

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. 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.
- .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.
- .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 UBCO 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. UBCO 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 drawing, all outlet boxes shall be 90 mm deep masonry outlet boxes (MBD-1 or MBD-2) or deep surface mount outlet boxes (single or double gang).

1.18 **PRODUCTS**

- .1 Flush-Mount Box

Each Communications outlet shall be housed in a deep masonry box (MBD-1 or 2) with a depth of approximately 90 mm. When it is necessary to mount an outlet box in a wall with a depth of 65 mm, a 65 mm masonry shallow outlet box (MBS-1 or 2) may be used. Approved low voltage Communications rings can be used where specified.

- .2 Surface-Mount Box

Manufacturer:

<u>Wiremold</u>	V5744-2 (dual-gang for use with conduits)
	V2144-2 (dual-gang for use with V2100)
	V3044-2 (dual-gang for use with V3000)
<u>Hubbell</u>	HWPFSCS/HBLFSCS series c/w cover (surface floor box)
<u>Panduit</u>	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.
 - .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, ect) must use separate pathway.

END OF SECTION 27 05 28