibre Backbone Details	
ITSTD-64	Communications Intra Voice Riser - 100 Pair Cat 3 Cable Details	
ITSTD-65	Communications UTP 24 port Patch Panel	

Originating Endpoint - (Comm room)	Terminating Endpoint - (User office or lab)
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Circuit Name	Circuit Type	Circuit Category	Label/Identifier	Type	Bldg #	Room #	Comment	Label/Identifier	Type	Bldg #	Room #	Comment
CCT081437	CAT6	VOIC	021-2-29	BIX	402	208A		CCT081437-021-2-29	RJ45	402	208A	
CCT081438	CAT6	VOIC	021-2-30	BIX	402	208A		CCT081438-021-2-30	RJ45	402	208B	
CCT081439	CAT6	VOIC	021-2-31	BIX	402	208A		CCT081439-021-2-31	RJ45	402	208C	
CCT081440	CAT6	USER	021-P6-1	PP	402	208A		CCT081440-021-P6-1	RJ45	402	208A	
CCT081441	CAT6	USER	021-P6-2	PP	402	208A		CCT081441-021-P6-2	RJ45	402	208A	
CCT081442	CAT6	USER	021-P6-3	PP	402	208A		CCT081442-021-P6-3	RJ45	402	208A	
CCT081443	CAT6	USER	021-P6-4	PP	402	208A		CCT081443-021-P6-4	RJ45	402	208A	
CCT081444	CAT6	USER	021-P6-5	PP	402	208A		CCT081444-021-P6-5	RJ45	402	208A	
CCT081445	CAT6	USER	021-P6-6	PP	402	208A		CCT081445-021-P6-6	RJ45	402	208A	
CCT081446	CAT6	AP	021-P6-7	PP	402	208A		CCT081446-021-P6-7	RJ45	402	208A	AP Outlet #1
CCT081447	CAT6	AP	021-P6-8	PP	402	208A		CCT081447-021-P6-8	RJ45	402	208A	AP Outlet #1
CCT081448	CAT6	USER	021-P6-9	PP	402	208A		CCT081448-021-P6-9	RJ45	402	208A	
CCT081449	CAT6	USER	021-P6-10	PP	402	208A		CCT081449-021-P6-10	RJ45	402	208A	
CCT081450	CAT6	USER	021-P6-11	PP	402	208A		CCT081450-021-P6-11	RJ45	402	208A	
CCT081451	CAT6	USER	021-P6-12	PP	402	208A		CCT081451-021-P6-12	RJ45	402	208A	
CCT081452	CAT6	USER	021-P6-13	PP	402	208A		CCT081452-021-P6-13	RJ45	402	208A	
CCT081453	CAT6	USER	021-P6-14	PP	402	208A		CCT081453-021-P6-14	RJ45	402	208A	
CCT081454	CAT6	AP	021-P6-15	PP	402	208A		CCT081454-021-P6-15	RJ45	402	208A	AP Outlet #2
CCT081455	CAT6	USER	021-P6-16	PP	402	208A		CCT081455-021-P6-16	RJ45	402	208A	
CCT081456	CAT6	USER	021-P6-17	PP	402	208A		CCT081456-021-P6-17	RJ45	402	208A	
CCT081457	CAT6	USER	021-P6-18	PP	402	208A		CCT081457-021-P6-18	RJ45	402	208B	
CCT081458	CAT6	AP	021-P6-19	PP	402	208A		CCT081458-021-P6-19	RJ45	402	208B	AP Outlet #2
CCT081459	CAT6	USER	021-P6-20	PP	402	208A		CCT081459-021-P6-20	RJ45	402	208B	
CCT081460	CAT6	USER	021-P6-21	PP	402	208A		CCT081460-021-P6-21	RJ45	402	208B	
CCT081461	CAT6	USER	021-P6-22	PP	402	208A		CCT081461-021-P6-22	RJ45	402	208B	
CCT081462	CAT6	USER	021-P6-23	PP	402	208A		CCT081462-021-P6-23	RJ45	402	208B	
CCT081463	CAT6	USER	021-P6-24	PP	402	208A		CCT081463-021-P6-24	RJ45	402	208B	
CCT081464	CAT6	USER	021-P7-1	PP	402	208A		CCT081464-021-P7-1	RJ45	402	208B	
CCT081465	CAT6	USER	021-P7-2	PP	402	208A		CCT081465-021-P7-2	RJ45	402	208B	
CCT081466	CAT6	USER	021-P7-3	PP	402	208A		CCT081466-021-P7-3	RJ45	402	208B	
CCT081467	CAT6	USER	021-P7-4	PP	402	208A		CCT081467-021-P7-4	RJ45	402	208B	
CCT081468	CAT6	USER	021-P7-5	PP	402	208A		CCT081468-021-P7-5	RJ45	402	208B	
CCT081469	CAT6	USER	021-P7-6	PP	402	208A		CCT081469-021-P7-6	RJ45	402	208B	
CCT081470	CAT6	USER	021-P7-7	PP	402	208A		CCT081470-021-P7-7	RJ45	402	208B	
CCT081471	CAT6	USER	021-P7-8	PP	402	208A		CCT081471-021-P7-8	RJ45	402	208B	
CCT081472	CAT6	USER	021-P7-9	PP	402	208A		CCT081472-021-P7-9	RJ45	402	208B	
CCT081473	CAT6	USER	021-P7-10	PP	402	208A		CCT081473-021-P7-10	RJ45	402	208C	
CCT081474	CAT6	USER	021-P7-11	PP	402	208A		CCT081474-021-P7-11	RJ45	402	208C	