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University of Victoria

Communication Systems Guidelines

June 2012

1 Building Requirements

1.1 Telecommunication Rooms

1.1.1 Access

1.1.1.1 Telecommunication Room access will be restricted to Network Service's staff, or personnel specifically authorized for access by UVic Network Services. Telecommunication Rooms will be set-aside for the exclusive purpose of housing equipment associated with telecommunication service delivery. Any equipment, material, or service, which requires access by the building occupant, non-authorized personnel, or outside agency, is prohibited.

1.1.1.2 All entrance doors to the Telecommunication Rooms will be lockable.

1.1.1.3 Room numbers are to identify the exterior of the Telecommunication Room, with no reference made to its status of Telecommunication Room.

1.1.1.4 Every effort will be made for Telecommunication Room doors to swing outwards.

1.1.2 General

1.1.2.1 Telecommunication Rooms should be vertically aligned.

1.1.2.2 Telecommunication Room layout diagrams are based on standard Telecommunication Room sizes with rectangular shaped walls and floors. If the finished room sizes or shapes differ from the sample TR layout diagrams the layouts will need to be reconsidered by UVic Network Services, with possible significant component relocation to maintain necessary clearances. See Entrance Telecommunication Room Layouts (Appendix E) and Secondary Telecommunication Room Layouts (Appendix F).

1.1.2.3 19 mm plywood is required to cover all wall surfaces from the floor to the 2.44 m height to allow for hardware mounting and cable routing and anchoring.

1.1.2.4 Telecommunication Rooms will have cable trays. See Cable Tray Detail.

1.1.2.5 To facilitate the installation of cable tray 3 sections of Unistrut (or compatible) are required to run wall to wall on the ceiling. See Entrance Telecommunication Room Layouts (Appendix E) and Secondary Telecommunication Room Layouts (Appendix F).

1.1.2.6 Telecommunication Rooms should be located away from sources of electromagnetic interference (transformers, motors, x-ray, induction heaters, arc welders, radio, radar) until interference is less than 3 V/m across the frequency spectrum.

1.1.2.7 Sources of flooding, including overhead plumbing, will be avoided. With the exception of sprinkler systems, no piping, ductwork, mechanical equipment or power cable shall be allowed to pass through the Telecommunication Room.

1.1.2.8 Proper grounding and bonding is required for all patch panels, racks & cable trays.

1.1.2.9 Painted concrete flooring is desired. Where flooring material is unavoidable, mono coloured finish will be used to produce a result where it is possible to locate small lengths of broken fibre created during fibre-optic cable terminations.

1.1.2.10 On completion of the contractor work within a Telecommunication Room, the area will be left in a clean state, free from debris.

1.1.2.11 Telecommunication Rooms will service areas not greater than 900 sm.

1.1.2.12 Telecommunication Rooms must not be more than 90 m of cable-distance from all associated communications outlets.

1.1.2.13 Telecommunication Rooms will have horizontal cable installed between the patch panels and communications outlets. See Horizontal Cable Detail.

1.1.2.14 Telecommunication rooms will have riser conduits to adjacent Telecommunication Rooms. See Backbone Conduit Detail.

1.1.2.15 Conduits are to be installed between a top floor Telecommunication Room and the roof. See Roof Conduit Detail.

1.1.2.16 Telephone riser cables will be installed between the Entrance Telecommunication Room and each of the Secondary Telecommunication Rooms. See 25-pair Cat5e Copper Riser Cable.

1.1.2.17 Telecommunication Rooms are not to have false ceilings, and all surfaces should be treated to reduce dust with walls and ceilings painted white or pastel to improve visibility.

1.1.2.18 The project's designated UVic Network Service Technician will review the Telecommunication Room final layout designs prior to construction approval.

1.1.2.19 The temperature within a Telecommunication Room will be limited to between 10 to 30 degrees C.

1.1.2.20 The humidity within a Telecommunication Room will be 10% to 80% non-condensing.

1.1.2.21 The Telecommunication Room will have at a minimum positive filtered air pressure.

1.1.2.22 Telecommunication rooms should have chilled water fan coil units to maintain temperature at 21 C.
1.1.2.23 A fan to draw heat from the rooms into an adjacent corridor will be required, but will only activate in the event of a power failure.
1.1.2.24 Telecommunication Rooms will have fire-rated doors.
1.1.2.25 Telecommunication Rooms will have automatic smoke detectors.
1.1.2.26 Telecommunication Rooms will have ambient lighting to 100-footcandles over the total room area by switched fluorescent lighting.
1.1.2.27 Doors will be fitted with dust sweeps.
1.1.2.28 Dust must be less than 100 micrograms/cubic meter/24 hour period.

1.1.3 Entrance Telecommunication Rooms

1.1.3.1 The minimum dimension of an Entrance Telecommunications Room is expected to be 2.75 m x 2.89 m.
1.1.3.2 Entrance Telecommunication Rooms will usually be sited on the lower floor.
1.1.3.3 Duct bank leading out to a manhole or pull box is required and will be clearly labelled at both ends. See Backbone Conduit Detail.
1.1.3.4 The contractor is responsible for the purchase, installation, bonding and permanent fastening (bolting down) of fibre frame and relay racks to the building structure. See Components to be supplied by the Contractor (Appendix A).
1.1.3.5 All fibre-optic cables will be terminated in panels in a fibre frame. See Riser Cable Detail , Backbone Cable Detail and Components to be supplied by the Contractor (Appendix A).
1.1.3.6 One “208v 20A” circuit with L6-20R type receptacle connected to building hydro is required. See Power Detail Diagram (Appendix I).
1.1.3.7 One “208v 30A” circuit with L6-30R type receptacle connected to the standby electrical panel is required. See Power Detail Diagram (Appendix I).
1.1.3.8 In cases where standby electrical panel is not available, a 208v 20A L6-20R type receptacle and 208v 30A L6-30R type receptacle will be required and they should be feed from separate sub panels. See Power Detail Diagram (Appendix I).
1.1.3.9 One “120v 20A” circuit with two NEMA 5-20 TSlot receptacles connected to building hydro is required. See Power Detail Diagram (Appendix I).

1.1.4 Secondary Telecommunication Rooms

1.1.4.1 With the exception of the floor that houses the Entrance Telecommunication Room, each floor of every building will at a minimum have one Secondary Telecommunication Room.
1.1.4.2 The minimum dimension of a Secondary Telecommunication Room is expected to be 2.75 m x 2.59 m.
1.1.4.3 The contractor is responsible for the purchase, installation, bonding and permanent fastening (bolting down) of the relay racks to the building structure. See Components to be supplied by the Contractor (Appendix A).
1.1.4.4 All fibre-optic cables will terminate in a rack or on wall-mounted boxes. See Riser Cable Detail and Components to be supplied by the Contractor (Appendix A).
1.1.4.5 Two “120v 20A” circuits with four NEMA 5-20 TSlot receptacles connected to building hydro are required. See Power Detail Diagram (Appendix I).
1.1.4.6 One “120v 20A” circuit with two NEMA 5-20 TSlot receptacles connected to the standby electrical panel are required. See Power Detail Diagram (Appendix I).
1.1.4.7 One “120v 30A” circuit with NEMA L5-30 receptacles connected to the standby electrical panel are required. See Power Detail Diagram (Appendix I).
1.1.4.8 In cases where standby electrical panel is not available, three “120v 15A” circuits with NEMA 5-20 TSlot receptacles and one “120v 30A” with NEMA L5-30 receptacle. See Power Detail Diagram (Appendix I)

1.1.5 External Service Provider Telecommunication Space

1.1.5.1 A separate space designated for the exclusive use of External Service Providers is required to house communication equipment not related to, or under the control of UVic Network Services to assure researchers, granting agencies, auditors, etc., that UVic data are not exposed to third parties.
1.1.5.2 ESP Telecommunication space should be positioned within close proximity to an Entrance or Secondary Telecommunication Room.
1.1.5.3 The entrance way will be lockable, and keyed as a sub key to the UVic campus

Telecommunication Room key set.

1.1.5.4 The recommended dimension of an External Service Provider Telecommunication Space is expected to be approximately 2 m x 1 m.

1.1.5.5 A minimum of two 50 mm conduits will be run between the External Service Provider Telecommunication Space and an Entrance or Secondary Telecommunication Room. See Riser Conduit Detail.

1.1.5.6 One “110v 20A” circuit with two NEMA 5-20 TSlot receptacles connected to building hydro are required. See Power Detail Diagram (Appendix I).

2 Cable

2.1 Cable Detail

2.1.1 General

2.1.1.1 Contractors are requested to source fibre-optic cable from Berk-Tek. Alternate manufacturers may be approved by special application to UVic Network Services (netadmin@uvic.ca).

2.1.1.2 Horizontal copper cable that is considered to be part of the UVic campus-cable infrastructure will be manufactured by AMP.

2.2 Horizontal Cable

2.2.1 Unshielded Twisted Pair

2.2.1.1 The length of any twisted pair horizontal cable shall not exceed 90 m.

2.2.1.2 The horizontal communications cable shall run without a splice between the Telecommunication Room and the communication outlet.

2.2.1.3 Horizontal cables will be as noted in the Components to be supplied by the Contractor (Appendix A).

2.2.1.4 All horizontal UTP wiring is to be terminated the designated patch panel within the Telecommunication Room. The patch panels will be clearly labelled “Data-In”.

Patch panel descriptions are as follows;

Panel	Description
Data-In	Horizontal Cable
Data-Out	Network Hardware
Tele-Out	Riser to the entrance facility

2.2.1.5 Implementation

2.2.1.5.1 The contractor will be responsible for the installation of the “Data-In” and “Tele-Out” patch panels. The number of horizontal cable runs will determine the quantity of patch panels. The panel locations are indicated on the TR layout diagrams. See TR layouts Figure 3 (Appendix E) and Figure 4 (Appendix F).

2.2.1.5.2 An indication of the patch panels to be supplied under the contract and their physical location is noted on the TR layout diagrams by a solid outline. The total number of voice and data connections required will determine the actual quantity of panels to be installed. Contact UVic Network Services at the 80% drawing stage for final layout drawings. See TR layouts Figure 3 (Appendix E) and Figure 4 (Appendix F).

2.2.1.5.3 Patch panels that are indicated by a dotted outline are for installation by UVic Network Services and identify space that must be kept clear of cable runs etc. See TR layouts Figure 3 (Appendix E) and Figure 4 (Appendix F).

2.2.1.5.4 UVic Network Services will be responsible for the installation of the “Data-Out” patch panels.

2.2.1.5.5 Telecommunication Rooms will be outfitted with patch panels, which will be mounted on adjustable deep wall brackets, sized to accommodate the bend radius of the horizontal cable and will have cable management rings. The cable management rings are to be mounted at the hinged ends of each patch panel. For positioning detail review the TR layout diagrams. See TR layouts Figure 3 (Appendix E), Figure 4 (Appendix F) and Components to be supplied by the Contractor (Appendix A).

2.2.1.5.6 Cable runs will have sufficient lengths of cable left for connection to patch panels within the Telecommunication Room.

2.2.1.5.7 All cables shall be bundled and supported to the walls at intervals of approximately 600 mm with tie-straps and saddles, Velcro type straps or specially designed cable clamps.

2.2.1.5.8 To avoid unnecessary stress on the cable, bundles will not be secured so tightly that the

cable jacket deforms.

2.2.1.5.9 When cable lubricant is required, the chemical make-up must be compatible with the cable's outer sheath.

2.2.1.5.10 Cable installations need to be neatly dressed against the sidewalls of Telecommunication Rooms. On backboards, care must be taken to ensure that they do not obstruct other cables, mounted equipment or cable entry points.

2.2.1.5.11 Cable runs on cable backboards must be installed parallel to building lines and follows the perimeter of the backboard.

2.2.1.5.12 The cables are to be connected to the Telecommunication Room patch panels in sequential order and where possible by room number. The Data Jacks should be sequential within the rooms.

Example: Room 101 = D1, D2, D3
Room 102 = D4, D5, D6 etc.

2.2.1.5.13 A nylon pull string shall be left in all raceways after installation of the cable.

2.2.1.5.14 Cable Certification – All cables will:

- be certified/approved by CSA standard PCC FT4 flammability test, and UL CMR,
- meet or exceed the requirements in the National Electrical Manufactures Associated (NEMA) Standard for Low-loss Extended-frequency Premises Telecommunication Cable,
- meet or exceed the performance requirements of Level V of the Underwriters Laboratories Inc. specifications, and cable surface markings shall indicate this classification.

2.3 Riser Cable

2.3.1 General Fibre-Optic Riser

2.3.1.1 The fibre-optic riser cable shall run from the Entrance Telecommunication Room to each of the Secondary Telecommunication Rooms. See TR layouts Figure 1 (Appendix E) and Figure 1 (Appendix F).

2.3.1.2 ***UVic Network Services will terminate all fibre-optic cable and provide fibre termination components***.

2.3.1.3 Implementation

2.3.1.3.1 Reverse bends (100-180 degrees) are not permitted. A pull box must be used as an alternative in these situations.

2.3.1.3.2 Care must be taken with laying cables in cable trays to ensure that runs are parallel and cable criss-crossing is minimized.

2.3.1.3.3 Cable installations need to be neatly dressed against the walls of Telecommunication Rooms or installed in appropriate cable tray. On backboards, care needs to be taken to ensure that they do not obstruct other cables, mounted equipment or cable entry points.

2.3.1.3.4 Cable runs on cable backboards must be installed parallel to building lines and follows the perimeter of the backboard.

2.3.1.3.5 A nylon pull string shall be left in all raceways after installation of the cable.

2.3.2 Singlemode Fibre-Optic Riser

2.3.2.1 A 12-fibre, premises distribution, riser rated, singlemode, fibre-optic cable shall be installed between the Entrance Telecommunication Room and each of the Secondary Telecommunication Rooms. See Components to be supplied by the Contractor (Appendix A).

2.3.3 Multimode Fibre-Optic Riser

2.3.3.1 A 12-fibre, premises distribution, riser rated, 50/125 um, OM4, laser optimized, multimode fibre-optic cable shall be installed between the Entrance Telecommunication Room and each of the Secondary Telecommunication Rooms. See Components to be supplied by the Contractor (Appendix A).

2.3.4 25-pair Cat5e Copper Riser

2.3.4.1 One telephone riser cable will be installed between the Entrance Telecommunication Room and each of the Secondary Telecommunication Rooms to connect to a 48-port 'tele-out' patch panel. See Components to be supplied by the Contractor (Appendix A) and TR layouts Figure 1 (Appendix E), Figure 3 (Appendix E), Figure 1 (Appendix F) and Figure 4

(Appendix F).

2.3.4.2 Implementation

2.3.4.2.1 25-pair cables will have sufficient lengths of cable to allow for connection to “Tele” patch panels located within the Telecommunication Rooms.

2.3.4.2.2 The cable will be terminated on the panels in each of the Secondary Telecommunication Rooms as indicated on the TR layout diagrams as follows;

Cable	Pair Per Jack	Jack Numbers	25th Pair	Comment
1	1	1 to 24	Spare	Fold back spare pair
2	1	25 to 48	Spare	Fold back spare pair

- Secondary Telecommunication Rooms will have the telephone risers terminated with one pair per patch panel jack following the standard T568A colour code. The pair will be punched down on the blue position of each jack. The Violet/Slate pair should be left long enough to reach any position on the row and coiled or folded back. See Wiring Illustration Diagram (Appendix B).
- Entrance Telecommunication rooms will have the telephone risers terminated on BIX 1A strips following the standard T568A colour code. All 25 pairs are to be terminated. The Violet/Slate on the last position is to be labelled as ‘spare’.
- Entrance Telecommunication Rooms will have tie cables connecting the “Tele Out” patch panels to the BIX strips and will be terminated the same as the riser cable from the Secondary Telecommunication Rooms.
  - Each path (jack) shall be tested end to end for proper wire map (pair 1 straight through to the end).
  - Each panel position should be labelled using the UVic Standard. See 25-Pair Copper Riser Cable Labels.

2.4 Backbone Cable

2.4.1 Singlemode Fibre-Optic Backbone

2.4.1.1 A minimum of two 72-fibre, riser rated, singlemode fibre-optic cables shall be provided between the Entrance Telecommunication Room of the new building and two locations to be confirmed with the project’s designated UVic Network Service Technician. See TR layout Figure 1 (Appendix E) and Components to be supplied by the Contractor (Appendix A).

2.4.1.2 The cable shall be run in duct provided specifically for that purpose. If the cable is to share a duct with other cable, it shall be run in a separate inner duct.

2.4.1.3 UVic Network Services will terminate all fibre-optic cable and provide fibre termination components.

2.4.1.4 Backbone cables will have service loops within the entrance facility. The amount of fibre left in the entrance room should be the distance from the point of entry to the farthest point in the room routing around the perimeter plus 20 metres.

2.4.2 Multi-pair 24 gauge OP Copper Backbone

2.4.2.1 A minimum of one multi-pair 24 gauge OP copper cable shall be provided between the Entrance Telecommunication Room of the new building and a location to be confirmed with the project’s designated UVic Network Service Technician. The cable pair count will be decided by the UVic Network Services. See TR layout Figure 1 (Appendix E) and Components to be supplied by the Contractor (Appendix A).

2.4.2.2 Implementation

2.4.2.2.1 The installation must comply with local and provincial codes.

2.4.2.2.2 Install and terminate OP multi-pair backbone cable in the Entrance Telecommunication Rooms of the new building. Verify pair count requirement with the project’s designated UVic Network Service Technician prior to implementation. See TR layout Figure 2 (Appendix E) and Components to be supplied by the Contractor (Appendix A).

3 *Infrastructure*

3.1 General Infrastructure

3.1.1 Standard Communications Outlet

3.1.1.1 A standard communications outlet is considered to be a double gang box and must have space to accommodate four modular jacks. See Components to be supplied by the Contractor (Appendix A).

3.1.1.2 All modular jacks will be black.

3.1.1.3 Two of the four positions will have modular jacks installed and will be connected via horizontal cable to the designated Telecommunication Room. The two remaining positions will be filled with blank inserts.

3.1.1.4 The communications outlet must not be more than 90 metres of cable-distance from the designated Telecommunication Room.

3.1.1.5 In offices designated for full-time members of the Faculty and Professional Staff, the communications outlets are to be installed in quantities of two.

3.1.1.6 In general work-areas or electrical rooms, only one communications outlet is required.

3.1.1.7 Standard faceplates are to be used unless electronic approval is received from the project's designated UVic Network Service Technician. See Components to be supplied by the Contractor (Appendix A).

3.1.1.8 Implementation

3.1.1.8.1 When coiling cable at the communications outlet a minimum bending radius of 4 x the cable diameter or 25 mm, whichever is greater, shall be maintained.

3.1.1.8.2 Cable runs will have a 400 mm length of service loop left near the communication outlet for future repairs. Communications outlet faceplate shall be flush mounted with the finished wall, at the same height as power receptacles.

3.1.1.8.3 Communications outlets shall be positioned to enable easy, unobstructed access and shall be clear of millwork.

3.1.1.8.4 Communications outlets on joint use surface raceway shall be single gang duplex cutouts.

3.1.1.8.5 Communications outlets on large surface raceway shall be dual gang duplex cutouts.

3.1.2 Non-Standard Outlet Box

3.1.2.1 A non-standard communications outlet is a single gang box and has one or two modular jacks. See Components to be supplied by the Contractor (Appendix A).

3.1.2.2 Non-standard communications outlets will have at least one of the modular jacks connected via horizontal cable to the designated Telecommunication Room.

3.1.2.3 Single modular jack communications outlets are to use the faceplate identified in ' Components to be supplied by the Contractor (Appendix A)' unless electronic approval is received from the project's designated UVic Network Services Technician.

3.1.2.4 Double modular jack communications outlets are to use the faceplate identified in 'Components to be supplied by the Contractor (Appendix A)' unless electronic approval is received from the project's designated UVic Network Services Technician.

3.1.2.5 Implementation

3.1.2.5.1 See Standard Communications Outlet Implementation Detail.

3.1.3 Modular Jack

3.1.3.1 Cable termination at the communications outlet shall be 8-pin modular jack (RJ45) and be approved to EIA/TIA 568A Standards. See Components to be supplied by the Contractor (Appendix A).

3.1.3.2 The Modular Jack's part number will be as noted in the Components to be supplied by the Contractor (Appendix A).

3.1.3.3 Provide wall plates containing two (2) or four (4) cutouts (stainless steel only).

3.1.3.4 'Telephone' modular jacks are referred to by the generic term 'Communication' or 'Data' Jacks.

3.1.3.5 Blanks will be fitted into unused cutouts.

3.1.3.6 Communications outlets shall be connected to the cable using the following ISDN Standard for telephone and data outlets (568a):

Pair	PIN No.	Colour Code
3T	1	Wh-Green
3R	2	Green
2T	3	Wh-Orange
1R	4	Blue
1T	5	Wh-Blue
2R	6	Orange
4T	7	Wh-Brown
4R	8	Brown

3.1.4 Courtesy Telephone Requirements

3.1.4.1 Wiring shall be installed to the courtesy telephone location confirmed in the building design layout.

3.1.4.2 One 120v power receptacle will be provided at the location of the telephone.

3.1.4.3 The installation of a vandal resistant, motorized TTY for public facilities will be installed at the discretion of Campus Security and Facilities Management.

3.2 Cable Infrastructure

3.2.1 General Cable Infrastructure

3.2.1.1 Wiring shall meet all Provincial and Local Electrical Codes.

3.2.1.2 Communications' cable system wiring and equipment shall be in accordance with good engineering practices as established by CAN/CSA T529, T530, EIAA'A 568A Standards, BICSU-TDM and CSA 22.1 Canadian Electrical Code, Part 1.

3.2.1.3 All references to Codes, Standards, and Regulations noted in these guidelines are to be taken as the ***latest or most current in effect*** at the time of the installation.

3.2.1.4 All wiring shall test free from all ground loops and shorts. All wiring shall be installed in the conduit system, specifically designated for this purpose.

3.2.1.5 All cables shall be free from defects caused by, but not limited to shorts, kinks, tight bends, damaged conductors, and wiring crossovers.

3.2.1.6 All cables shall be free from splices.

3.2.1.7 Incoming cable is to be dressed to the patch panels on the opposite side of the hinge.

3.2.1.8 In open office environments the preferred method of extending the conduit from the communications outlet to the cable tray is via perimeter walls. If this is not possible then Power and Communications poles or pony walls should be used.

3.2.1.9 The contractor will ensure that all patch panels are grounded (bonded).

3.2.1.10 All communication pathway installed shall be metallic, including but not limited to cable trays, surface raceways, conduit, pull boxes, and power and communications poles, unless otherwise specifically noted. Plastic raceway may be approved by special application to the project's designated UVic Network Services Technician (netadmin@uvic.ca).

3.2.2 25 mm Horizontal Conduit (optional)

3.2.2.1 The conduit is not to exceed 15 m in length.

3.2.2.2 The conduit must not have more than three right-angle bends, and will be E.M.T.

3.2.2.3 Nylon pull strings are to be left in each conduit after cable installation.

3.2.2.4 For individual communications outlets where wall cavities are not available or recessed conduit is not possible (e.g., exposed concrete walls) 25 mm equivalent surface raceway shall be used.

3.2.2.5 Surface raceway in conjunction with flexible conduit may be used to feed modular furniture.

3.2.2.6 If conduit is installed, associated junction boxes and pull boxes shall be galvanized steel complete with cover plate unless otherwise indicated or required by Canadian Electrical Code. See Components to be supplied by the Contractor (Appendix A).

3.2.2.7 Implementation

3.2.2.7.1 Reverse bends (100-180 degrees) are not permitted. A pull box must be used as an alternative in these situations.

3.2.2.7.2 In exceptional cases, where the conduit length or number of bends is outside the guidelines, pull boxes will be installed.

3.2.3 Surface Raceway

3.2.3.1 Work area outlets on surface raceway shall be located so that the communications equipment will be no further away than 3 m from the communications outlet.

3.2.3.2 When the surface raceway is used to distribute power and communications cable, a pre-manufactured barrier, separating communications cable and communications outlets from power cables and power outlets, shall be installed in the centre raceway.

3.2.3.3 Surface raceways shall be continuous around corners. Provide manufacturer's corner pieces and vertical sections where two joining sections are at different elevations.

3.2.3.4 Implementation

3.2.3.4.1 The surface raceway shall parallel building lines and hug ceilings, baseboards, and corners.

3.2.3.4.2 The surface raceway base shall be mechanically fastened to walls and supporting structures.

3.2.3.4.3 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.

3.2.3.4.4 Surface raceway extending into the false ceiling shall connect to an appropriate "Entrance End Fitting".

3.2.3.4.5 When installing surface raceway, pre-manufactured bends and fittings must be used. Installation shall be in accordance with the manufacturer's instructions.

3.2.3.4.6 Wire clips shall be installed in two-piece surface raceway at 450 mm centres.

3.2.3.4.7 When installing cable in surface raceway, cable fill shall not exceed 40%.

3.2.4 Power and Communications Pole

3.2.4.1 Power and Communications poles will be used for communications system wiring requirements in open floor spaces to extend communications cable to freestanding workstations in a room.

3.2.4.2 Power and Communications poles for modular furniture are available from the manufacturer of the furniture and shall be used for top feeding of the communications wiring.

3.2.4.3 Implementation

3.2.4.3.1 Power and Communications poles shall be fixed at the floor and ceiling to minimize movement or rotation of the poles.

3.2.4.3.2 Power and Communications poles shall extend into the ceiling and connect to an appropriate size pull box.

3.2.4.3.3 If the system requires the installation of fibre-optic cable in Power and Communications poles, a minimum 25 mm deep extension shall be installed to increase the depth of the outlet.

3.2.4.3.4 When pulling cable into Power and Communications poles, fill shall not exceed 40%.

3.2.5 Cable Tray

3.2.5.1 From each Telecommunication Room, cable tray shall be installed in the main corridor false ceiling.

3.2.5.2 When cable trays are fed by conduit, the conduit shall be attached to the edge of the tray with a bracket designed for this purpose. Alternatively the conduit shall be stubbed above and within 150 mm of the tray and terminate in a bonding bushing. Conduit will be bonded to the tray with a No. 6 AWG bonding conductor.

3.2.5.3 All conduit ends shall be bushed or terminated with an insulated throat connector.

3.2.5.4 Communications cable is generally supported between the cable tray and the communications outlet by "J" hooks or "Velcro Straps".

3.2.5.5 All cable trays shall be installed parallel to the building lines, keeping conduit length to an absolute minimum.

3.2.5.6 Where cable tray size is not specified, the cable tray shall be sized to not exceed a 28% fill ratio after all the cables are installed. Where there are zero bends in the cable tray, the fill ratio may be increased to 40%.

3.2.5.7 A nylon pull string shall be left in all raceways after installation of the cables.

3.2.5.8 All empty cable trays shall be clearly and permanently marked at both ends to indicate destination and function. The markings shall be clearly visible after construction is completed.

3.2.5.9 Cable trays shall be supported using the manufacturer's standard supports such that wherever possible one side of the tray is both accessible and unencumbered by support members to permit convenient placement of cables. Otherwise utilize suspended trapeze

racks, with cable trays securely bolted to the support assemblies. Provide additional supports under all fittings of 600 mm radius or larger. Brace all supports to withstand the loads due to pulling in of cable. All supports shall permit a minimum of 150 mm vertical adjustment.

3.2.5.10 Proximity to potential sources of electromagnetic interference (e.g., motors, transformers, power cables, florescent lighting etc) must be avoided when designing communications cable pathways.

Minimum clearance shall be provided:

Distance	Direction	Description
1200 mm		From large motors or transformers
305 mm	Vertical	From adjacent conduits, pipes, ductwork
600 mm	Horizontal	From adjacent conduits, pipes and ductwork
450 mm		From conduit and cables used for electrical power distribution
120 mm		From fluorescent lighting

3.2.5.11 Proper grounding and bonding is required.

3.2.5.12 Pathways and cables should cross perpendicular to fluorescent lighting and electrical power cables or conduits, not gradually over long distances.

3.2.5.13 Additional clearance requirements, as noted in the CAN/CSA-T530 (Building Facilities Design Guidelines for Telecommunications) and EIA/TIA 569 (Commercial Building Standard for Telecommunications Pathways and Spaces) must be followed.

3.2.5.14 Clearances relating to electrical safety and separation of electrical communications systems in a building as specified in the Canadian Electrical Code Part 1 must be followed.

3.2.5.15 Implementation

3.2.5.15.1 Care must be taken not to attach conduits and cables containing power conductors to communication cable tray supports.

3.2.5.15.2 Where conduit is stubbed above and within 150 mm of the tray and terminates in a bonding bushing, care must be taken to ensure that the bonding lugs are not placed in the path of the cables.

3.2.5.15.3 Telecommunication Rooms will have cable trays extending into the space to accommodate the installation of horizontal cables.

3.2.5.15.4 Cable “drop outs” will be provided where cables are routed between trays at different elevations.

3.2.5.15.5 Communication cables shall be fastened together on a system-by-system basis by use of Velcro cable ties on maximum 3 m centres.

3.2.6 Riser Conduit

3.2.6.1 A minimum of four 100 mm fire stop sleeves will be run between vertically aligned Telecommunication Rooms. In situations where the Telecommunication Rooms are not vertically aligned, it is deemed acceptable to provide an alternate path via cable tray. See TR layouts Figure 1 (Appendix E) and Figure 1 (Appendix F).

3.2.6.2 A minimum of two 50 mm conduits will be run between the External Service Provider Telecommunication Space and an Entrance or Secondary Telecommunication Room. See TR layouts Figure 1 (Appendix E) and Figure 1 (Appendix F).

3.2.7 Backbone Conduit

3.2.7.1 A minimum of 6 conduit duct bank leading out to a manhole or pull box is expected and will be clearly labelled at both ends. See TR layout Figure 1 (Appendix E).

3.2.8 Roof Conduit

3.2.8.1 Where possible, conduits should penetrate the roof above the Telecommunication Room doorway where electronic equipment would not be expected to reside.

3.2.8.2 A minimum of two 2" 50 mm conduits will be installed between a top floor Telecommunication Room and the roof. One will be designated for the exclusive use of UVic Network Services, and the second for External Service Providers. The conduits will be fitted with a weather resistant entrance cap for service drop conductors. See TR layout Figure 1 and Figure 5 (Appendix F).

4 Contractor Requirements

4.1 General

4.1.1 Standards and Certification Requirements

4.1.1.1 Installers will be AMP, minimum ACT-1 trained and certified.

4.1.1.2 Installations are to be performed according standards and guidelines defined under:

- Province of British Columbia Building Code,
- ANSI data and telecommunication standards,
- CSA telecommunication cable and wiring standards,
- EIA standards for data, telecommunications and audio video,
- IEEE 802 standards,
- ISDN standards,
- ISO standards,
- UVic fire, safety, and security standards,
- UL LAN cable certification program.
- Non-compliant work will be removed and replaced at the Contractor's expense.

4.2 Commissioning

4.2.1 Installation Requirements

4.2.1.1 The Contractor shall employ competent cable installers who are trained and certified by AMP.

4.2.1.2 The Consultant prior to the commencement of functional and electrical performance testing shall inspect all systems visually. The installation and interface equipment will be inspected for compliance with the Industry Standards with particular attention given to the following criteria:

- Neatness, clamping, and harnessing or cabling and wiring,
- Wire and cable identification and labelling,
- Cable and connections, ground clamps, and terminal strips,
- Completeness,
- Nameplates, identification plates, and markings,
- Safety,
- Grounding,
- Continuity and polarity.

4.2.1.3 The project's designated UVic Network Service Technician prior to the commencement of functional and electrical performance testing shall inspect all systems visually. The installation and interface equipment will be inspected for compliance with the Industry

Standards with particular attention given to the criteria noted above.

4.2.2 Testing

4.2.2.1 All testing shall be performed end to end from the patch panel to data jack after final installation is completed. Testing is to meet or exceed the performance requirement of EIA/TIA 568A, TSB67, and SP195.

4.2.2.2 ***Permanent Link tests*** will be performed as per Industry specifications.

4.2.2.3 All horizontal data cables shall be tested individually, and test results will include Closet No., Room / Office No., and Data Label No.

4.2.2.4 Horizontal cables will only be accepted if they 'PASS' the Industry Standard Permanent Link Test parameters defined for the category of cable being tested.

4.2.2.5 The Contractor shall supply the Owner and the Consultant with test results for approval and system acceptance, presented in electronic disk format (CSV format). All test results are to be supplied in an electronically searchable format, via email to the Facilities Management Project Officer and UVic Network Services 'netadmin@uvic.ca' as soon as the testing is complete.

4.2.2.6 Test results must include the Telecommunication Room number from which cables terminate and indicate the following information:

- Telecommunication Room
- Room number of outlet box location
- Communication jack number

Example: A cable runs from Clearihue Telecommunication Room c008a to office C071, Data Jack D04, therefore it would have a test label ID of 'c008aRMc071D04'.

4.3 Labelling Requirements

4.3.1 Label Type

4.3.1.1 Labelling on patch panels and on wall plates is to be done with a Brother P-Touch or similar labeller using tape that produces black lettering on white tape.

4.3.2 Patch Panel

4.3.2.1 Patch panels should be labelled consecutively with "0+", "100+" etc. with all labels affixed directly to the patch panel. See TR layouts Figure 3 (Appendix E) and Figure 4 (Appendix F).

4.3.2.2 The callout area for each jack of the "Data-In" patch panels should be labelled with the room number of the location where the corresponding circuit will be found. Labels like "231", "253a" etc are all that should appear on these labels, there is no need to repeat the data jack numbers as the information should be readily apparent from the manufacturer's silk-screening (1 to 96) in conjunction with the "100+" panel label assignment.

4.3.3 Wall Plate

4.3.3.1 The patch panel designations are key to the following wall port labelling scheme:

- Communication jacks at the remote wall plate derive their numbering based on the position to which they are wired on the corresponding patch panel.
- Data circuits wired to the first "Data-In" panel (0+) will receive labels "D1" to "D96", circuits wired to the 2nd "Data-In" panel (100+) will receive labels "D101" to "D196" (by adding 100 to the patch panel location where the circuit is terminated) etc.
- The data ("D107" etc.) labels are the only labels that need to go on the remote wall plates.

4.3.4 Raceway

4.3.4.1 All empty raceway shall be clearly and permanently marked at both ends to indicate destination and function. The markings shall be clearly visible after construction is completed.

4.3.5 Fibre-Optic Riser Cable

4.3.5.1 Fibre-Optic riser cable labelling is the responsibility of UVic Network Services.

4.3.6 25-Pair Copper Riser Cable

Cable	Pair Per Jack	Jack Numbers	25th Pair	Comment
1	1	1 to 24	Spare	Fold back spare pair
2	1	25 to 48	Spare	Fold back spare pair
3	1	49 to 72	Spare	Fold back spare pair
4	1	73 to 96	Spare	Fold back spare pair

Each panel position should be labelled as follows:

Secondary Tele Com Rm Number - 333
Entrance Tele Com Rm Number - 029
Cable Number - 3
Label: “333-029-49, “333-029-50”, etc. to “333-029-72”

4.3.7 Fibre-Optic Backbone Cable

4.3.7.1 The installing contractor must label the cable clearly and permanently at both ends.

4.3.8 Multi-pair Copper Backbone Cable

4.3.8.1 The installing contractor must label the cable clearly and permanently at both ends.

Contact UVic Network Services if labeling instructions are unfamiliar or unclear.

5 *Appendix*

5.1 Appendix A Components to be supplied by the Contractor

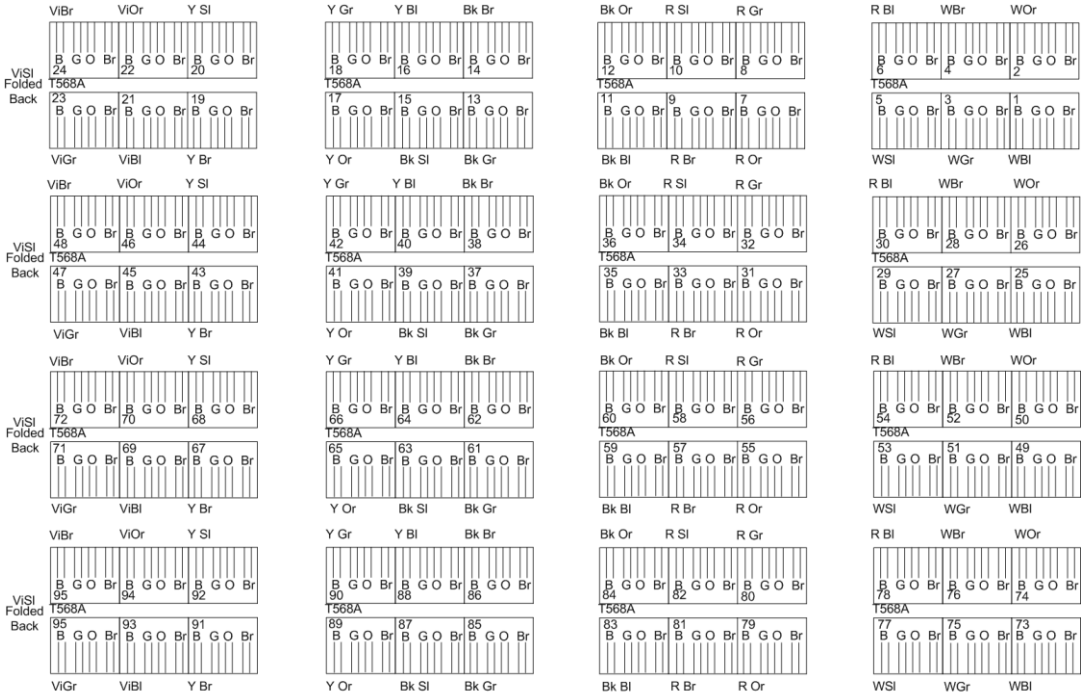
Confirm with UVic Network Services (netadmin@uvic.ca) PRIOR to ordering components

Component	Part Number	Description	Comments
Racks and Patch Panels:			
7' Unequal Flange Rack (Fibre Frame)	PWUEF-7X19ERN	ADC 7' Unequal Flange Rack (Fibre Frame)	One for each end of the backbone fibre
Lower Cable Trough	FL2-ACC012	ADC - LOWER CABLE TROUGH	
Inter bay Management Panel	E-501-L139	ADC PANEL, 7' X 5" INTERBAY MANAGEMENT PANEL W/ TROUGH FILLER KIT	One for each end of the backbone fibre
Relay Rack	EM-19-77/700RR1	Electron Metal - Welded Rack; Width - Usable - 19.00 in; Capacity - Rack Units - 44U; Height - Imperial - 82.62 in; Height - Metric - 209.8 cm; Frame Material - Steel, 12 gauge; Rack Mounting Holes - Front; Base Type - Bolt Down; Base WxD - Imperial - 20.50 x 15.00 in; Base WxD - Metric - 520.7 x 381.0 mm; Cable Management - Vertical - None; Cable Management - Horizontal - None; Color - Black; Manufacturer Series - 700	For entrance facility and each secondary telecom room
Tele-Out Panels:			
48 Port Patch Panel	406331-1	48-PORT PANEL 110-MOD 8W8P FLAT T568A CAT5E 5500 SERIES BLACK 2U	Cat5e risers from entrance facility to secondary telecom rooms
Data-In and Data-Out Panels:			
96 Port Patch Panel	1375016-2	96-PORT PANEL 110-MOD 8W8P 4U T568A/B CAT6 SL SERIES	Data-in panels
Patch Panel Adjustable Wall Bracket – 4U	EM-19-4U/ADWB H2-BK		Adjustable wall brackets for data-in patch panels
Patch Panel Cable Management	556561-1	CABLE MANAGEMENT	

		RING 7.0" HIGH	
Patch Panel Cable Support Bars	557548-1	CABLE MGMT SUPPORT BRACKET	One per panel
Horizontal:			
Patch Cables – White – 1.8m (6ft)	1933121-6	Category 6 Patch Cables, slim line – White – 1.8m (6ft) T568a	
Cable IP connections, CMP, 23AWG, White	219567-x	4-Pair Maximum: Cable Type - UTP Horizontal; Category - 6; Jacket Rating - CMP; Conductor Count - 4 Pair; Conductor Size - AWG - 23; Conductor Stranding - Solid; Color - White; Length - Metric - 305m; Length - Imperial - 1000 ft, Plenum rated	X denotes colour and packaging (1 – white/wooden reel, 2-white/reel-in-a-box)
Cable IP connections, CMR, 23AWG, White	219560-x	4-Pair Maximum: Cable Type - UTP Horizontal; Category - 6; Jacket Rating - CMP; Conductor Count - 4 Pair; Conductor Size - AWG - 23; Conductor Stranding - Solid; Color - White; Length - Metric - 305m; Length - Imperial - 1000 ft, Riser rated	
Standard Outlet Box Faceplate Stainless steel 4 modular jacks	2FM-(4)0E-AMP 2 gng- (4) AMP110	Semtron - Stainless Steel Faceplate, 4-Port	
Non-Standard Outlet Box Faceplate Stainless steel 1 modular jack for Wall Phone	1-OE-A5-/PHONE-DPIP	Semtron - Stainless Steel Faceplates, Single Gang for Wall Phone, 1-Port	Stud spacing to match Cisco VoIP phone CP-7906G
Non-Standard Outlet Box Faceplate Stainless steel 2 modular jacks	1FM-(2)00E-AMP 1 gng- (2) AMP110	Semtron - Stainless Steel Faceplates from Semtron, Single Gang, 2-Port	
Modular Jacks IP connection	1375055-2	Module Type - Modular UTP Jack; Connection - IDC - Press-Fit; Mounting - Faceplate, Adapter; Configuration - 8-Wire RJ45; Wiring Code - T568A/B; Category - 6; Color – Black	
Pull Box Galvanized Steel			
Junction Box			

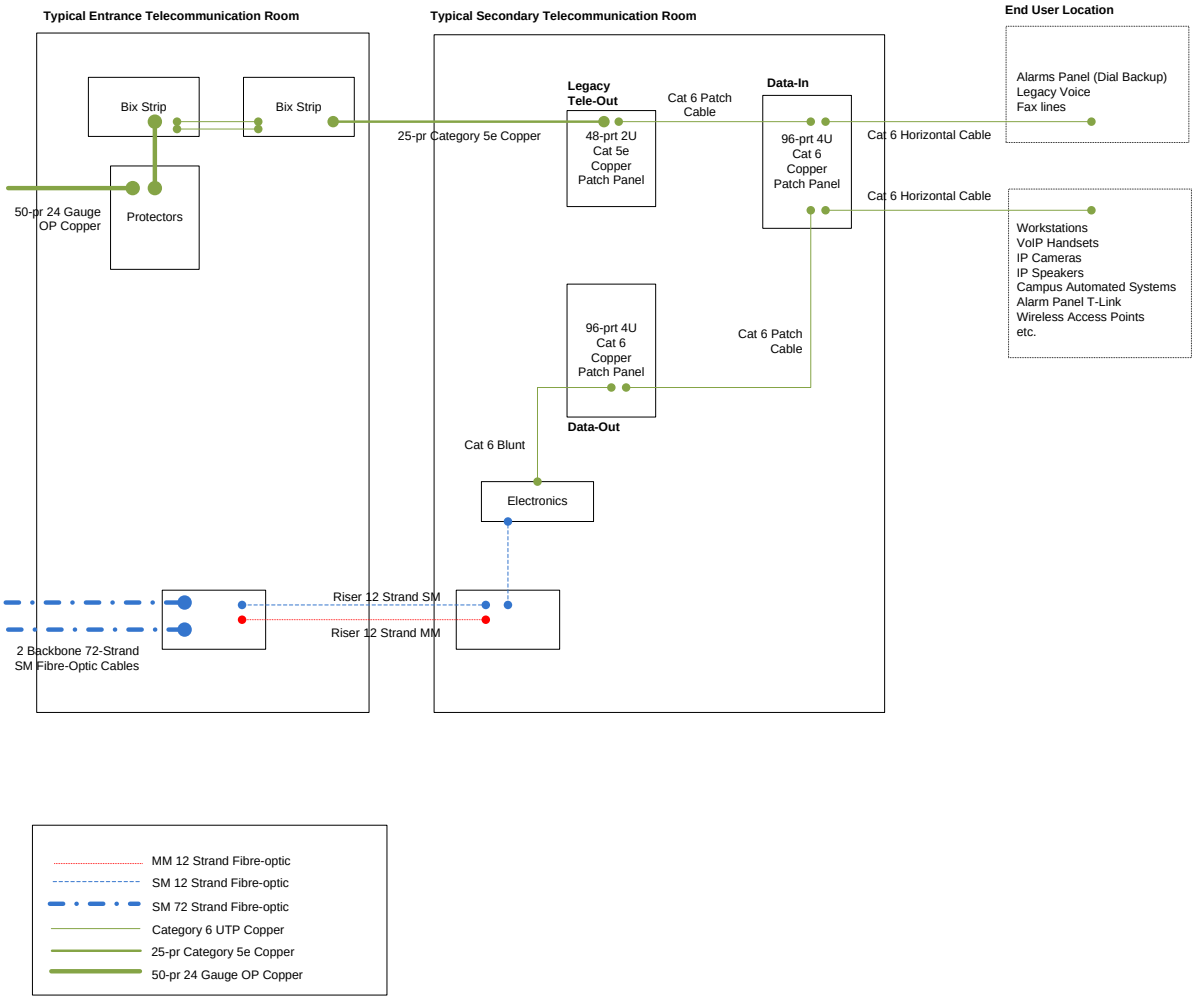
Galvanized Steel			
Cat 6 Dust Cover – Black	1375187-2	Cat6 RJ-45Jacks: Cat. 6 with dust cover; Wiring pattern: T568A/T568B; Color: black	
Cable Tray and components			
Riser:			
12-fibre, premises distribution, riser rated, singlemode fibre-optic cable	Berk-Tek PN PDR012AB0707	12-fibre, premises distribution, riser rated, singlemode fibre-optic cable	
12-fibre, premises distribution, riser rated, OM4 50/125 um, support for 550m, multimode fibre-optic cable	Berk-Tek PN PDR012FB3010/F5	12-fibre, premises distribution, riser rated, lazer optimized OM4 50/125 um, supports 10Gb at 550m, multimode fibre-optic cable	
25-pair Cat5e Riser , 24 AWG, Grey	AMP PN 1499418-2 or Berk-Tek PN 10061456	24 AWG, UTP, NEC/NFPA CMR rated cable with grey lead-free jacket	
Backbone:			
72-fibre, loose tube, riser rated, singlemode fibre-optic cable	Berk-Tek PN LTR12B072AB0403	72-fibre, loose tube, riser rated, singlemode fibre-optic cable	
50-pair 24 gauge Copper Cable	50-pair 24 gauge Copper Backbone Outside Plant Cable	50-pair 24 gauge Copper Cable	

5.2 Appendix B Telephone Riser Wiring



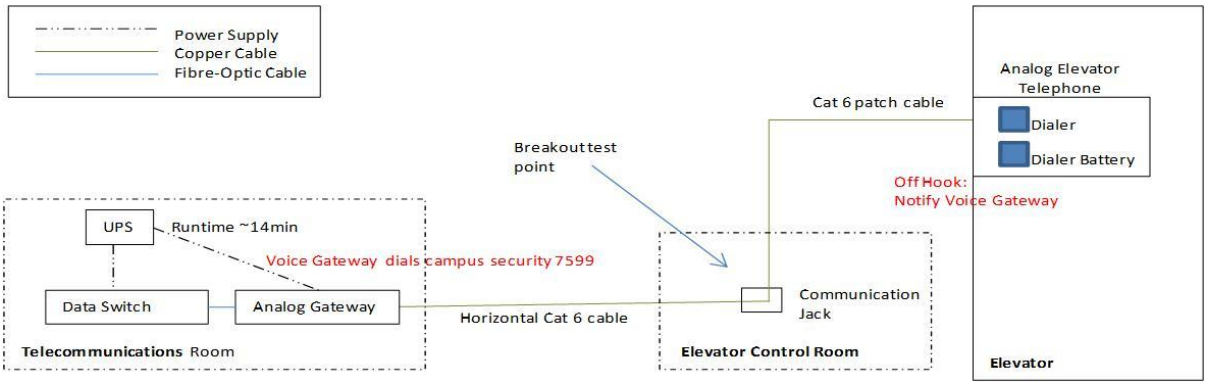
Back of AMP Panel

5.3 Appendix C Typical Cabling Diagram



Revised January 20, 2012

5.4 Appendix D Standard Elevator Telephone Connection Diagram



5.5 Appendix E Entrance Telecommunication Room Layouts

5.5.1 Typical Entrance Telecommunication Room – Floor Layout

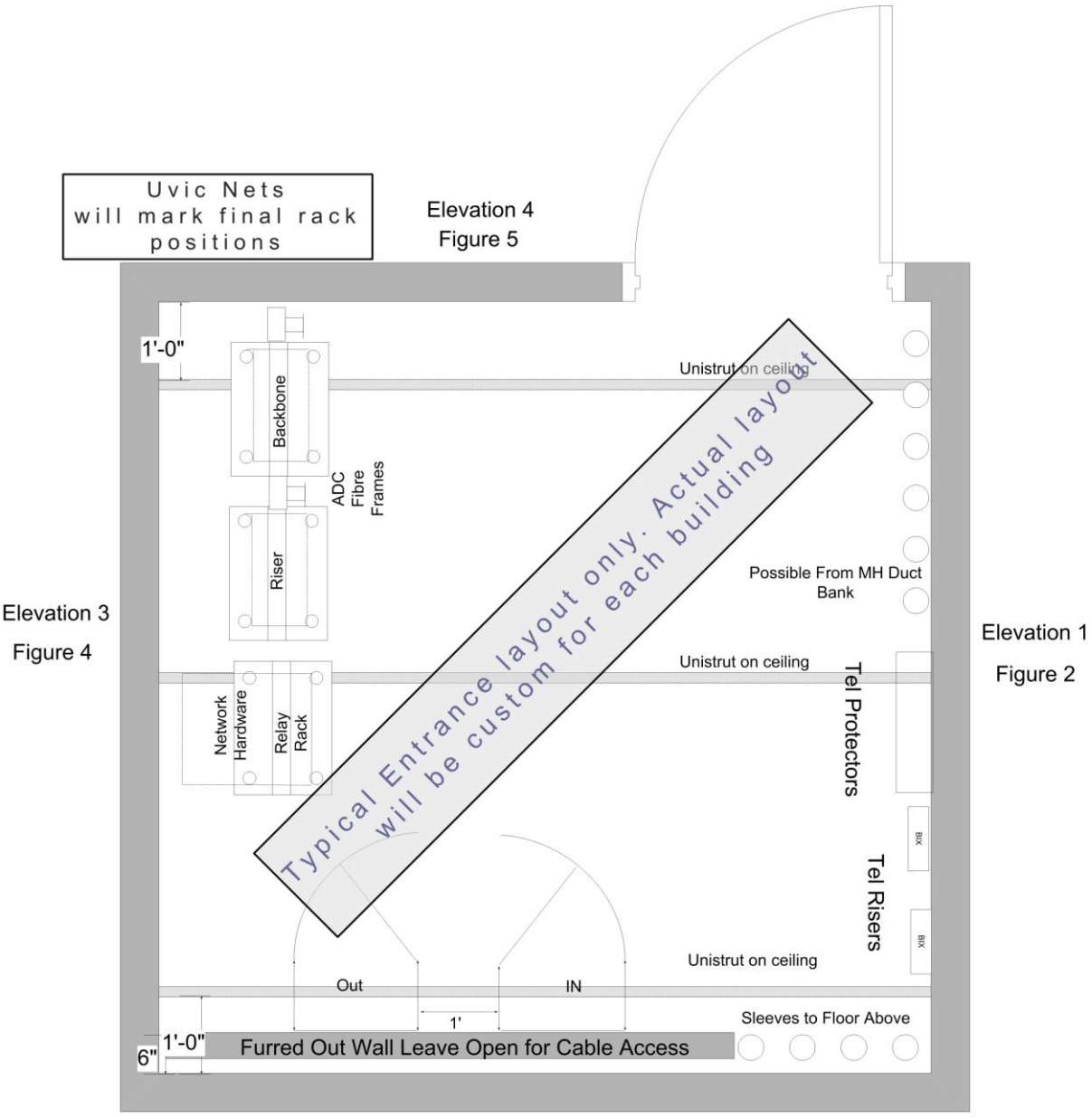

Uvic Nets will mark final rack positions
Elevation 4
Figure 5
1'-0"
Backbone
ADC Fibre Frames
Riser
Unistrut on ceiling
Possible From MH Duct Bank
Elevation 3
Figure 4
Elevation 1
Figure 2
Unistrut on ceiling
Network Hardware
Relay Rack
Tel Protectors
Typical Entrance layout only. Actual layout will be custom for each building
BIX
Tel Risers
BIX
Unistrut on ceiling
Out
IN
1'
Sleeves to Floor Above
6"
1'-0"
Furred Out Wall Leave Open for Cable Access
Elevation 2
Figure 3

Figure 1

5.5.2 Typical Entrance Telecommunication Room Elevation 1 Layout

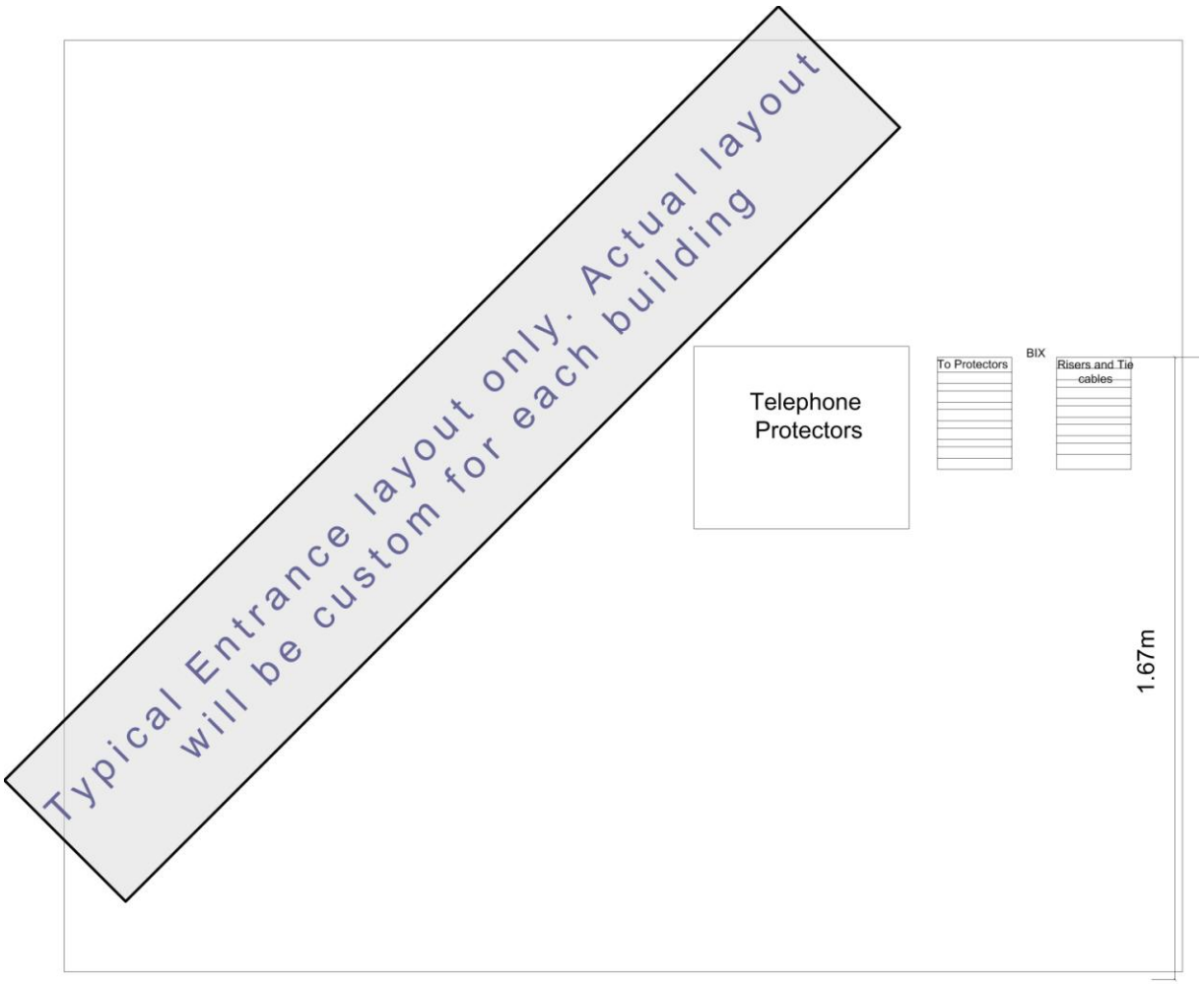


Figure 2

5.5.3 Typical Entrance Telecommunication Room Elevation 2 Layout

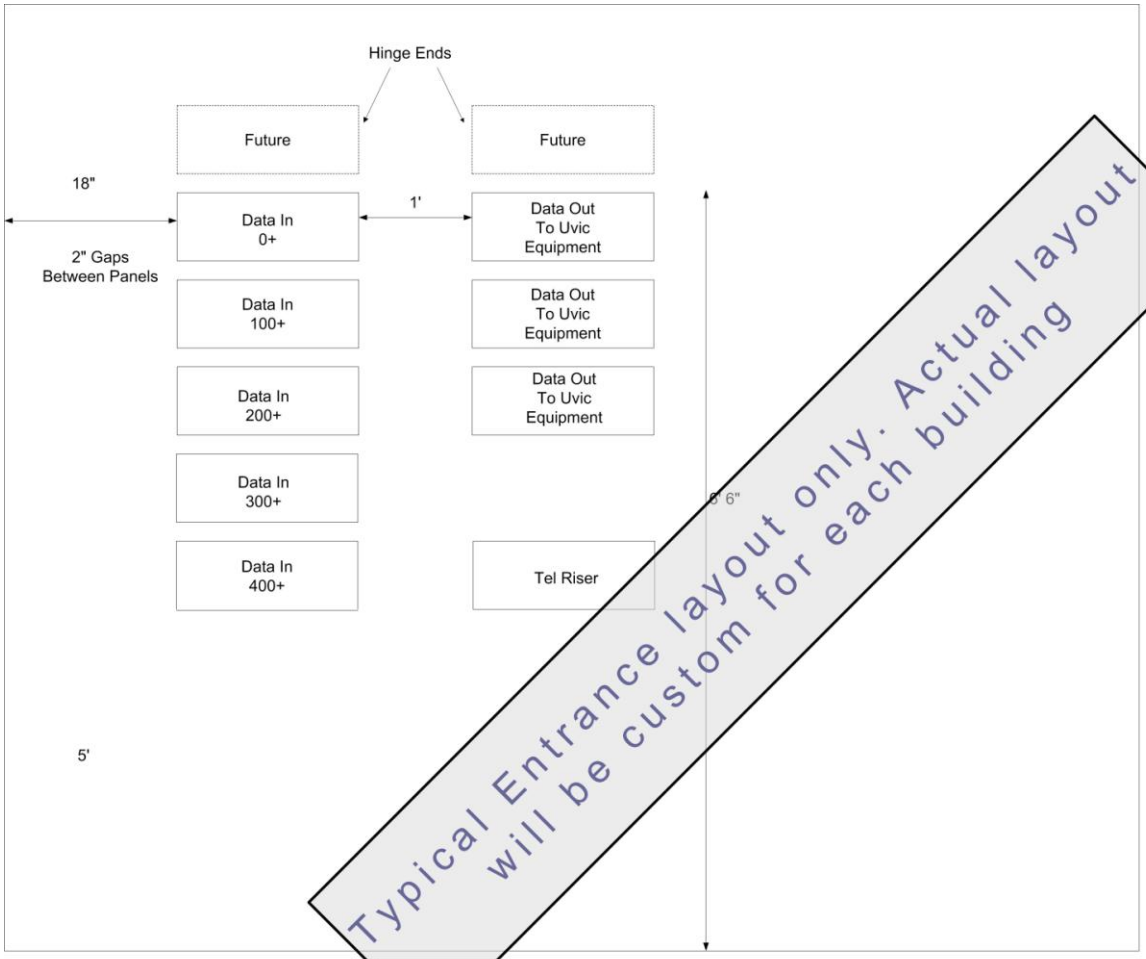


Figure 3

5.5.4 Typical Entrance Telecommunication Room Elevation 3 Layout

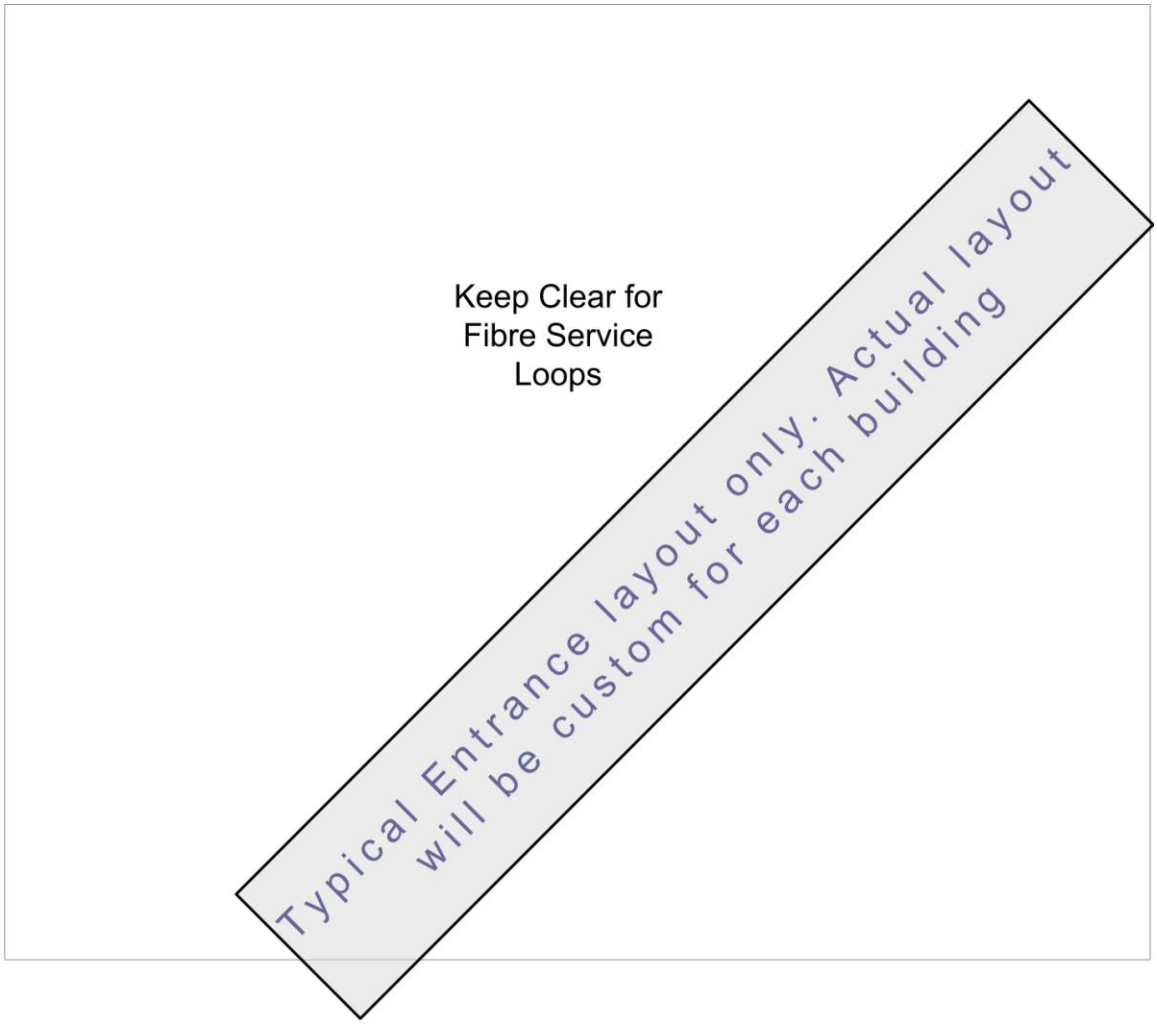


Figure 4

5.5.5 Typical Entrance Telecommunication Room Elevation 4 Layout

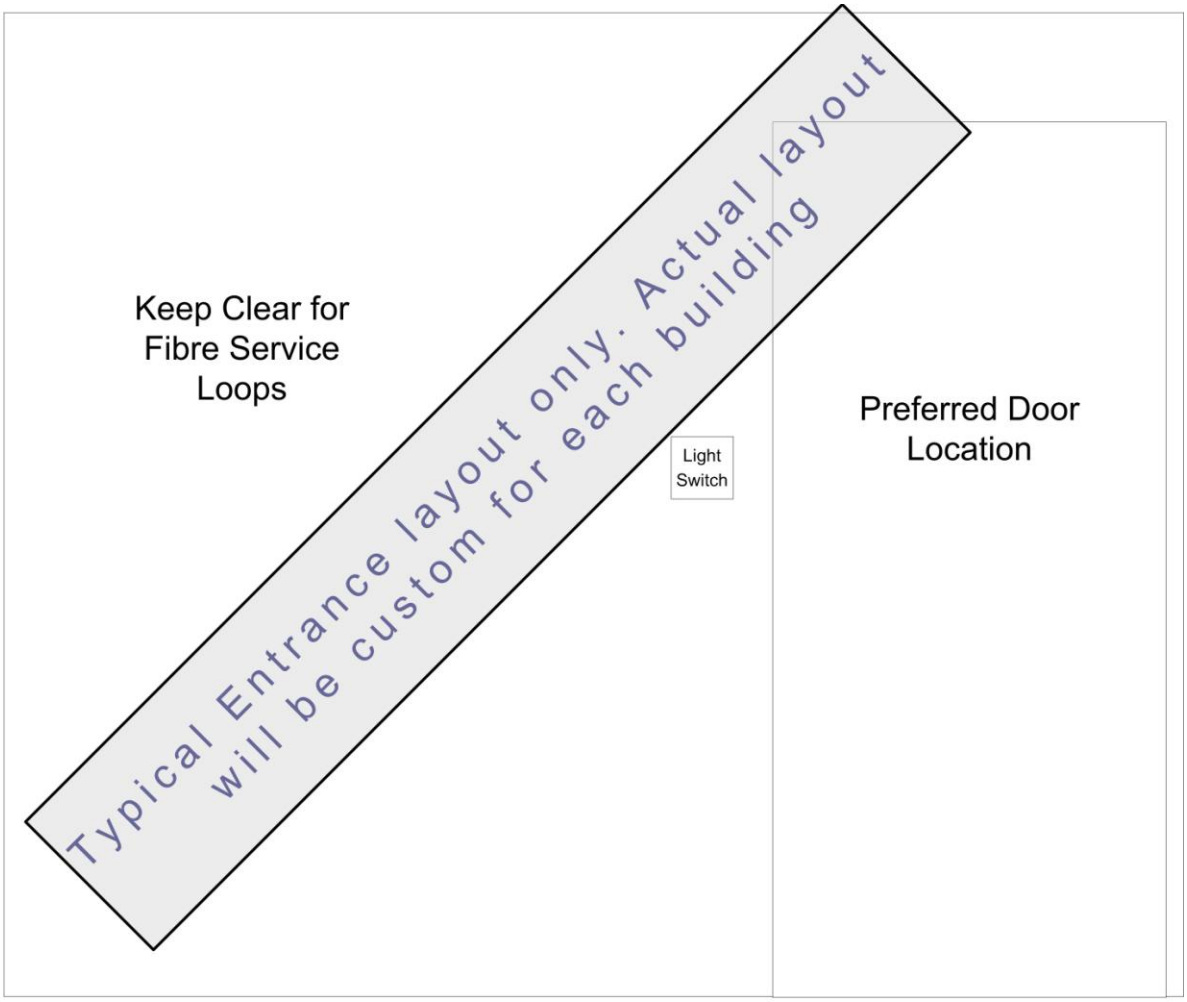
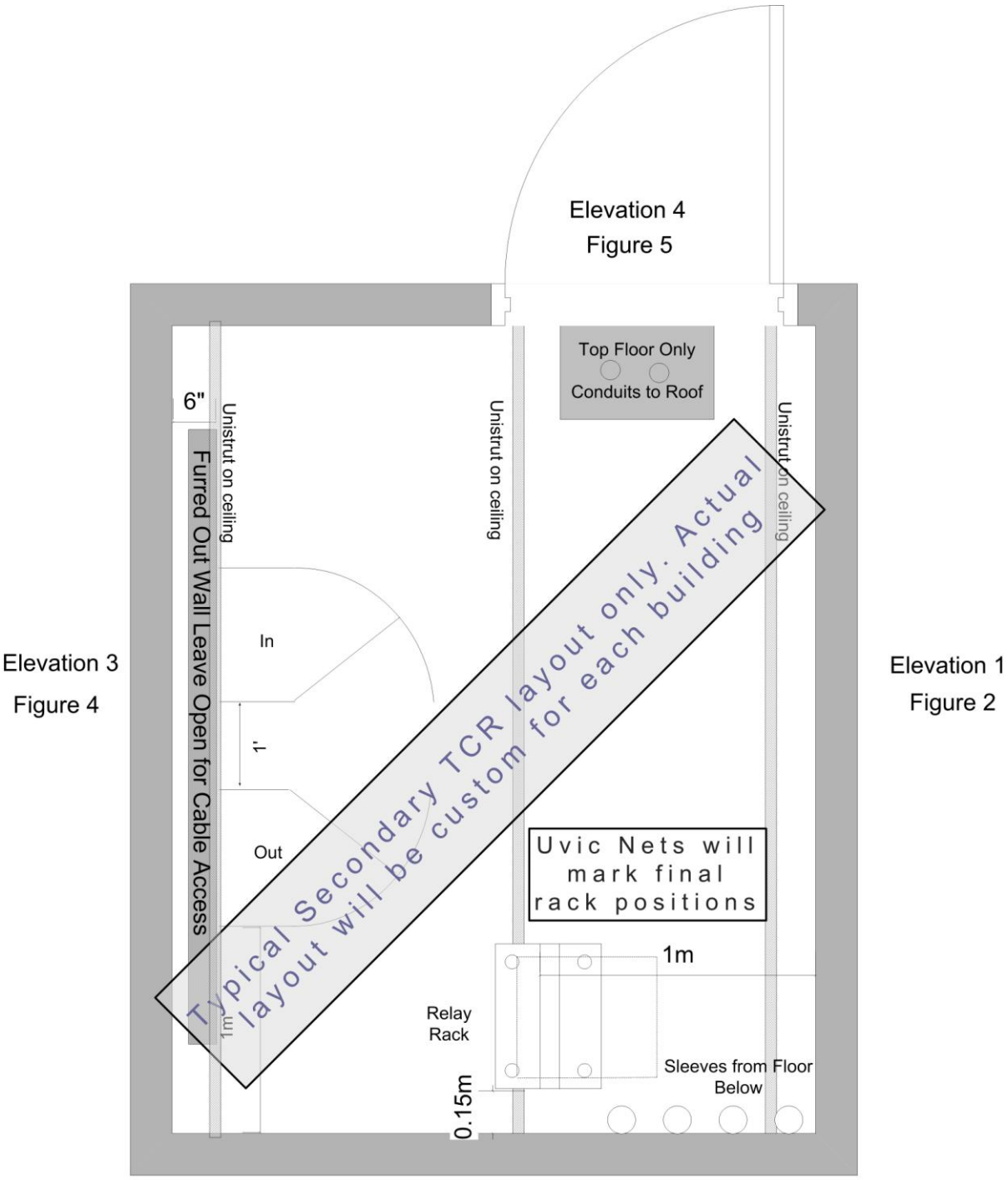


Figure 5

5.6 Appendix F Secondary Telecommunication Room Layouts
5.6.1 Typical Secondary Telecommunication Room – Floor Layout



5.6.2 Typical Secondary Telecommunication Room Elevation 1 Layout

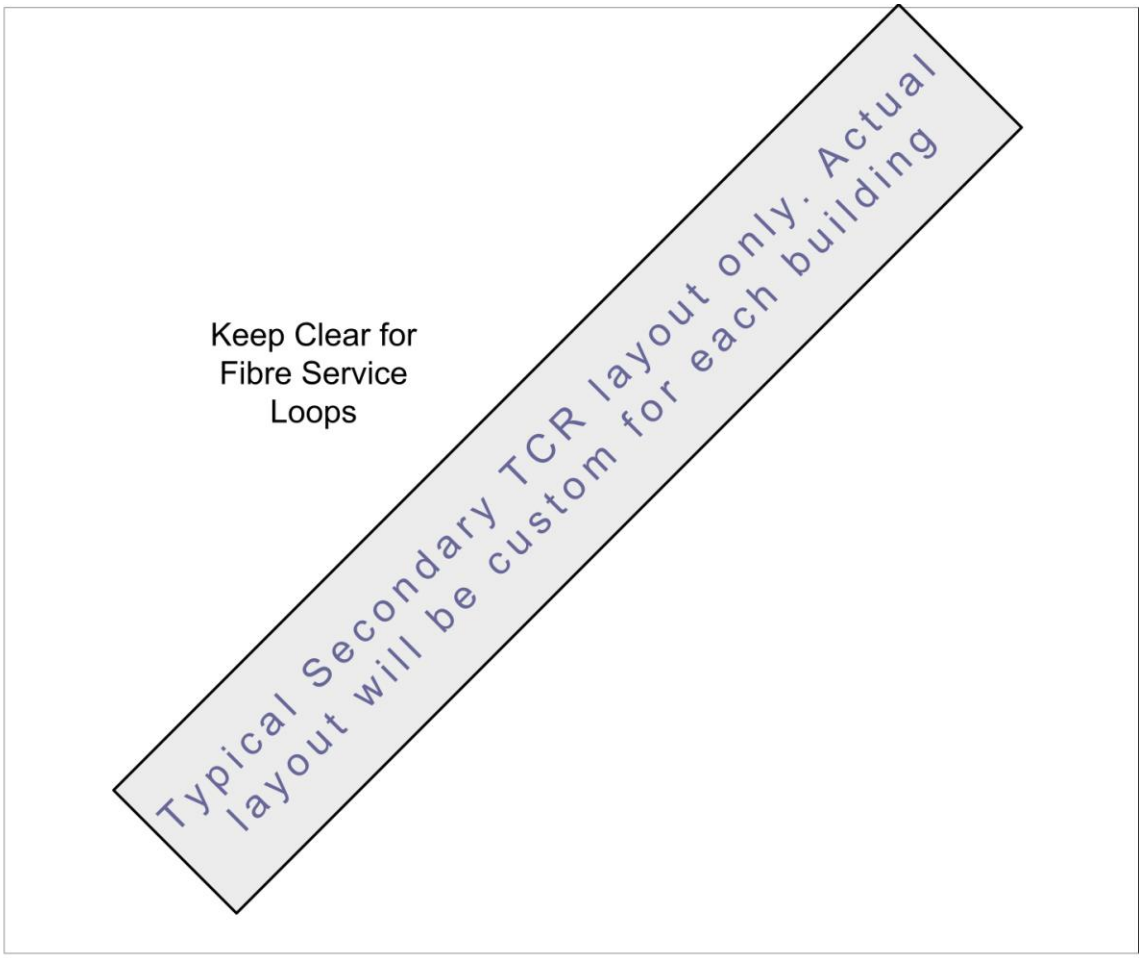


Figure 2

5.6.3 Typical Secondary Telecommunication Room Elevation 2 Layout

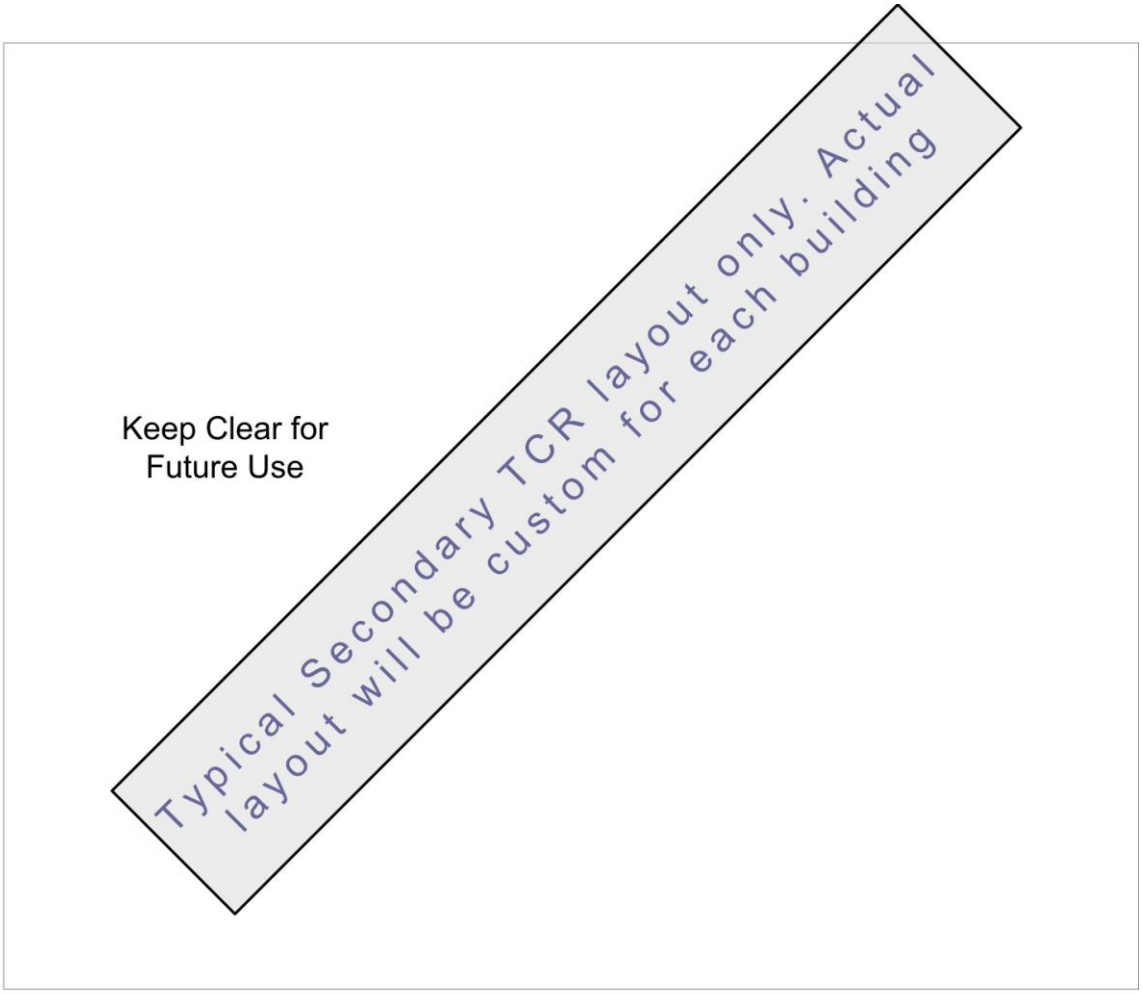


Figure 3

5.6.4 Typical Secondary Telecommunication Room Elevation 3 Layout

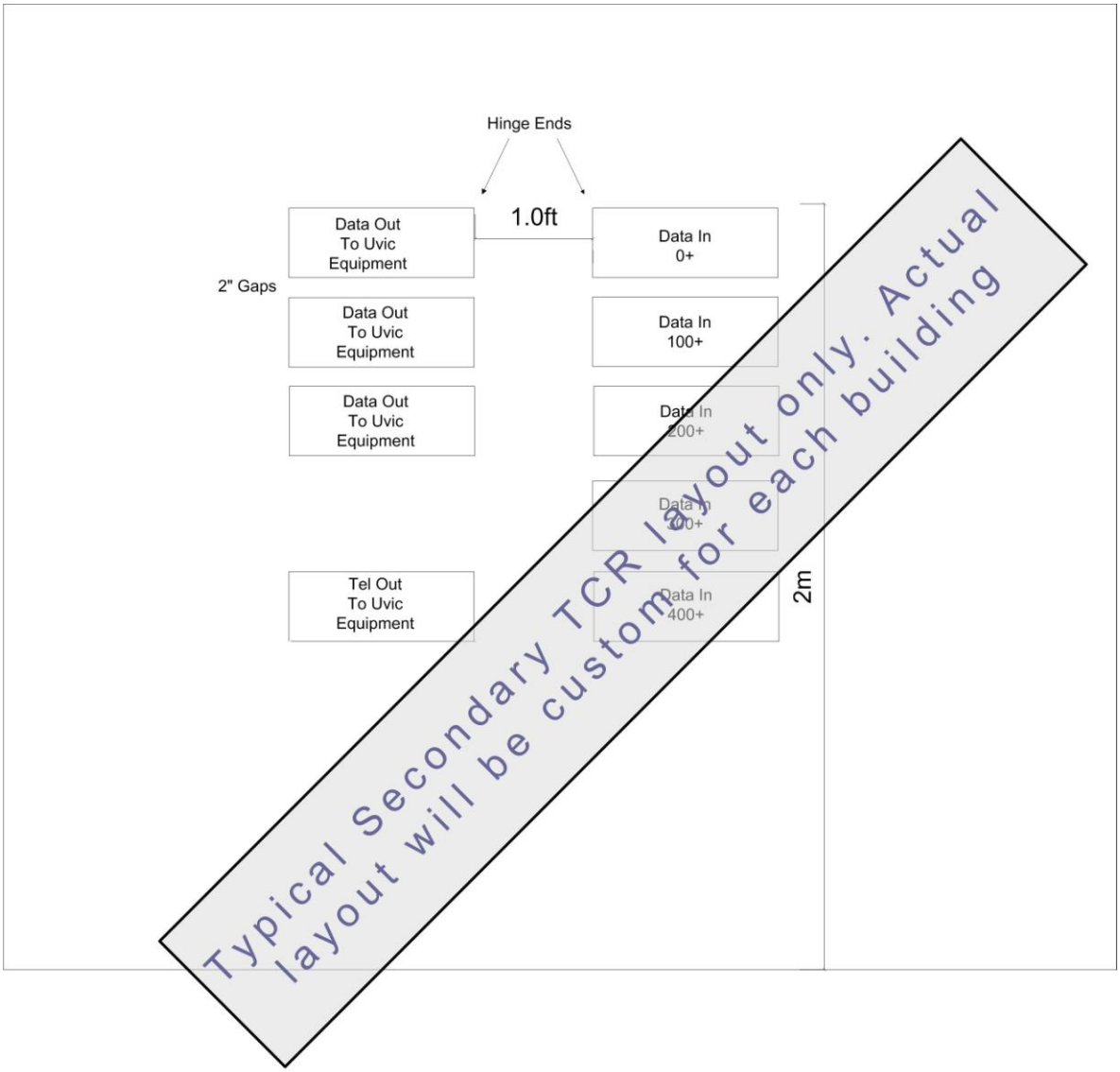


Figure 4

5.6.5 Typical Secondary Telecommunication Room Elevation 4 Layout

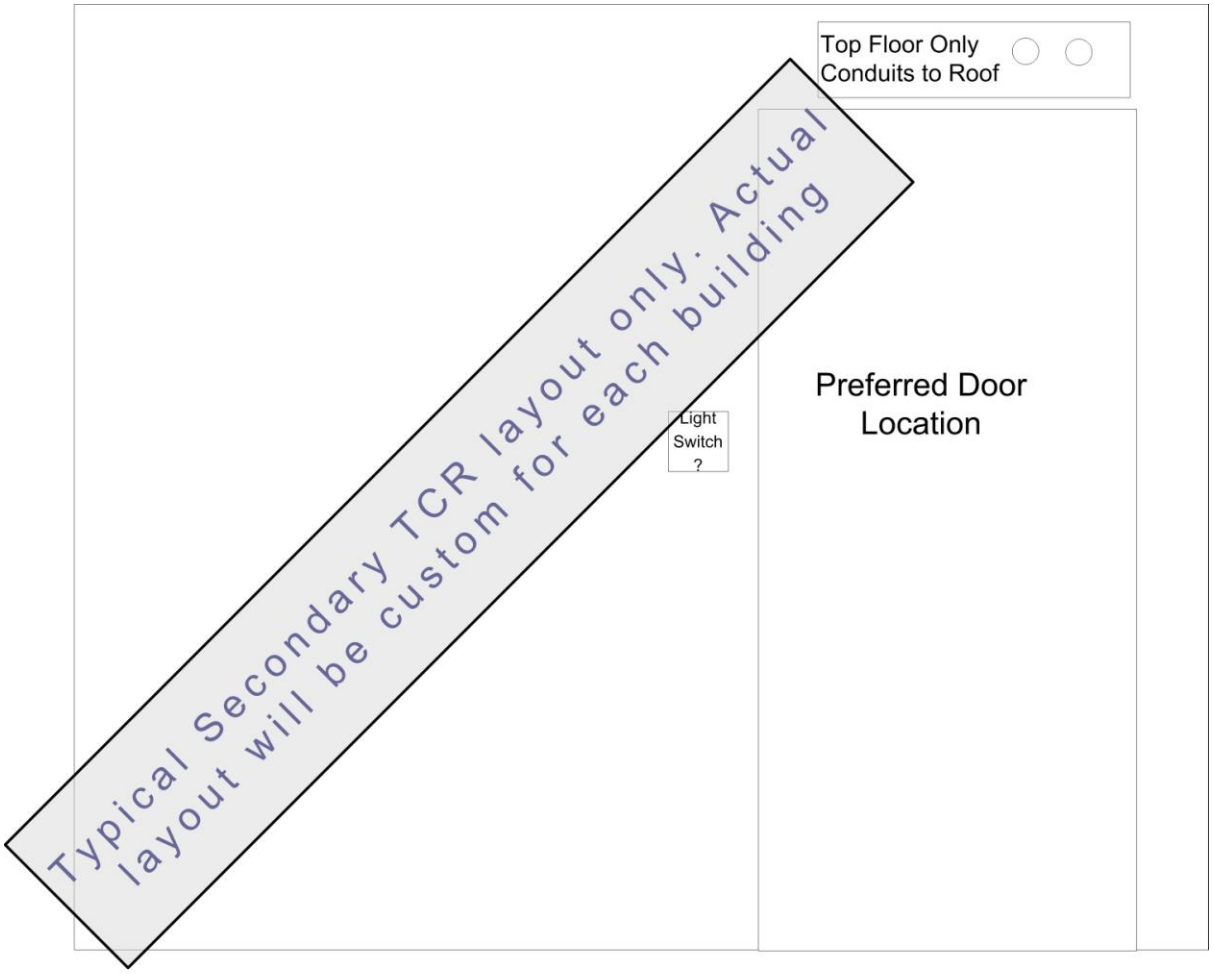


Figure 5

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5.7 Appendix G Contractor Information Sheet

January 2012 Rev 06.10.04

Contractor Information Sheet for Installing Data/Tel Lines

Patch Panel

- Incoming cable is to be dressed to the 96 port patch panel on the opposite side of the hinge or through the cut out in the furred out wall.
- When a new patch panel is added it will be labelled 100+, 200+ etc. depending on how many have previously been installed. For example if there is only one previously installed panel (0+) then next one will be labelled 100+ or if there are two panels previously installed the next one will be labelled 200+ and so on.
- When connecting multiple horizontals, where possible connections shall be grouped sequentially by room number and then by data jacks within the rooms keeping in mind that the panel number plus the silk screened numbers provided by the panel manufacturer will be the number that will appear on the wall plate (see **Wall Jack**).
  Example: Room 101 = D31, D32, D33
  Room 102 = D34, D35, D36 etc.
- Punch down must be to EIA/TIA 568A standard.
- A black on white label indicating room number only is to be affixed directly to the patch panel above the jack using a P-touch or similar labeller.

Wall Jack

- Communication jacks are generic and support data, voice, wireless, etc. services. They are generically referred to as 'data' or 'communication' jacks.
- The patch panel labels of 0+, 100+, 200+ etc. indicates what the jack numbers will be at the remote wall port. Data circuits wired to the first "Data-In" panel (0+) will receive labels "D1" through "D96" ("D48" on 48 port panels), on the second panel "D101" through "D196", on the third "D201" through "D296", and so forth.
- Cable runs will have a 400 mm length of service loop left near the communication outlet for future repairs. Communications outlet faceplate shall be flush mounted with the finished wall, at the same height as power receptacles.
- A black on white label indicating the number of the patch panel jack connected at the other end prefixed with a "D" shall be affixed on the wall plate. For example: D101, D302, etc.

25-pair Riser

- Telephone riser cable installed between the entrance facility and secondary telecommunications rooms should be terminated on a 48-port patch panel in the secondary telecommunication room and bix in the entrance facility.

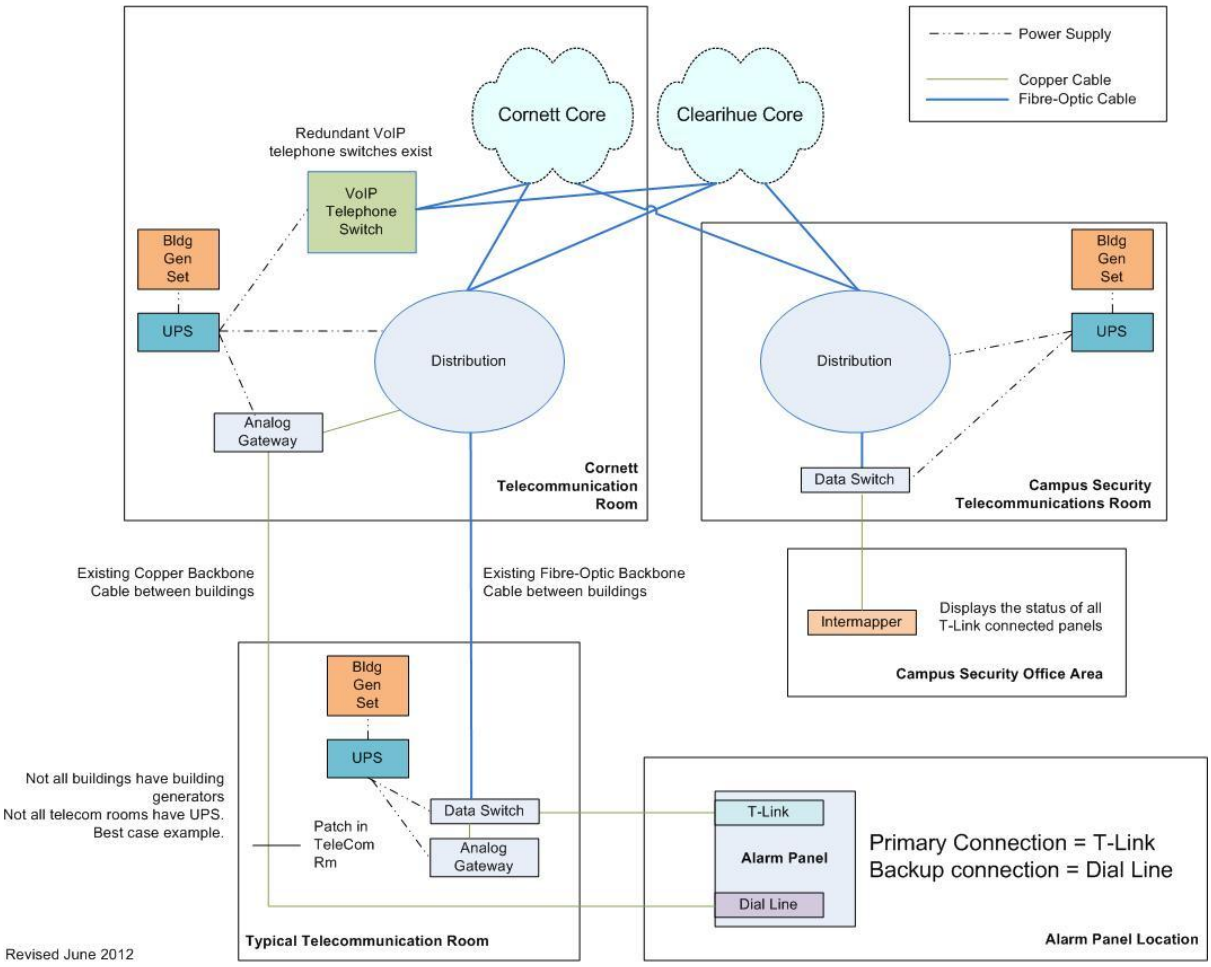
Testing

- All testing shall be performed end to end from the patch panel to communication jack after final installation is completed.
- A 'Permanent Link' test will be performed and is expected to meet or exceed the performance requirement of EIA/TIA 568A, CAT5e/CAT6 as appropriate.
- Tests results must include the Telecommunication Room number from which cables terminate and indicate the following information:
  - Telecommunication Room
  - Room number of outlet box location
  - Communication (Data) jack number

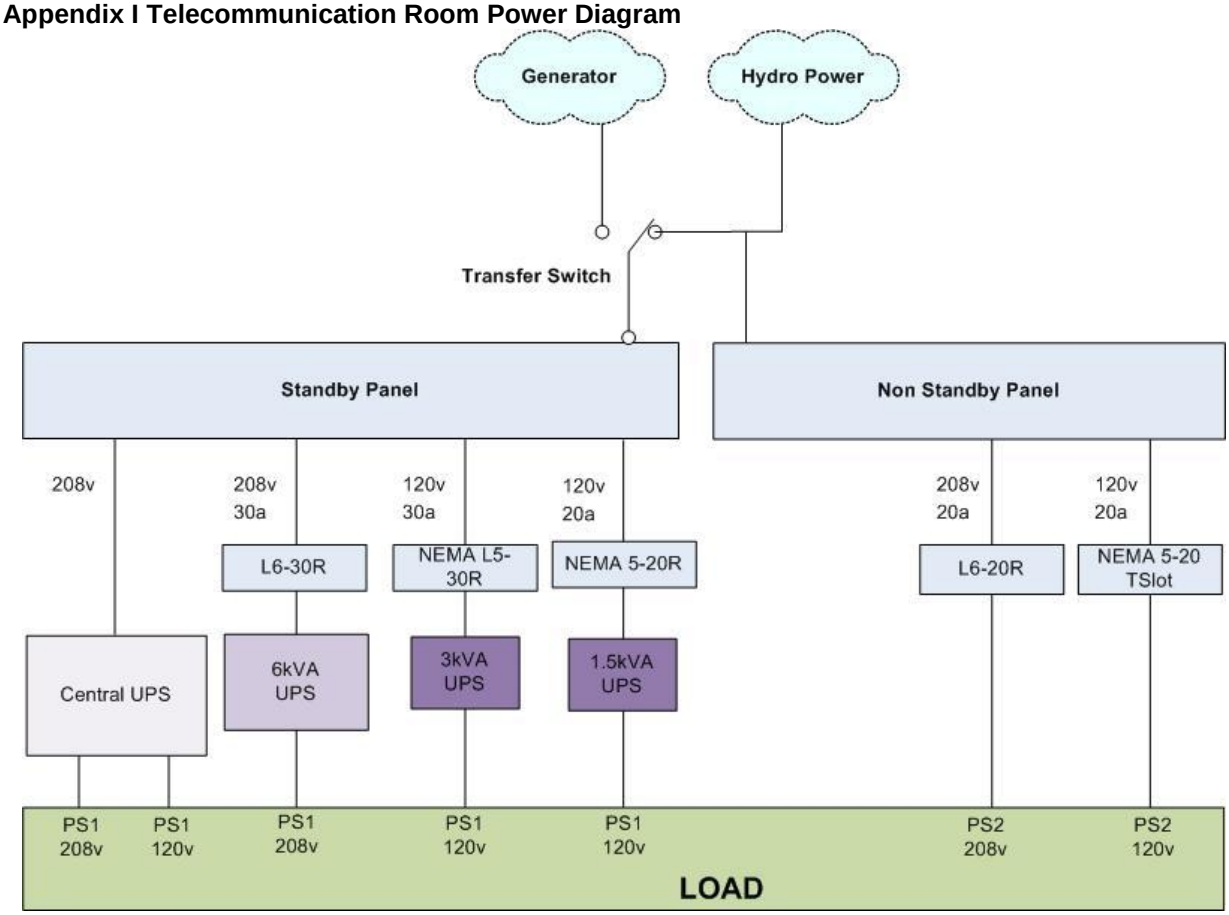
  Example: A cable run from Clearihue Telecommunication Room C008a to office C071, communication jack D4 would have a test label ID of C008aRMC071D4.

For additional information or clarification email the Network Services Technician Supervisor at netadmin@uvic.ca.

5.8 Appendix H Standard Alarm Panel Connection Diagram



5.9 Appendix I Telecommunication Room Power Diagram



5.10 Amendments to the Document

Section Number	Section Description	Change Date