1.0 GENERAL

.1 This document describes the allowances and restrictions for Communications Pathways

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:

1.3 REFERENCES

.1 Current Canadian Electrical Code

.2 Current B.C. Electrical Code

1.4 CUTTING AND CORING

.1 All cutting and coring will be completed by an appropriate contractor or trade. The cutting and coring work will be coordinated with the General Contractor of the project.

.2 Any cutting and coring work outside of a project with a General Contractor will be approved by UBC IT before proceeding.

1.5 ENTRANCE, INTERCONNECTING, RISER PATHWAYS

.1 Entrance ducts, interconnecting ducts, riser ducts, and any floor penetrating conduits in all communication rooms shall be positioned against a wall and not interfere with any open floor space as depicted in 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 a four (4) 100mm Hilti Gang plate / speed sleeve system (preferred) or as indicated on drawings for communications cable use. Security cable and other approved systems cable fill requirements are not accounted for within these 4 sleeves as they are dedicated to Communications cable fill.

.3 Hilti Gang plate / speed sleeve system will protrude above floor level as the system installation practice dictates. Ducts shall protrude exactly 100 mm above finished floor level and shall be encased in concrete.

.4 Riser ducts connecting vertically stacked rooms may consist of a schedule 40 steel sleeve that protrudes exactly 50 mm through the ceiling of the lower room and exactly 100 mm through the floor of the upper room. If possible, use the preferred Hilti Gang plate/ Speed sleeve system. The resulting gap will be bridged with vertically mounted flex/ basket tray over plywood.

.5 When sleeves are used, 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.

.6 After installation of the inter-building cables in the Main Communication Room, the ducts shall be sealed with an approved re-enterable sealing material if not using the Hilti Speed Sleeve system.

1.6 INTERIOR PATHWAYS

.1 General

.1 The Contractor shall supply and install a system of cable raceways consisting of a combination of cable tray, zone conduit, pull boxes and drop conduit. The cable trays or zone conduits extend horizontally from the Communications rooms, down the hallways or corridors to become the main zone pathway to support communication structured cable system. Each Communications outlet shall be connected to the nearest cable tray or zone pull box with dedicated drop conduit. J-hooks are not be used on major large scale renew, renovation, or new construction projects unless a specific situation warrants their use and this must be specifically allowed by UBC IT. Zone conduit pathway will not be shared with other systems i.e. security or BMS, when in new construction.

.2 Where raceway size is not specified, the raceway shall be sized to not exceed a 40% fill ratio after all communications 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%.

.3 Where isolated renovations are re-using existing building pathways – cable overfill 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.

.4 All raceway, including J hooks shall be installed parallel to the building lines, keeping cable run length at an absolute minimum.

.5 A pull tape shall be left in all raceways after installation of the cables. Pull tape shall be Greenlee 4435 or approved equal.

.6 The minimum pathway size will be 27mm regardless of fill ratio except as allowed in 1.4.8.

.7 Connecting outlet boxes together without the use of appropriately sized zone conduit and pull boxes or “daisy chaining” is a practice that is restricted to special circumstances and will only be employed with the approval of UBC IT.

.8 All empty communication raceway shall be clearly and permanently marked at both ends to indicate belonging to the communications system. Green paint stripes are used to indicate communications.

.9 Provide approved dedicated pathway for installed cables that vertically drop to a cable tray location when that location is without wall support.

.10 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.

.11 All hangers, supports and brackets shall be provided and installed to be consistent with the requirements of the B.C. Building Code. On walls inadequate to support the equipment, provide angle or channel iron supports to bear the equipment weight, independent of the wall or conduit.

.12 Provide seismic bracing for all communications infrastructure, communications equipment and components where required. If seismic bracing is supplied, provide a seismic restraint structural review of all elements which form part of the communications infrastructure installation. A structural engineer registered with the APEGBC must sign and seal the report.

.13 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 the preferred Hilti Gang plate / Speed Sleeve system or alternatively electrical metallic tubing. (See 27 05 07)

.2 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 will be sized appropriately to adequately accommodate the number of conduits entering and leaving and respect the bend radius of intended cables,

at the time of installation. Pull boxes in unusual locations will also be sized in a manner that allows for the number of conduits and additionally sized to compensate for any access restrictions, if possible, i.e. – a longer box than is strictly necessary for number of connected conduits will afford extra accessibility and allow for easier installation of cables due to the access restrictions present.

.3 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. Conversely an access hatch must be provided within 1 m of each installed pull box that is located in an inaccessible area.

.4 Access hatches should be located in service access areas wherever possible.

.3 Location of Outlets

.1 Locations of outlets are determined in part through a consultation process between UBC IT and the client in addition to industry standard practice. UBC IT consultation process must be incorporated in the production of any structured cabling system design.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Changes to location of outlets at no extra cost or credit, provided distance does not exceed 1 M, and information is given before installation.

.4 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 electrical 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

.5 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 and conduits or preferably avoid the areas entirely

.6 Cable Trays

.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 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.

.3 Zone cable trays that will be installed through ceilings of classrooms that carry cables 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 in consultation with UBC IT.

.4 Conduits and cables containing line voltage conductors (including branch circuit wiring) shall not be supported from the same supports used for communication cable trays or from the communication cable trays themselves.

.5 Provide cable support tray 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.

.6 Cable trays should be installed continuously in the required direction and dimensions to form a continuous and connected tray system as per the manufactures guidelines where appropriate. Disjointed sections of tray are not considered connected simply due to proximity. All elevation changes, tee connections, drop outs, and bends will be constructed as per manufacturer instructions and intentions.

.7 See Section 27 05 07 for fire stop of tray penetrations at fire rated walls and floors.

.8 Trays shall be positioned to allow the best access for future installations and minimize cable lengths. If during construction, tray section becomes inaccessible due to congestion, UBC IT must be notified and corrections must be implemented.

.9 A minimum of 300mm clearance must be maintained above the overall length of an installed cable tray. Short sections of tray can have reduced clearance provided the tray does not change direction in the section with limited clearance. Along its length, one side of an installed cable tray must be accessible with enough space for the head and shoulders of an installer.

.10 Cable trays shall not be penetrated or impeded by other services. Cable tray capacity must not be diminished by other systems. If during construction, tray sections become obstructed due to infringement by other systems, UBC IT must be notified and corrections must be implemented.

.11 Sharp metal edges in cable trays which could cut the cable shall be smoothed and or covered. Cables will be dressed away from these edges.

.12 Canstrut, Flex, or basket cable tray and fittings are specified, others may be accepted with UBC IT pre-approval before installation.

.13 Connect the new cable tray system to the existing cable tray (if exists). Re-work existing tray ends to suit tie-in.

.7 Zone Conduit Pathways

.1 It is acceptable to install an appropriately sized zoned conduit and pull-box system instead of cable tray. Zone conduits are not to be shared with other system's cables i.e. security or BMS when it is in new construction. Other systems will require their own zone conduits for their cable installations; however appropriately sized zone pull boxes can be shared.

.2 Zone conduit is defined as any conduit that connects one pull box to another pull box or connects to a pull box with more than one communications outlet connected to that pull box.

.3 Minimum zone conduit size is 35mm with a cable fill ratio of 40%, typically this equates to 8 - Cat6A cables.

.1 UBC IT recommends the use of the CommScope Cable fill calculator tool located at the CommScope web site - https://calcpathways.commscope.com/

.4 Minimum zone conduit pull box size is 300mm x 300mm x 150mm.

.5 Zone conduit installations are required to have:

- a maximum of 9000 mm between pull boxes.

- a combined maximum of 180 degrees in bends and offsets between pull boxes.

.8 Conduit

.1 This section applies to all communications conduits, regardless if used for zone, drop, demark, or other applications.

.2 Conduit shall be EMT or rigid steel except for special cases where floor boxes must be fed with in slab conduit. (See 1.6.8.11)

.3 Where no specific allowance is made or no description offered, the default minimum conduit size shall be 27 mm.

.4 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

.5 All conduit installations are required to observe:

- a maximum of 9000 mm between pull boxes.

- a combined maximum of 180 degrees in bends and offsets between pull boxes.

- must not be installed in slab

.6 Outlet boxes are not to be directly connected together with conduit i.e. – 'daisy chaining'. Zone conduit and pull boxes must be used to feed outlet boxes individually – even when the outlet boxes are laid out in series or in difficult locations.

.7 An allowance for the use of 21mm conduit for communications pathways is acceptable in these specific situations:

- drop conduit to outlet boxes in residential bedrooms

- drop conduit to outlet boxes in single occupant offices

- drop conduit to outlet boxes for building service demarcations - if services are not combined together in the same outlet box - i.e. elevator, meters, fire alarm

.8 LB type fittings 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.

.9 Coreline conduit type is not acceptable at any time and is not to be used for UBC IT pathways on campus.

.10 Flexible metal and PVC jacketed flexible metal conduit shall not be used unless allowed by the UBC Information Technology Representative.

.11 In slab conduit is not acceptable, except when supplying floor boxes where conduit poke through to the floor below is not practical. In this specific case, minimum 27mm ridged PVC will be accepted. Conduits are to leave the slab and rise up walls to ceiling spaces above or down to ceiling space below as soon as practical. Coreline product is not acceptable in any circumstances and is not to be used for IT pathways at UBC.

.12 When cable trays are used, conduit shall be attached to the edge of the tray with a conduit bracket designed for this purposed. 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.

.13 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 / tray intersecting location. Minimizing cable lengths will take priority over routing conduits to existing ceiling hatches.

.14 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.

.15 In rooms where conduits are installed on the surface of walls, locate them so as not to interfere with the installation of the white boards, wall details or other obstructions.

.16 Conduits installed in new walls will be placed inside the wall cavity.

.9 J-Hooks

.1 J-Hooks and hangers - when allowed by UBC IT, 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. J-Hooks and hangars will have a maximum spacing interval of 1.5m and a J-Hook or hangar must be present in the apex of each change of direction.

1.7 Surface Raceways

.1 General

.1 Surface raceways must be specifically designed to accommodate high performance structured network cabling systems. Wiremold or Panduit surface raceway products may be used for voice and data outlets.

.2 Where Wiremold raceway has been used on existing walls; continue to use the same make and model of Wiremold raceway.

.3 Surface raceway and/or flush mount wall outlet in conjunction with flexible conduit can be used to feed modular furniture.

.4 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 raceway.

.5 For individual outlets where recessed conduit is not possible (i.e. exposed concrete walls) 27 mm surface raceway shall be used.

.2 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 Non-metallic surface raceway shall be manufactured by Panduit. Except as noted, colour of Panduit shall be off-white on painted surfaces and grey on unfinished concrete surfaces.

.3 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 500 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.

.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%.

1.8 Communications Outlet Boxes

.1 Wall Outlet Boxes

.1 A Communications outlet is defined as the point at which the Communications equipment i.e. computer, phone, building service panel, is connected to the University networks. The outlet consists of an outlet box and cover plate, connecting conduit, potentially several jacks, and its connecting cables.

.2 All communications outlet boxes will connect directly back to cable tray or zone pull box utilizing the default 27mm size conduit at a minimum unless specifically allowed.

.3 These specific outlet box types may use 21mm conduit directly connected back to cable tray or zone pull box as per 1.6.4.7.of this document:

- Residential bedrooms

- Single occupant offices

- Building service demarcations if not combined together - i.e. elevator, meters, fire alarm

.4 Unless specified on the drawings all outlet boxes will follow this selection matrix:

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

.5 Communications outlets that are considered demarcation points are not required to have faceplates as bare jacks conserve space and allow for box covers to be installed. In addition, a 4x4 box is the default selection and use of MBD boxes is discouraged.

.6 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.

.7 Communications 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.

.2 Floor Outlet Boxes

.1 Floor boxes must be specifically designed to accommodate high performance communications structure cable systems.

.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, ect) must use separate pathway.

.5 Floor boxes must have a code compliant separation from any electrical power systems installed in the same floor box.

.3 Outlet box 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

Manufacturer:

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 Equivalents

1.9 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 if the system allows.

.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 communications cables in wall outlets near the modular furniture area - extend with patch cords through furniture to user work areas.

.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.

END OF SECTION 27 05 28