APPENDIX C

I.T. Infrastructure Design Standards and Guidelines

(Excerpted from Interior Design Standards for Service Canada Centres, Appendix 7)

Service Canada

Appendix 7

IT Infrastructure Design Standards and Guidelines

FOR SERVICE CANADA CENTRES (SCCs)

Detailing Responsibilities of the Landlord/General Contractor and GMCS Cable Contractor

Revision 2
May 2012

ANNEX A - TELECOMMUNICATIONS SPECIFICATIONS FOR SCCs

1. GENERAL REQUIREMENTS

1.1. General Note

TIA-568-A (Commercial Building Standard for Telecommunications Pathways and Spaces) states that no telecommunications room should serve more than 1,000 m² of a single floor space.

Telecommunications room fit-up should follow the layout provided as a guide in Annex C where there are Centrex services available. Within a non-Centrex environment, (PBX, Key System, BCM) a second equipment rack may be required to allow for jack/patch panel fields for the PBX locals (as indicated in Annex D).

1.2. Government Managed Cabling Services

Service Canada and Shared Services Canada have subscribed to the Public Works and Government Service Canada (PWGSC) cable installation contract awarded to Bell Canada. As a result, the responsibility for the installation of communications cabling will be managed separately.

Important Note: This document contains specifications that apply to the Landlord and their General Contractor as well as the Cabling Contractor so all parties are aware of details but may not be their responsibility. Refer to project drawings for location and quantity of cables and jacks required.

Responsibility of the GMCS Contractor: Items designated with **(GMCS Contractor)** shall be the responsibility of the GMCS Cable Contractor to provide but are not limited to supply and installation of cable, jacks, faceplates, patch cords, patch panels, equipment rack and accessories.
Responsibility of the Landlord/General Contractor: Items designated with **(Landlord/General Contractor)** shall be the responsibility of the Landlord and General Contractor to provide and will typically be responsible for cable tray, all conduits, power and Technical Room (LAN / TeleCom Room) construction as detailed in this document.

1.3. Security Clearance

It is the responsibility of the landlord and PWGSC Project Manager to ensure all required security clearances for all trades is in place.

1.4. Continuation of Service (refits only)

Installation and removal of products and services are to be completed without disruption of voice and data services at any time during core hours of operation, 05:00 am to 8:00 pm, Monday through Friday, unless approved by the Project Authority.

1.5. Cut-Over times

Mutually agreeable cut-over times are to be arranged between Bidder, General Contractor and PWGSC on behalf of the Regional Accommodations Manager (RAM) and the Client including the SC (Service Canada) business lines and National Voice and Data Services.

1.6. Requirements for "Move Weekends"

Work outside core hours will likely be required during move weekends.

1.7. Vendor Certification and Qualification *(GMCS Contractor)*

1.7.1. The cabling Contractor must be a certified system vendor of the manufacturer's components and cable being bid.

1.7.2. Proof that each member of the installation team has successfully completed the connectivity product manufacturer's installation courses or equivalent industry-sponsored certificate courses.

1.7.3. Contractor must use only technicians fully trained and qualified on installation and testing of the components to be installed.

1.7.4. Proof of fire stop installation certification.

1.7.5. Contractors will be licensed or permitted to work in the province in which the work is being performed.

1.7.6. The Contractor shall provide certified documentation of the qualifications described above to PWGSC.

1.7.7. Failure to meet or provide such documentation will be the basis for disqualification of the cabling Contractor by PWGSC.

1.8. Telecommunication Backboards *(Landlord/General Contractor)*

1.8.1. All linear wall space used for anchoring equipment shall be lined on two adjacent walls; full Telecommunications Room width; with fire-rated 4 x 8 x ¾" BCX plywood; smooth finish on one side (G1S). One of these walls should be directly behind the LAN rack. In some locations, there may be a requirement to cover three adjacent walls, which will be decided upon by the Telecom authority.

1.8.2. Smooth side shall be facing out and painted with light coloured acrylic, interior, fire-retardant paint.

1.8.3. All plywood used for supporting riser backbone cables shall be installed vertically, resting directly on the finished floor and anchored sufficiently to support a minimum of 1500 pounds of weight.

1.8.4. Screws used to mount and secure backboards shall not protrude past the face of the plywood.

1.9. Grounding and Bonding for Rack *(Landlord/General Contractor)*

1.9.1. The Telecommunication Room is to be equipped with a Telecommunications Grounding Bus-bar (TGB) mounted on the plywood wall in close proximity of the equipment racks - following TIA J-STD-607-A Standard.

1.9.2. The Telecommunication Main Grounding Bus shall be grounded to the building's main electrical service grounding electrode system. Ground loops to be avoided.

1.9.3. Ground cable shall be a minimum of No. 6 AWG insulated green jacket, stranded copper wire installed in each Telecommunications Room that connects to the building ground system.

1.9.4. This TGB shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential for acting as a current carrying conductor.

1.9.5. All connectors and clamps shall be mechanical type made of silicon bronze.

1.10. HVAC Standard Requirements *(Landlord/General Contractor)*

1.10.1. The HVAC system must be capable of operating on a "24/7" basis.

1.10.2. Ventilation of the room must follow the standards outlined in Annex B attached.

1.10.3. The HVAC compressor must be located outside the Telecommunications/ Technical Room and evaporator wall mounted as high as possible to maximize usable space.

2. WORK REQUIREMENTS

2.1. Structured Wiring Cabling System *(GMCS Contractor)*

For existing office locations where Category 5e cabling exists, no upgrade is required. In offices where cabling must be upgraded, or installed, Category 6 should be used.

All cables will be certified/approved by CSA standard PCC FT4 or FT6 flammability test and UL CMR as required by local building codes.

Supply and install a certified structured wiring cabling system following the TIA-568-A standards including a minimum Category 5e or Category 6 cabling standard:

2.1.1. Provide and install the correct number of drops required by the design layout using 48-port modular 2U patch panels on a 19" free standing equipment rack in the Technical Room (TR) as specified to accommodate the needs of the office. The standard workstation will have two jacks, however special purpose workstations may require additional capacity.

2.1.2. Populate panels referenced above with specified number of RJ45 jacks to accommodate the port count.

2.1.3. Provide and install a vertical and horizontal cable management system outlined and described in paragraph 3.5.

2.1.4. Supply, install, test and label all cable runs with one end terminating on RJ45 jacks situated at locations identified on the floor plans and the other end being connected to RJ45 patch panels in the TR. These runs will be universal in nature and used for all communication purposes (Voice, Data and Video). The required locations will be identified on the site floor plan as follows:

2.1.4.1. Location and Number of jacks terminating in various work areas as outlined on the site floor plans.

2.1.4.2. Location and Number of jacked coiled spares to be left in each zoned ceiling area as outlined on the floor plan. Drawing jack symbol to be prefixed with "C" (coiled).

2.1.4.3. Location and Number of jacks for data or telephone lines required in the Technical Room near the Security Alarm System for monitoring services.

2.1.5. Provide a 1-meter cable slack above the patch panels in the Telecommunications Room. Provide minimum 1.5m cable slack in ceiling for all far end cable terminations.

2.1.6. Supply and install the necessary horizontal conduit, cable trays, J-hooks or D-rings as required.

2.1.7. Supply, install and test all communication outlets, including associated cable.

2.1.8. Provide Category 5e or 6, to match cable grade, patch cords necessary to complete the communications network (description and quantities as per section 3.7 and section 3.8). All patch cords for complete project must be available prior to commencing installation.

2.1.9. Co-ordinate with Project Manager to determine the exact location of all jacks.

2.1.10. Provide any other materials and labour required to complete the certified cabling system.

2.1.11. All termination components and connectors used for the horizontal portion of the cabling shall meet Insulation Displacement Connector (IDC) type, certified Category level and be for use with solid core wire.

2.1.12. All spare cables shall be neatly coiled and securely attached to the ceiling slab, or other permanent structure above the t-bar ceiling, to allow easy access for future use. Spare cable must not be coiled tighter than the minimum radius recommended by the manufacturer.

2.1.13. All cable components must be from the certified system manufacturer.

2.2. Voice-specific Requirements *(GMCS Contractor)*

Supply and install a distribution wiring system for the voice services which includes:

2.2.1. If there is currently no demarcation point, arrangements must be made to provision one.

2.2.2. Provide and install category 3 riser cable from the building's main entrance cable to the technical room. Provide a minimum of 3 cable pairs per 7.4 square meters of usable floor space. Installed cable should be in multiples of 50 pairs. The backbone cabling shall be terminated and clearly labeled at both ends.

2.2.3. Provide and install the required number of 48-port RJ45 voice distribution panels to a 19" floor mounted equipment rack.

2.2.4. Wire all ports of the voice patch panels to the demarcation with appropriate Category wire and providing a 1-meter slack of cable above the voice panel.

2.2.5. Install the necessary cable tray to extend the voice services from the demarcation point on the wall (referenced in paragraph 2.2.1) to the RJ45 panel in the equipment racking (referenced in paragraph 2.2.3).

2.2.6. Each port on the Voice Panel must be wired to the corresponding pair on the demarcation point. For example, Port 26 on the Voice Panel must be wired to Pair 26 on the demarcation point. See Wiring Configuration for Horizontal Distribution Patch Panels drawing attached.

2.2.7. Provide the required patch cables as per Section 3.7.

2.2.8. Provide any other materials and labour required to complete the structured wiring system.

2.3. Cable Pathways - Horizontal and/or Vertical Conduit and Cable Tray *(Landlord/General Contractor)*

Specification and coordination with the General Contractor for cable pathways (conduit / cable tray) may be required from the building's main demarcation point to the SCC/HRSDC Telecommunications Room (TR), or wherever cable may be run through public areas. The Landlord / General Contractor shall supply and install two 103 mm (4") or greater continuous run EMT backbone conduits from the building's main cable entrance facility to the TR complete with bushings and

pull cords for copper and fibre optic cable. Copper and fibre-optic cables will not be housed in the same conduit. Specifications relating to horizontal cable pathways in Government of Canada owned building is covered as part of the "base building" while horizontal cable pathways in buildings that are not owned by the Government of Canada is covered under the terms of the specific lease agreement.

2.4. Cable Installation *(GMCS Contractor)*

It is the responsibility of all contractors to be aware of and fully compliant with current standards and regulations.

2.4.1. Install data cables between patch panels and outlets.

2.4.2. Terminate cables at outlets and at patch panel in Technical Room.

2.4.3. Install surface mounted wireway and outlet boxes where required.

2.4.4. All wiring shall be installed in a neat and tidy manner.

2.4.5. All cable should be coiled in the ceiling in large loops and in an irregular manner to reduce interference.

2.4.6. Cable runs shall not be installed near sources of electromagnetic interference (motors, distribution/isolation transformers) and the following clearances shall be adhered to:

2.4.6.1. 1.2 meters (4 feet) from large motors or transformers.

2.4.6.2. 0.3 meters (1 foot) from conduits or cables used for electrical power distribution.

2.4.6.3. 12 centimeters (5 inches) from fluorescent lighting. Pathways should cross at 90 degrees from fluorescent lighting and electrical power cables or conduits.

2.4.7. Cables shall not be run near water pipes.

2.4.8. Cables should be velcro-wrapped as per the following:

2.4.8.1. All cables should be suitably wrapped with Velcro straps at maximum intervals of 1500 mm (5 feet).

2.4.8.2. All Velcro cable ties should be able to slide around the cable bundle.

2.4.9. All cables, not installed to the Project Manager's satisfaction shall be removed and re-installed. No additional costs shall be paid by the Client in this event.

2.4.10. Install cables on a cable tray, in conduit or loop through J-hooks.

2.4.11. Cables should be evenly distributed down both sides on rear of racks and strapped neatly in place.

2.4.12. There should be no breaks in the cable run. That is, each cable is to be installed in one continuous run from the patch panel in the Telecommunications Room to the termination point (RJ45 jack in work area).

2.4.13. There should be cable slack of 1 (one) meter in the Telecommunications Room end immediately above the voice and data panels to allow free movement of panels within racks.

2.4.14. All spare runs should be long enough to reach all areas of the zone in which they are located.

2.4.15. No single cable run shall exceed 90 meters in length, measured from the patch panels in the Technical Room to each RJ45 jack located in the work area. The Contractor must ensure this distance is not exceeded before installing the cabling system.

2.4.16. Cables not installed in cable tray must be run in a uniform pattern, equivalent to a conduit system, and supported by J-hooks or D-rings affixed every 1500 mm (5 feet). No "shortest routes" will be accepted.

2.5. Installation of Fire Stop Materials as Required.

2.6. Provide of a twenty-five (25) year warranty on the entire system (described in section 4.6).

2.7. Provide a complete cabling labeling system (described in section 6).

2.8. Repair and make good any damage, including any necessary cleaning.

2.9. Provide complete and accurate documentation of wiring layout on the date the cabling system is handed over so that documentation can be maintained with each move/add/change. Documentation requirements are described in Section 4.

2.10. All work necessary for the completion of the intended communication cabling installation, whether shown or not on the drawings, shall be part of this contract.

2.11. Refer to Interior Design Standards, Zone and Function Standards Sheet for Technical Specifications for each operational area's requirements.

3. PRODUCT REQUIREMENTS *(GMCS Contractor)*

3.1. Product General Requirements

All components and products used from end to end, including patch cords and line cords, must be supplied from the same manufacturer, certified and warranted for 25 years as per section 4.6.

3.2. Unshielded Twisted Pair Cable Data

3.2.1. Transmission requirements shall conform to or exceed all applicable sections of TIA-568-A current specifications for Category 6 and components as required for the location. Category 5e is acceptable only to supplement and match existing for refit installations.

3.2.2. All cabling will be 4-pair, 100-ohm, unshielded twisted pair, solid conductor, 24 AWG and certified Category 6. Category 5e acceptable only as noted.

3.3. Communication Outlets

3.3.1. 8 PIN, RJ45 configuration. Use as required.

3.3.2. To match cable rating category.

3.3.3. For surface, recess mounting or for modular furniture

3.4. Rack Unit with Power Bar

3.4.1. Free standing equipment rack(s) as indicated in Annex C.

3.4.2. Free standing 2075 mm (84") high rack(s) units, gangable.

3.4.3. Must provide 482.6 mm (19") rack(s) mount capability for rack mountable components.

3.4.4. Must provide 1925 mm (77") of vertical mounting space.

3.4.5. One Meter (40") clearances at the front and rear of each rack are necessary for access to network equipment.

3.4.6. All racks are to be adequately secured to the floor with four (4) ¾" bolt down holes.

3.4.7. Must have threaded mounting holes front and rear to standard (EIA) hole pattern.

3.4.8. There shall be two (2) 20 amp, 120V, rack mounted non-switched power strips (power bar) that are surge suppressed. Each strip shall have six outlets and a ten (10) foot power cord with twist lock plug. The distribution of these power strips within the racks will vary depending on the number of racks required, which will be decided upon by the technical authority.

3.4.9. Supply and Install a 19" shelf unit to be mounted on rack unit as shown in Annex C. (If PBX phone switch is required, a separate shelf will be provided with unit, but rack space will have to be available).

3.5. Cable Management System

3.5.1. Supply and Install required 2U horizontal cable management system should be installed between each Panel and Switch as shown on Annex C.

3.5.2. Suitable for mounting on a 19-inch rack.

3.5.3. Install vertical cable management system a minimum of 6" wide to comfortably manage the number of patch cords for each patch panel. Mount on each side of rack as shown on Annex C.

3.6. Modular Patch Panels

3.6.1. To match cable rating category

3.6.2. 2U 48-port panels as specified in Work Requirements above (2.1.1).

3.6.3. Suitable for mounting on a 19 inch free standing rack.

3.7. Patch Cords

3.7.1. Should be of the same performance category or higher as the horizontal cables to which they connect.

3.7.2. Wired "straight through" to standard TIA EIA568-A.

3.7.3. Provide white color patch cords (or one other available color different than those supplied for data) to connect voice to voice patch panel in the following quantities:

- Total number of workstations and computer stations + 20% split in 4' and 7' lengths.

3.7.4. Provide red or green color patch cords for special purpose applications. Quantities are 5 each of 4', 7' and 10'.

3.7.5. Provide blue color cords to connect data to Ethernet switches in the following quantities:

- Total number of workstations and computer stations + 20% split in 4' and 7' lengths.

3.8. Workstation Patch Cords

3.8.1. Should be of the same performance category or higher as the horizontal cables to which they connect.

3.8.2. Wired "straight through" - to standard TIA EIA568-A

3.8.3. Provide blue color patch cables for workstations in the following quantities. :

- Total number of workstations and computer stations+ 20% split in 7' and 10' lengths.

3.9. Cable Tray and Conduit

Install all cables in a cable tray or conduit or install J hooks based on the infrastructure outlined in the electrical drawings.

3.10. Flush Faceplates for Wall-Mounted Outlets

3.10.1. For use on all flush mounted communication wall outlets.

3.10.2. Supply 2 or 4-port face plate. Install blanks on all unused ports.

3.10.3. For videoconferencing equipment in boardrooms, a 4-port face plate is required

3.10.4. Single gang, flush mounted – to match electrical plates.

3.11. Surface Mounted Adapters

3.11.1. For surface mounting on stand-alone pac poles, or other locations as specified on the drawings

3.11.2. Must be 2, 3 or 4-ports. Install blanks on all unused ports.

3.11.3. Single gang, surface mounted – to match electrical plates.

3.12. Furniture Mounted Adapters

3.12.1. Must be 2, 3 or 4-ports.

3.12.2. Install blanks on unused ports.

3.12.3. All jacks must be installed face up and not suspended in the furniture service channel so all jacks and labels are visible.

3.12.4. Contractor is responsible to supply the appropriate adaptor plate.

3.13. Modular jacks

3.13.1. For installation in faceplates/adapters noted in sections 3.10 and 3.11 and 3.12.

3.13.2. Modular type connectors.

3.13.3. All jacks must match the category rating of the cable installed

4. DOCUMENTATION / AS-BUILTS / RECORDS *(GMCS Contractor)*

4.1. All documentation is to be provided both in paper and electronic formats compatible to Microsoft products such as Word, or Excel, Visio, or using AutoCAD on a CD or USB memory stick, as specified by the Telecom Authority.

4.2. One hard copy of the floor plan is to be provided upon completion of work and include the location and label of each installed jack and spares in the ceiling.

4.3. Provide paper and electronic formats of all test results.

4.4. Provide a certificate document issued by the cable/component manufacturer, guaranteeing the cabling system installed meets or exceeds the performance requirements of the applicable Standard as referenced in this document.

4.5. Manufacturer must guarantee that all material and labour is covered in this circumstance for the full certification period and in the event that the Contractor is no longer in business, the full certification remains valid.

4.6. The installed structured cabling system must be covered by a 25-year warranty which includes, as a minimum:

4.6.1. Warranty against defects in material and workmanship from the date of installation.

4.6.2. Repair or replacement of a failed component, covering parts and labour, at no charge to the owner. Response time onsite should be a maximum of 4 hours.

4.6.3. Single point of contact for all warranty service.

5. TESTING *(GMCS Contractor)*

5.1. Testing Cable

5.1.1. Tests shall be completed pass rated in accordance with TIA/EIA-568-A and TIA/EIA-568-A.

5.1.2. All results recorded outside of applicable category limits for the wiring installed, shall require replacement of defective components or cables.

6. LABELING AND MARKING *(GMCS Contractor)*

6.1. Labels shall be of a permanent style, sleeve type label, conforming to AMS-DTL23053/5.

6.2. Both ends of each cable (at the patch panel and the workstation end) shall be labeled with the same designation and patch panel port ID to which it is connected.

6.3. Each RJ45 connection shall be labeled with the same designation and patch panel port ID to which it is connected.

6.4. Drop cable number shall be consecutively numbered.

6.5. The label format for the components is to follow the format "a.yy" where:

- "a" indicates the panel letter (each panel being lettered consecutively)
- "yy" indicates the port number (each panel will have number from 1-48)

6.6. For voice distribution panels, an additional label is placed on the front of each panel in a fashion so that the number of each port is visible at all times, for each jack.

6.7. All markings must be carefully done so as to present an easily-readable, neat appearance.

6.8. There shall be no hand-written labels of any kind.

6.9. Place a small, brightly colored sticker on the ceiling T-bar directly below where the spares will be placed. Sticker must be visible from the floor level.

ANNEX B - GENERAL IT FIT-UP STANDARDS AND GUIDELINES

Ideally, on-floor telecommunications rooms form part of the base building infrastructure, but are often constructed as part of the fit-up process. Technical Rooms are typically sized, secured, ventilated and air conditioned, to accommodate equipment racks, network cabling, communication switches and other passive and active equipment specifically related to the distribution of the SCC's telecommunications and security systems. The room is to be located as close as practicable to the centre of the area being served and preferably in the building core area. Technical Rooms, *a.k.a.* TRs complying with Telecommunications Industry Standards are sized as follows:

Minimum Room Size based on the number of racks. Size may vary based on barrier free standards and equipment requirements.
2 racks - 3.3 m x 3 m (11' x 10')
1 rack - 2.2 m x 3 m (7' x 10')

On-floor TRs may accommodate a single server in this space without exceeding the air cooling capacity specifications previously derived from heat load calculations of all active equipment. Under no circumstances are non-telecom equipment, active or not, or general office materials to be stored in this room. The TR is not a storage room.

The completion of the entire fit-up of the TR is a priority item entered into the site construction schedule and or re-fit schedule.

The following TR diagrams are indicative of a generic Technical Room fit-up. Questions pertaining to the specification provided should be forwarded to your local SCC/HRSDC Telecom authority.

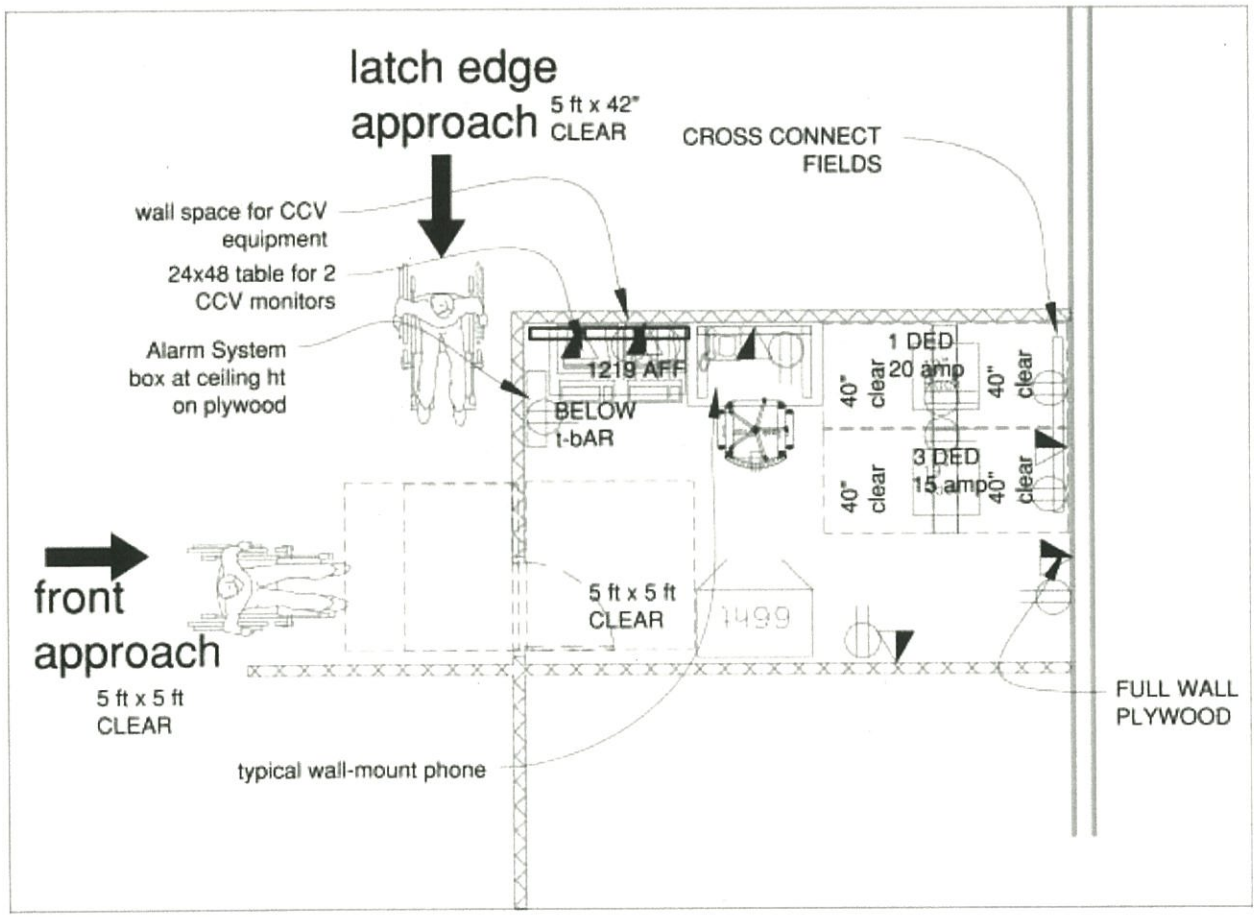
Submitted expressions of interest must be forwarded to your local Telecom authority to identify that facilities are available at each of the locations. Verification of these locations will be forwarded to the Project Authority within 5 business days.

All IT plans must be reviewed and approved by the local Telecom authority prior to tendering.

TELECOMMUNICATIONS ROOM SPECIFICATIONS AND GUIDELINES

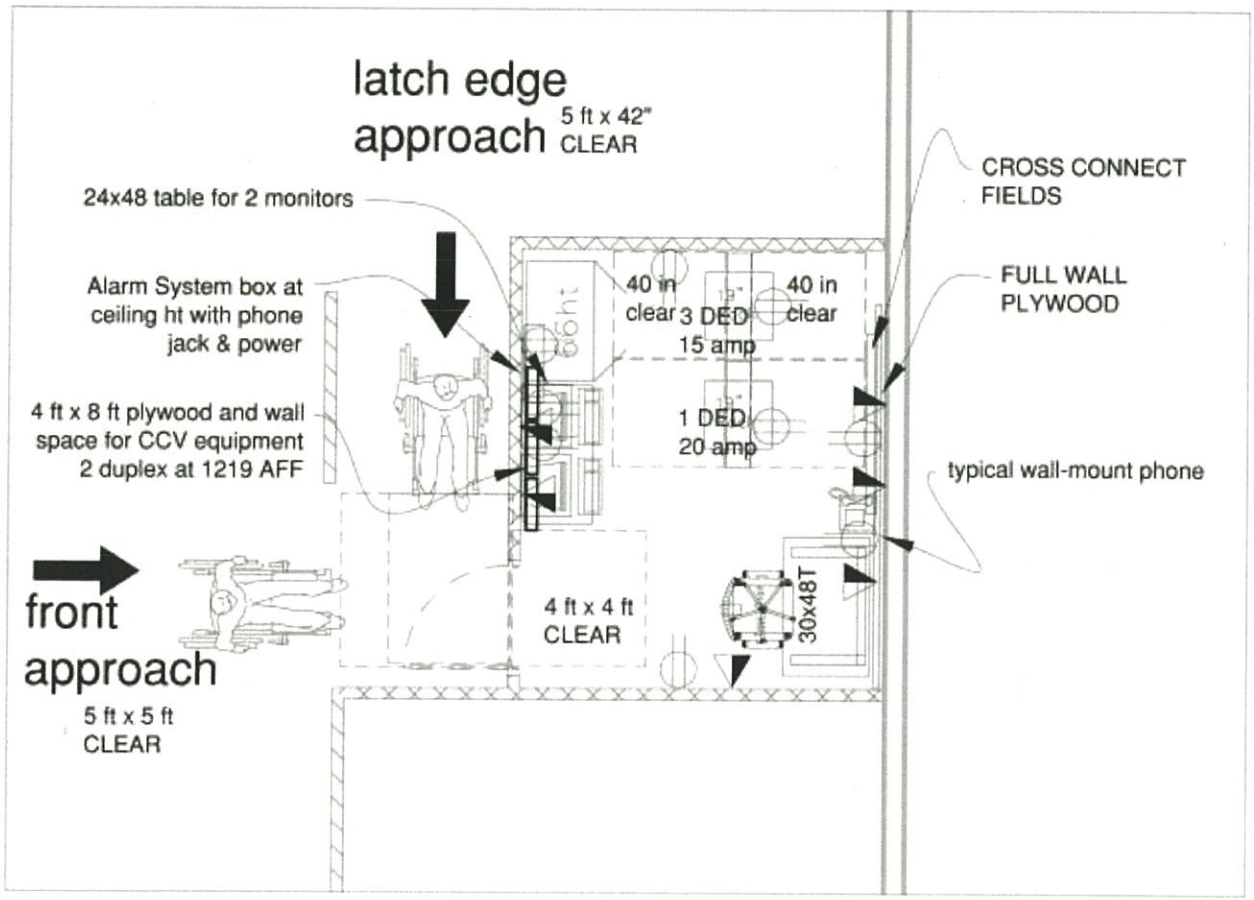
Provided are some typical small and medium size Technical Room a.k.a. Telecommunication or LAN Room layouts showing barrier free standards requirement. Security equipment should typically be wall mounted as high as possible and away from voice and data infrastructure. Security specs including closed circuit video, if required, to be provided by others.
No piping, ductwork, mechanical equipment or power cabling should be allowed to pass through the TR. Avoid sources of flooding.

Note: Room dimensions depend upon equipment requirements and barrier-free standards determined during the design phase



MEDIUM-LARGE SAMPLE 'A' - 2-RACK
TECHNICAL RM DOOR SWINGS INWARD
XXX

Note: Room dimensions depend upon equipment requirements and barrier-free standards determined during the design phase

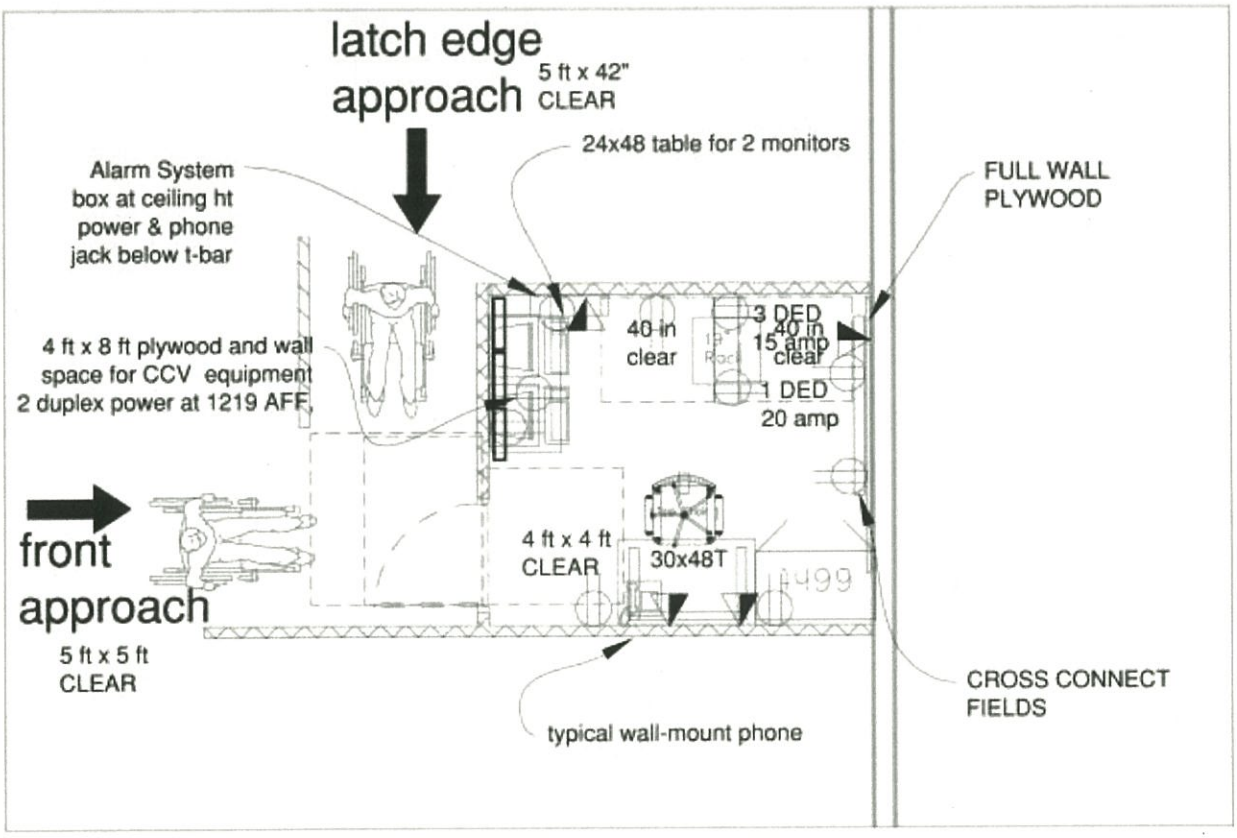


MEDIUM-LARGE SAMPLE 'B' 2-RACK TECHNICAL RM DOOR OUTWARD

XXX

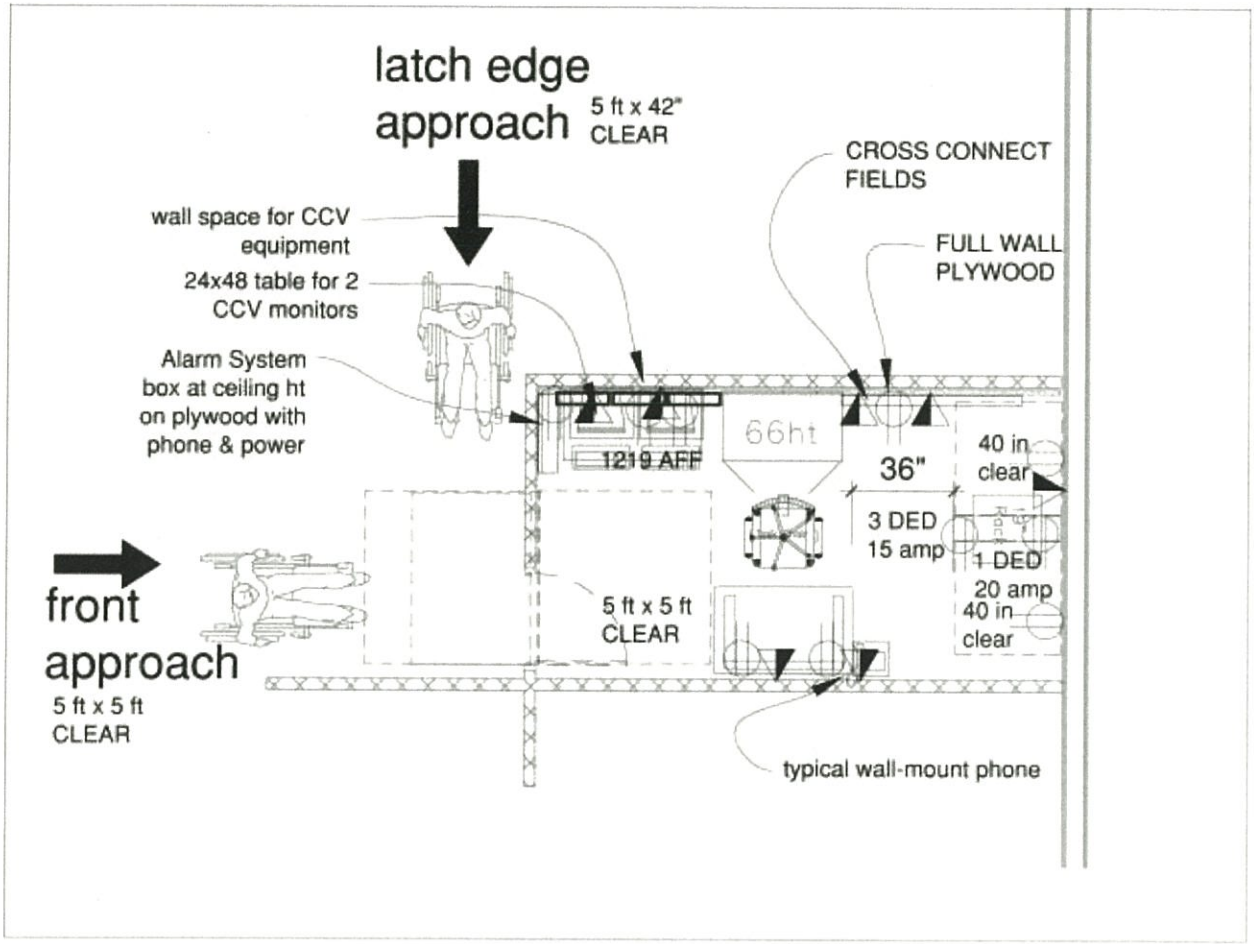
Service Canada

Note: Room dimensions depend upon equipment requirements and barrier-free standards determined during the design phase



SMALL OFFICE SAMPLE 'C' 1-RACK
TECHNICAL RM DOOR OUTWARD
XXX

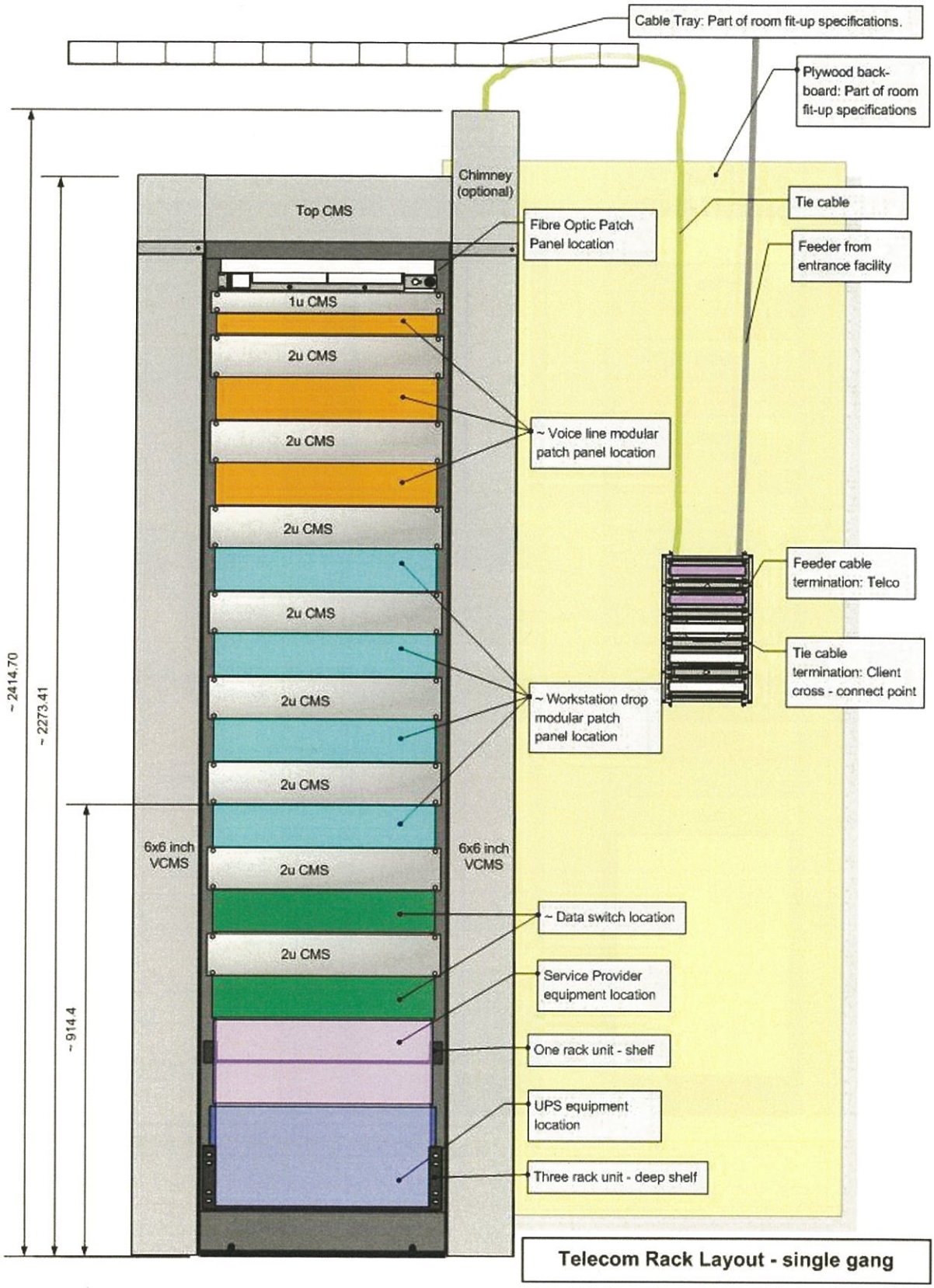
Note: Room dimensions depend upon equipment requirements and barrier-free standards determined during the design phase



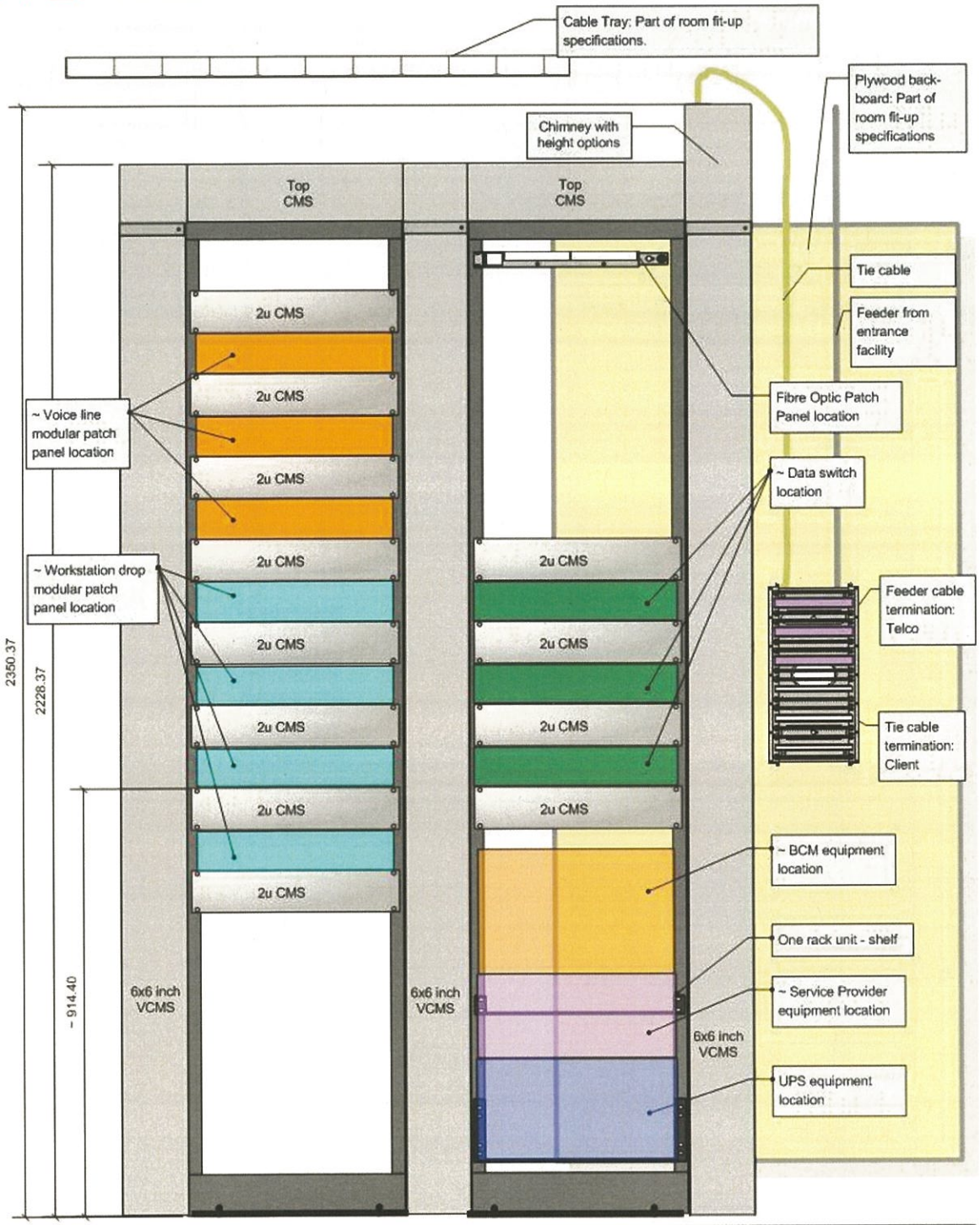
SMALL OFFICE SAMPLE 'D' 1-RACK
TECHNICAL RM DOOR SWINGS INWARD

XXX

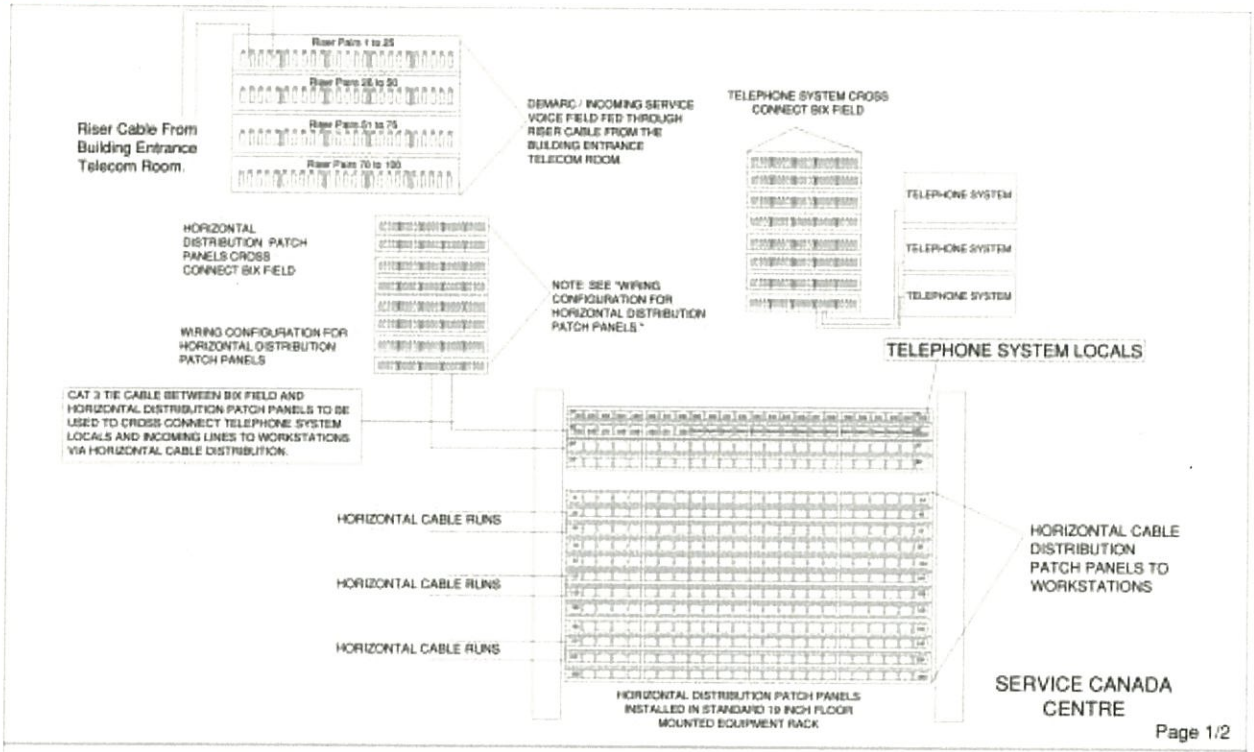
ANNEX C – TELECOM RACK LAYOUT (TYPICAL)



Telecom Rack Layout - single gang



Telecom Rack Layout - dual gang



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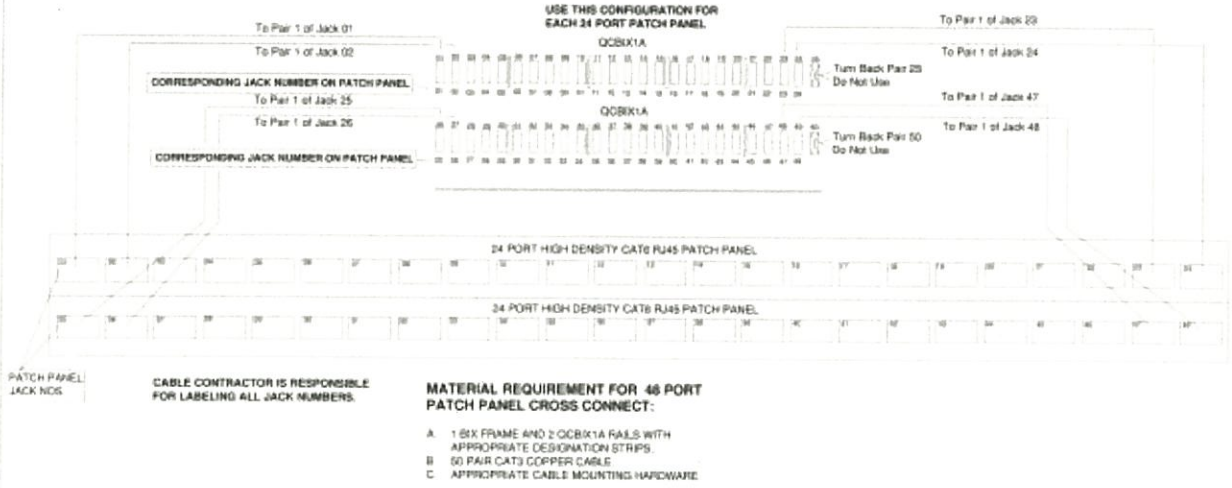
WIRING CONFIGURATION FOR HORIZONTAL DISTRIBUTION PATCH PANELS



CABLE CONTRACTOR IS RESPONSIBLE FOR LABELING ALL JACK NUMBERS.

MATERIAL REQUIREMENT FOR 48 PORT PATCH PANEL CROSS CONNECT:

A. 1 BIX FRAME AND 2 QCBIX1A RAILS WITH APPROPRIATE DESIGNATION STRIPS
B. 50 PAIR CAT3 COPPER CABLE
C. APPROPRIATE CABLE MOUNTING HARDWARE

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