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Health Information Technology Services – Specifications/Standards Policy

Applies to: All Hamilton Health Sciences staff, contractors and vendors

1.0 Purpose & Goals Description

1.1 To outline the cabling & communication room infrastructure - specifications/standards - necessary for capital and operational purchases, for inclusion in Request for Proposals (RFP), Request For Information (RFI), Request For Quotation (RFQ) and for Facilities Management.

1.2 To inform Facilities Management and other departments of the HHS cabling and communication room infrastructure specifications/standards that is required to be adhered to.

2.0 Policy

2.1 The scope of enforced specifications/standards on Health Information Technology Services (HITS) infrastructure includes (but not limited to):

- Communication room build, Rack system build, new building design
- CAT 6 UTP, CAT6A UTP, Fiber Optic and Voice trunk cabling, other cabling
- Wireless Access Points
- Installer/Installation
- UPS/Power
- HHS Cabling Direction
- Existing Cabling Decommissioning (Renovation)
- Existing Communication Room Relocation

2.1.1 **This document serves the following departments:**

HITS (Health Information Technology Services)
Telecom
Security (where applicable)
Biomedical Engineering (where applicable)
Multi-Media (where applicable)
Facilities Management (not limited to: Nurse Call, Fire alarm, etc - where applicable)

2.1.2 **This document is to be used by:**

Capital Development
Third party Engineering Consultant
Third party Contractors
HHS Facilities Management Department

2.1.3 ***This general document <u>is not to be considered</u> signoff from the above mentioned departments for projects. For every project, there will need to be departmental engagement for signoff of infrastructure required. The application of the standards in this document may differ slightly with each project, in particular with existing communication room builds. This specification is a <u>living document subject to change</u> as required.***

3.0 Cross References

ICT-Information & Communication Technology Standards Policy

4.0 Developed By

Health Information Technology Services

5.0 In Consultation With

The key stake holders consulted regarding the content of the document includes staff of HITS.

6.0 Approved By

Director, HITS Infrastructure Service & Solutions

Keyword Assignment	

Hamilton Health Sciences

Infrastructure Specifications

For Data/Voice and other Low Voltage Communications

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Revised May 2007 V 1.1

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Created by: Aurelio (Al) Caruso
Updated by: same as above – April 2016

Preface

This infrastructure specification is a Hamilton Health Sciences document as it relates to the following:

Communication room build, Rack system build, new building design
CAT 6 UTP, CAT6A UTP, Fiber Optic and Voice trunk cabling, other cabling
Wireless Access Points
Installer/Installation
UPS/Power
HHS Cabling Direction
Existing Cabling Decommissioning (Renovation)
Existing Communication Room Relocation

The information in this specification is standards to be adhered to at Hamilton Health Sciences for on-site and remote services.

This document serves the following departments:
HITS (Health Information Technology Services)
Telecom
Security (where applicable)
Biomedical Engineering (where applicable)
Multi-Media (where applicable)
Facilities Management (not limited to: Nurse Call, Fire alarm, etc - where applicable)

This document is to be used by:
Capital Development
Third party Engineering Consultant
Third party Contractors
HHS Facilities Management Department

This document is to be used for:
New building/communication room builds
New communication room builds within existing buildings
Existing communication room builds (in whole or part – where possible)
All areas within new and existing buildings
HHS external points of presence.

This general document is not to be considered signoff from the above mentioned departments for projects. For every project, there will need to be departmental engagement for signoff of infrastructure required. The application of the standards in this document may

differ slightly with each project, in particular with existing communication room builds. This specification is a living document subject to change as required.

Note: This document is write-protected for the safety of Hamilton Health Sciences.

Table of Contents:

1. Communication Standards

- TIA/EIA-568-B Commercial Building Telecommunications Wiring Standard
- CAN/CSA T529 Design Guidelines for Telecommunications Wiring Systems in Commercial Buildings.
- ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, February 2009
- ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, February 2009
- ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standards, August 2009
- ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, June 2008.
- TIA/EIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces, October, 2004.
- ANSI/TIA-606, Administration Standard for Commercial Telecommunications Infrastructure, May, 2006.
- IEEE Std 802.3(tm)-2008 Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.
- IEEE Std 802.3(tm)-2008 Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.
- IEEE 802.3bc-2009, Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications. Amendment 2: Ethernet Organizationally Specific Type, Length, Value (TLVs).
- ANSI/TIA-1179 “Healthcare Facility Telecommunications Infrastructure”

2. Communication Room Build

The communication room build will consist of the following:

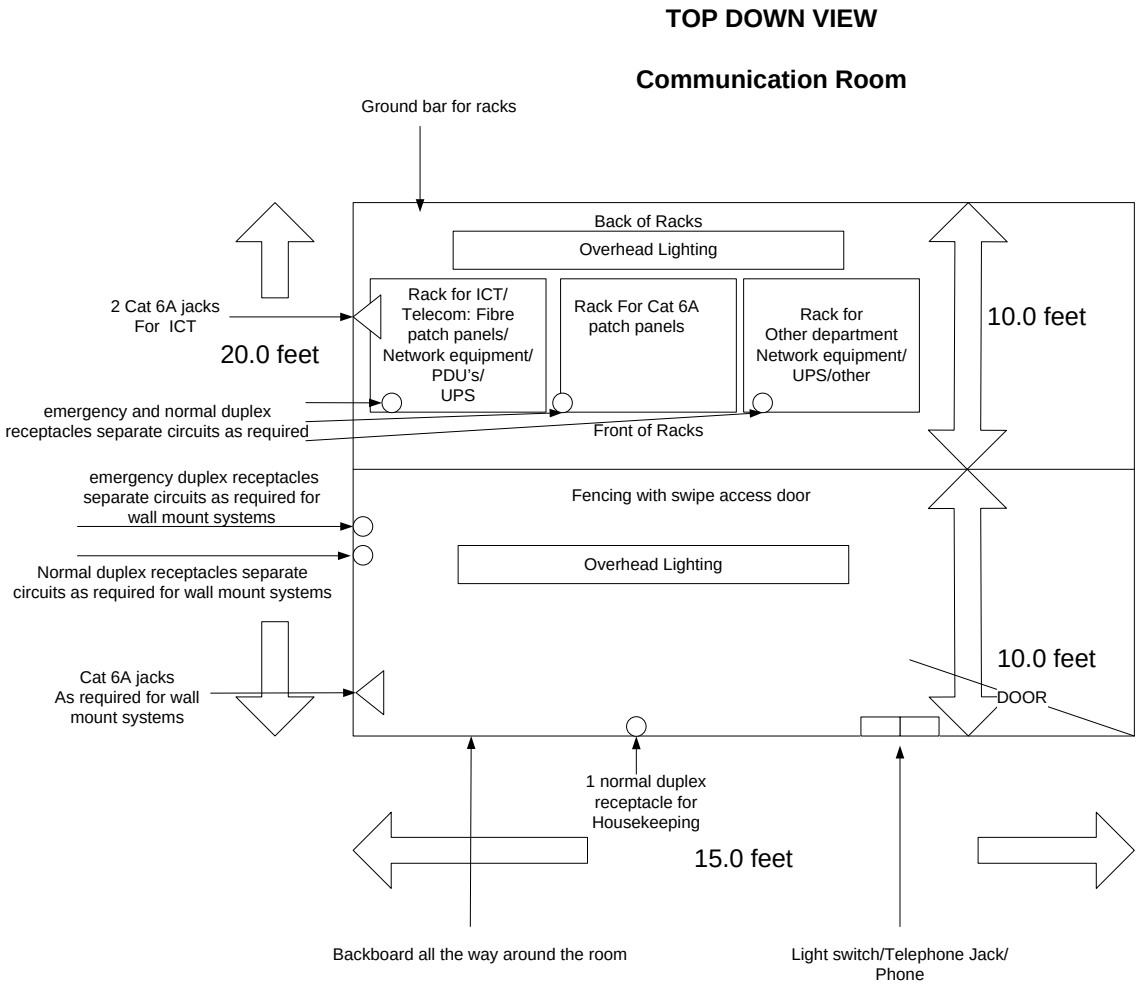
- Minimal 15 feet by 20 feet inside footprint
- Over head lighting on both sides of the rack system and other side of fencing between HITS/Telecom area and 3rd party area, within room
- Manual light switches by doors (not motion sensor)
- Six emergency power duplex receptacles (separate circuits) (six 20A) on backside of racks (as identified) to satisfy HITS, Telecom and any other hospital department
- Three normal power duplex receptacle (three 20A) on backside of racks (as identified) to satisfy HITS, Telecom and any other hospital department
- Telephone wall jacks by doors
- Telephones
- Climate controlled air handling (brought from outside of room to within room)
- Door locks – swipe system
- Top to bottom fire rated wall board all the way around inside of room
- Normal power duplex receptacles on wall for Housekeeping use
- Additional emergency duplex receptacles on back and side walls as required for wall mount systems in 3rd party area
- CAT 6A walljacks on back and side walls as required for wall mount systems
- Wall mounted wire manager rail for voice pig tail patch cables (from rack to backboard) (or overhead tray system)
- Grounding system for racks
- **There is to be no overhead Air Conditioner or other equipment, ducts, water pipes, etc inside the room - only lighting and cable tray overhead**
- **No water pipes of any sort within the room. No washrooms adjacent or above.**
- Sealed floor for dust prevention
- Communication room to be situated off of main hallway, not off sub hallway within staff office/clinical areas.
- There is to be no wall board low voltage systems either on front side or back side of racks, on the walls. As well, no wall board low voltage systems on side walls. See below for communication room layout.

There must be signoff by HITS for approval of multiple department occupation of data/voice communication room and location of their respective equipment in order to ensure co-occupancy will not be to the detriment of HITS and anyone else occupying the room.

Please see Item 3. Communication Room Layout (next page) for all requirements stated above.

3. Communication Room Layout

Revised



Note 1: Grounding bar system to be placed down low on back wall behind racks.

Rationale for increase of room size from 11' x 12' to 15' x 20': Newest network equipment on racks is longer in depth. Increasing wall mount systems for Engineering and Security. Space requirement (by governed code) between end of last rack and wall for access from front to back side.

4. Relay Racks Build

The rack build system will consist of the following:

- Three 84" high racks
- 10" or 12" vertical wire managers between the racks and outside of racks
- 48 port CAT 6A patch panels
- 4U horizontal wire managers (1 per rack), installed at top
- Racks bolted to floor, top side of racks tied off to overhead or sidewall
- Laptop sliding shelf

Note: HHS standardized on Cisco networking equipment in 1999. PANDUIT is the Cisco certified cabling partner.

The rack build system will be PANDUIT specific:

- Panduit racks - Part # R2PS
- Panduit 10" Patch Runner Vertical Manager - Part # PRVF10
- Panduit 10" Patch Runner Vertical Manager Door - Part # PRD10
- Panduit 12" Patch Runner Vertical Manager - Part # PRVF12
- Panduit 12" Patch Runner Vertical Manager Door - Part # PRD12
- Panduit Angled Modular Patch Panel 48 port - Part # CPPLA48WBLY
- Panduit Horizontal Wire Manager – Part # NMF4

Patch panels:

- 48 port, 2U modular jack panels wired to 568A or 568B configuration (General/Henderson – A, MUMC/Chedoke – B, St. Peters – A)
- Panels shall be complete with Cat 6A PANDUIT modular jacks as required
- Quantities as required

For existing, older communication rooms with existing CableTalk rack system, the following is required:

- Panduit Flat Modular Patch Panel 48 port - Part # CP48BLY
- CableTalk 2U Horizontal Wire Manager
- CableTalk 84" rack (from storage stock)
- CableTalk 8" vertical wire manager (from storage stock)
- CableTalk overhead manager - CTH-CMT-21-B

To be determined at cabling requirements stage.

5. Relay Racks Layout

The relay rack layout will be as follows:

- Three racks with vertical management will be placed together in a line closest to the far wall away from the door – See Item 3. Communication Room Layout previous.

- The equipment and patch panels will be front facing to the fencing separation (with door) with the equipment extending out the back of relay back. See Item 3. Communication Room Layout previous.

Vertical real estate on the racks will be setup as follows from top to bottom:

Top down for first rack:

- Horizontal wire manager at top of each rack (4U)
- Fibre optic patch panel
- HITS/Telecom equipment
- UPS/s
- 1U spacer between each of the above mentioned

Top down for second rack:

- Horizontal wire manager at top of each rack (4U)
- Copper patch panels

Top down for third rack:

- Horizontal wire manager at top of each rack (4U)
- Other department equipment
- UPS/s

Note: No copper patch panels on the equipment rack.

BioMed and Hospitality Network, other - will provide their own UPS and switches/equipment, as it applies.

6. Cabling – HITS Fiber Optic Specifications

Backbone and patch cabling/patch panel will be one of two vendor types:

Note: HHS standardized on Corning Cable Systems in 1999 but is open to PANDUIT Fiber Optic Products as an equal.

Corning Cable Systems or PANDUIT

Note: A fibre run is required for every new communication room home-run back to the Campus site computer room, unless otherwise determined at design stage.

If fibre path completely indoors and distance as the path taken is no greater than 984 feet (300 metres):

Twelve (12) strand cabling will be pulled from Campus Site Computer Room to each communication room which will consist of the following:

- 12 strand, 50 micron, tight buffered, laser optimized (OM3), 50/125, FT4, Aqua jacket

Rationale for laser optimized fibre deployment:

Current industry standard - capable of supporting 10 Gigabit speeds from communication room to computer room as needed in future for high bandwidth requirements.

If fibre path completely indoors and distance as the path taken is greater than 984 feet (300 metres):

Twelve (12) strand cabling will be pulled from Campus Site Computer Room to each communication room which will consist of the following:

- 900 micron, single mode, tight buffered fibre, FT4, yellow jacket

If any part of the fibre path is outside (aerial or underground), it will need to be loose tube or indoor/outdoor fibre for the entire distance from communication room to computer room.

Connectors:

LC-2-fibre type, no epoxy, prepolished

Fiber Optic Specifications continued

Patch Cords:
7 foot, two fibre, LC to LC – quantity 6 per communication room
15, 40 or 60 foot, two fibre LC or LC – quantity 6 per communication room (length to be determined at design stage)

Patch panels for each new room:
2U, 19" rack mounted shelf that will accept up to four 6-fibre LC connector housing panels complete with LC bulkheads.

Patch panels for Campus Site Computer Room (Data Center):
72 port patch panel(s), rack mountable, that will accept twelve 6-fibre connector housing panels (per patch panel) complete with LC bulkheads

The patch panels for both communication room and computer room are to be front facing, flip down lid style. To be confirmed with HITS beforehand.

Fibre optic routing:
Fibre optic cabling will be run thru conduit as per: Item 1. Communication Standards

Fibre cabling to be home-run to Campus site computer room, unless otherwise specified

Fibre cabling to be home-run using dual conduit paths

Cable jacket to be FT4 rated thermoplastic except where otherwise indicated.

Cable jacket to be FT6 rated thermoplastic where any part of the cable is exposed
to an air return or air feed system.

Additional fibre cabling to be run between communication rooms for redundancy/failover:

- 6 strand, 50 micron, tight buffered, laser optimized (OM3), 50/125, FT4, Aqua jacket

To be determined at cabling infrastructure design stage.

Backbone cabling requirements for other departments is to be determined with the requestor and HITS.

7. Cabling – Copper Specifications

CAT 6A Horizontal cabling will be PANDUIT:
Note: HHS standardized on PANDUIT in 1999. PANDUIT is the certified cabling partner to Cisco.

PANDUIT TX6A 10 GIG UTP Copper Cable with Matrix Technology – Part number PUR6A04BU-UG for riser rated cable, Part number PUP6AM04BU-UG for plenum rated cable.

Rationale for CAT 6A deployment -
Current industry standard - capable of supporting 1 Gigabit speed to the desktop device as needed in future for high bandwidth requirements.

Cabling type (HITS/Telecom/BioMed)

- 4-pair, #24 AWG, solid copper, CAT 6A, CSA PCC FT4 (CMR) **unshielded**, and or CSA PCC FT6 (CMP), twisted pair
- Potential **shielded** twisted pair requirement to be determined at design stage.
- Horizontal runs will be in accordance to CAT6A specifications and not exceed 295 feet (90 metres).

Patch cabling, face plates/jacks will be of one vendor type:

PANDUIT
Note: HHS standardized on Cisco networking equipment in 1999. PANDUIT is the Cisco certified cabling partner.

Jack type (ICT/Telecom/BioMed)

- 8-conductor, coloured modular jacks, Category 6A, T568A or 568B configuration (General/Juravinski – A, MUMC/Chedoke – B)
- Giga-Channel TX-6A Plus Series CJ6X88TG**

Colour jacket for horizontal cable, patch cable, jacks:

- Data/Voice: Blue (except for communication room pig tails – see below)
- BioMed: White (if required for older installations)

Copper Specifications continued

Patch cables – (HITS/Telecom/Other):

- For device end: 10 foot, uniquely numbered (labeled at each end - 1..1, 2..2, continuum.)
- For communication room end: 7 foot, uniquely numbered (labeled at each end - 1..1, 2..2, continuum.) **For existing, older communication rooms -** some longer patch cables are required (e.g. 15 or 20 foot). To be determined at cabling requirements stage.
- One patch cable for office end and one patch cable for closet end, for each horizontal cable run.

They will be solid or stranded conductor. Each end terminated with 8 conductor, Category 6A, T568B RJ45 configuration modular plugs to match jacks.
Gigachannel TX-6A Plus Series Patch Cords UTP6ASD7**, UTP6ASD10**, UTP6ASD15**, UTP6ASD20**

Patch cables – Voice (Telecom):

If TDM phone:

- No patch cable required (provided with phone)
- For communication room end: 25 foot, uniquely numbered (labeled at each end - 1..1, 2..2, continuum.), cross connect CAT 6A, RJ45, **grey colored** pig tail cables (factory assembled) with RJ45 on one end to patch panel and the other end terminated to Cat 6 BIX block on wall (See Voice Trunk Cabling, pages 26, 27).
  UTPSP25**. Number of pig tail patch cables required will be determined by HITS/Telecom at design stage.

If VOIP phone:

- For device end: 10 foot, CAT 6A, RJ45 uniquely numbered (labeled at each end – 1..1, 2..2, continuum)

  - For communication room end: 7 foot, CAT 6A, RJ45 uniquely numbered (labeled at each end - 1..1, 2..2, continuum.)

Wallplates/Surface Mounts (HITS/Telecom/BioMed):

- Quad or Duplex outlet, single gang, plastic, white complete with 2 label cards plus cover and blank inserts for unused port holes
- CFPL Series**
- To be placed with bottom side of wallplate, minimally 18” from floor OR above desk/counter (no higher than 4” above desk/counter) for easy access for servicing.

Copper Specifications continued

Faceplates (Modular Furniture Snap on Type):
Same as flush mount type except suitable for snapping into modular furniture raceways/knockouts. Faceplates complete with extenders, as necessary

Faceplate/Jack for Wall Mount Telephone:
Stainless steel plate complete with Category 6 Keystone jack module and labels

PANDUIT – KWP6P Series**

Quantities as required for all of the above. Determined at design stage.

Notes:

- Cabling is to be home-run from accessible office/area to communication room.
- No ceiling consolidation patch panel boxes.
- Cable jacket to be FT4 rated thermoplastic except where otherwise indicated.
- Cable jacket to be FT6 rated thermoplastic where any part of the cable is exposed
  to an air return or air feed system.
- Cabling for common, multi user areas is to be pulled to different communication rooms for redundancy/failover purposes. To be determined at cabling infrastructure design stage.

The following minimum clearances from electrical and heat sources are to be maintained when routing cables.

- Unit substations 10 m
- Power transformers (greater than 30KVA) 10 m
- Transformers 1.2 m
- Motors 1.2 m
- Switch gear (greater than 600V) 10 m
- Feeder cables (600V and above) 1 m
- Distribution cables (less than 600V) 750 mm
- Conduit (Enclosing 30A branch circuits) 300 mm
- Conduit (Enclosing 20A branch circuits) 75 mm
- Conduit (Enclosing 15A branch circuits) 65 mm
- Fluorescent luminaires 120 mm
- Pipes (gas, oil, water, etc.) 300 mm
- HVAC (equipment, ducts, etc.) 150 mm

Any deviation from cable routing shown on drawings to be approved by Engineer and documented on as-built drawings.

Copper Specifications continued…

Additionally:
Do not strap cables to, or lay cables on, any length of conduit, pipe, ventilation duct or other building element not expressly installed for the purpose of cable support
.
When determining a cable routing pathway, give priority to air handling ducts, fire sprinkler pipes and electrical conduits.

8. HITS UPS Specifications for Communication Rooms

UPS system will be of one vendor type: APC

Note: HHS standardized on APC in 1999.

There will be minimally one UPS in each communication room for HITS rack:

- APC Smart-UPS x 1 (or 2) – to be determined at design stage
- Along with 2 (or 4) PDU's – to be determined at design stage

Product models:

UPS:	Receptacle:
APC SMT 1500 (with APC 9630 network card)	NEMA 5-15P
APC SMT 2200 (with APC 9630 network card)	NEMA 5-20P
APC SURTA 3000XL (with APC 9630 network card)	NEMA L5-30P

PDU:

APC AP9563 20A Rack Mount PDU
APC NET9RMBLK 15A Rack Mount PDU

Model type required for both UPS and PDU, to be determined at design stage.

Normal and Emergency power receptacles required for UPS models, vary as based on above.

The UPS size requirement will depend on the following factors: number of switches required (based on number of total connections) and number of PoE (Power over Ethernet) switch ports required for potential VOIP phones and Wireless Access Points.

The UPS'/PDU's are to be paid for by the project.
The UPS'/PDU's are to be ordered by HITS.
The UPS'/PDU's are to be installed by HITS.
The UPS'/PDU's are to be for HITS/Telecom use only.

Note: Any UPS requirements for Bio Med, Hospitality Network or other will need to be provided by them for the protection of their equipment.

9. Wireless Access Point (WAP) Surveying/Installation

- Surveying for determination of WAP locations will be performed by Compucom – HHS 3rd party network provider.
- Surveying will be done for all areas. Stairwells, elevators and outside of building may be included.
- Initial, best approach, conservative estimating for WAP location and quantities (and equal amount of cables required to be pulled by contractor) can be performed based on floor plan layouts
- Actual surveying cannot be performed until all construction walls are up and drop ceiling (with tiles) in place, doors, glass for doors and walls, in order to determine the near final placement and locations for the WAP's.
- Final survey to be performed after furniture, staff moved in order to determine any fine tuning of WAP placement and locations (some may need to move).
- CAT 6A cabling for WAP's will be brought back to communication room.
- WAP's are to be installed by Contractor as per:
  Site Survey Floor Plan Maps provided by HITS
  Installation Guide provided – see page 16/17
- Survey Maps deliverable to Contractor will be sent in bmp or pdf format
- WAP's are to be installed **onto T-bar ceiling with AP exposed below drop ceiling (newer AP model) or as determined for hard ceiling**

- WAP's will receive power via CAT 6A cable from communication room switches (HITS provided). Power not required in ceiling for WAP's

- WAP's will be provided by HITS

- Patch cables for patching WAP's to data cables will be provided by contractor.

- Outdoor WAPs, their protection and placement requirements to be determined at design stage

Wireless Access Point – Installation Guide

Installation instructions:

- Use electronic drawing sent along with this document, to identify installation location for each Wireless Access Point (WAP) identified in the table below.
- The WAP's must be snapped onto T-bar ceiling, or as determined for hard ceiling
- Network horizontal cable will be laid to the determined communication room. Ensure that the length cable run does note exceed length specified by EIA/TIA-568 standard which is 295 feet (90 metres), end to end. Cabling for common, multi user areas are to be pulled to different communication rooms for redundancy/failover purposes. To be determined at cabling infrastructure design stage
- Network connection "surface mount" will be above drop ceiling (for newer model AP)
- Approximately 20 feet of extra cable is to be wrapped in a loop and left at each location as per the best guess paper survey locations noted.
- Mark (label) the wall plate using the standard HHS wall plate ID schema, as per diagram attached at the end of this document. See page 17.
- Wall plate ID label will be affixed to both surface mount and on the T-Bar of drop ceiling, (or to hard ceiling)
- Punch horizontal cable to CAT 6A patch panel in communication room.
- Install CAT 6A patch cable from surface mount to ETHERNET port on WAP.
- Enter corresponding Wall Plate ID for each WAP into the table below.
- Indicate if installation conforms 100% to installation instructions. Report any discrepancies in the Comment section (see table below).
- Forward the completed document to HITS contact who requested the installation, within 1 day after completion of the installation.

9. Wireless Access Point Surveying / Installation continued

Sample form required to be returned from the Contractor listing wallplate ID's, etc for each WAP Reference ID:

WAP Reference ID (from Site Survey drawing) [HITS]	Wall Plate ID [Engineering/ Contractor]	Install conforms to instructions (Yes / No) [Engineering]	Comment [Engineering]	WAP Name (UID) [Compucom]
AP344 (ICU)				
AP345 (ICU)				
AP343 (CCU)				

The wallplate labeling schema for cabling is as follows:

XXXXXXXX-XXXX-XXXX which translates to:

8 alphanumeric maximum - 4 numeric - 4 alphanumeric

This schema is referencing the following:

OFFICE/AREA ROOM NO – COMM ROOM PATCH PANEL JACK NO – COMM ROOM I.D. NAME

Example - RM135-241-140
RM135-242-140

10. Labeling

The wallplate labeling schema for cabling is as follows:

XXXXXXXX-XXXX-XXXX which translates to:

8 alphanumeric maximum - 4 numeric - 4 alphanumeric

This schema is referencing the following:

OFFICE/AREA ROOM NO – COMM ROOM PATCH PANEL JACK NO – COMM ROOM I.D. NAME

Example - RM135-241-140
RM135-242-140

Note: patch panel jack numbers 1 to 99 are to be labeled 001 to 099 at the wallplate and communication room ends.

See page 32 for Appendix A – **Current** Communication Rooms/ID's

Note: Label font to be 10 or 12 pitch. Determined with HITS beforehand for sample label provided by contractor.

No special characters, including dashes are to be used in the OFFICE/AREA ROOM NO portion of the wallplate ID. All capital letters.

Room/area portion part of wallplate ID is based on - Owner's Final (Wayfinding) Room Numbers (not Architectural Room Numbers).

Copper Horizontal Distribution Cabling

Each cable leaving the communication room is to be labeled at both ends within 6" of termination point in sequential manner using labeling schema above. No two cables leaving communication room shall share the same cable number.

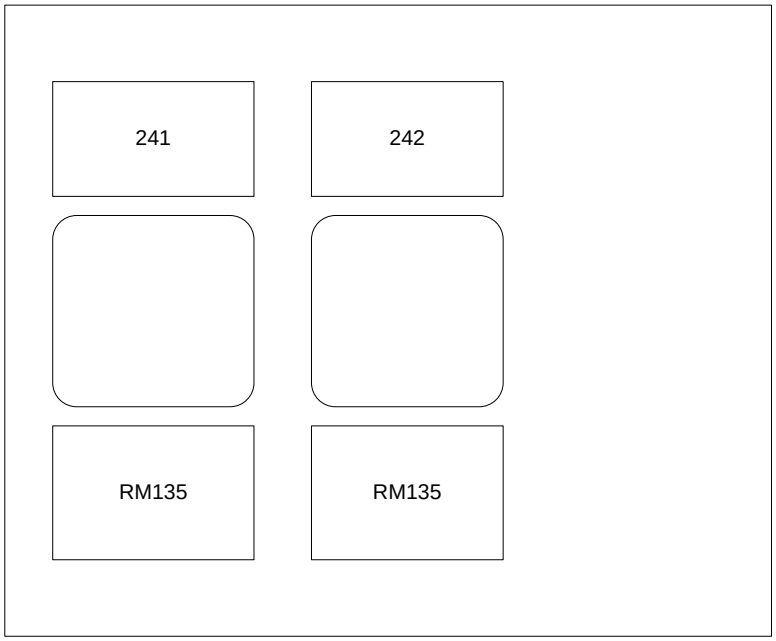
The patch panels numbers in the communication room will be a continuum.
e.g. 001 to 300.

Therefore, beyond first 48 patch panel, every subsequent panel will be renumbered
049 to 096, 097 to 144, 145 to 192, …

Labeling (Room Location) according to Owner's Final Room Numbers (not Architectural Room Numbers).

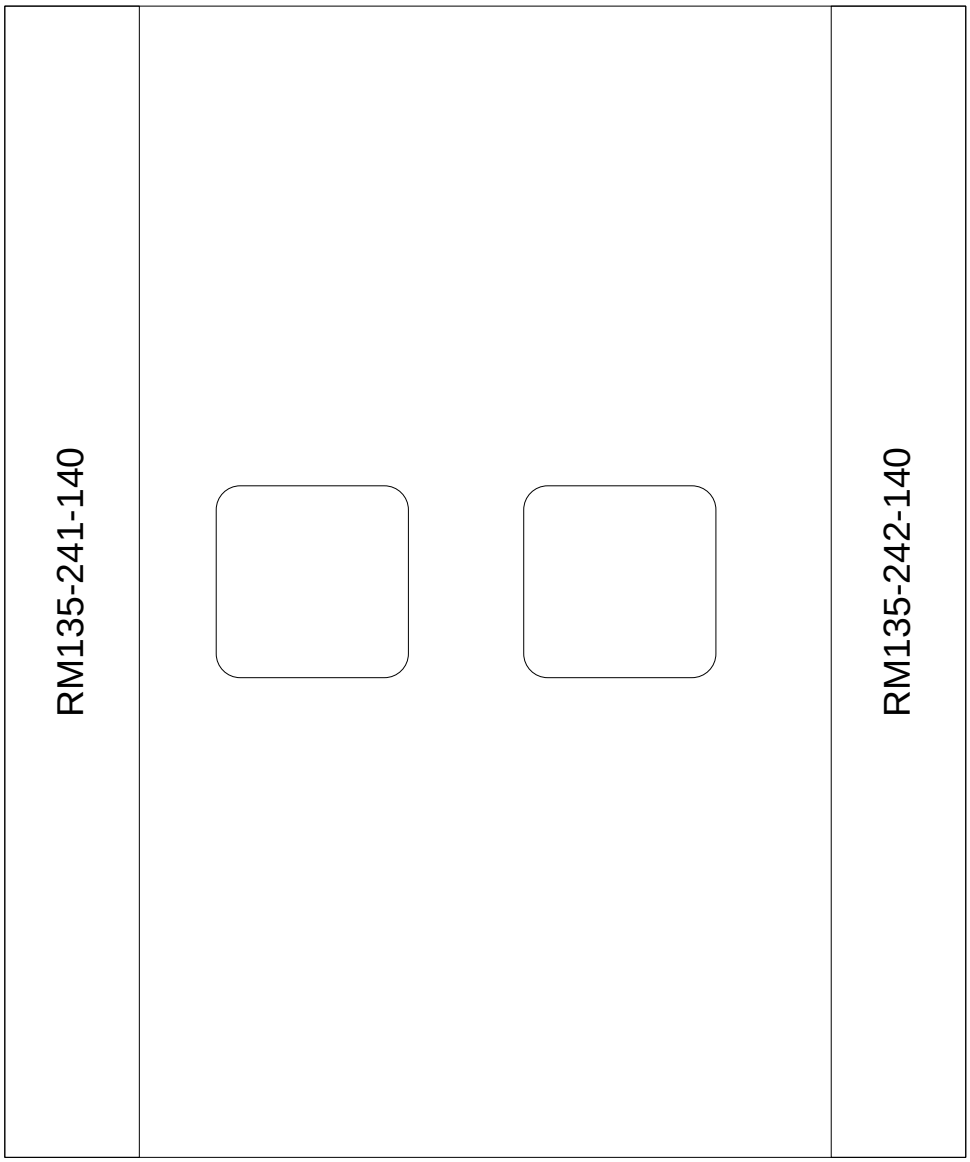
The communication room patch panel labeling layout is as follows:

Underneath or above each patch panel jack (dependent if top or bottom row of jacks) the OFFICE/AREA ROOM NO will be identified on the panel.



10. Labelling continued

The office/area wallplate labeling layout is as follows:



Labels need to be placed on left and right side of jacks regardless of 2 gang or 4 gang jack. One unique label per jack.

Labeling System: PANDUIT or approved equal (Brother P Touch Labels Not Accepted)
If required, labeling for Bio Med, Hospitality Network, other - needs to be determined with respective departments and HITS.

11. Installer Approval/Certification

Approved cabling installer/contractor must be a current approved Panduit Certified Installer (PCI) in good standing. Each Panduit Certified Installer must supply their PCI Certificate as part of their submittal with their Price/RFQ package. The Panduit Certified Installer can access and download their "PCI Certificate" through the Panduit Partner ONE HUB Portal. The approved cabling installer/contractor will provide a PANDUIT "Certification" System Warranty (25 year) upon completion of the project. The PCI will perform all of the following during installation: Pull cables, terminate cables, test cables & label cables. All cable test results and Certification forms must be submitted to Panduit's warranty department via the Panduit Partner ONE HUB Portal. This is required by the Panduit Certified Installer in order to provide the PANDUIT "Certification" System Warranty (25 year).

12. Installation Warranty

- Approved cabling installer/contractor will provide PANDUIT "Certification" System Warranty (25 year) upon completion of the install/project.

- Fulfill all of PANDUIT's Warranty/Certification registration requirements. Prepare and submit electronically all necessary certification forms/documentation and cable test results to PANDUIT's warranty department via the Panduit Partner ONE HUB Portal.

- Submit Warranty certificates at conclusion of installation to Hamilton Health Sciences - Capital Development/Engineering and HITS Department contacts assigned to the project install.

Installer Approval/Installation Warranty for other type cabling systems to be determined by the department.

13. Documentation

Submit shop drawings for the following items:

- Voice/Data jacks/faceplates
- Horizontal cabling (data/voice)
- Horizontal patch panels
- Backbone (fibre/voice trunk) cabling (data/voice)
- Backbone (fibre/voice trunk) patch panels/Bix blocks
- Equipment & Cabling racks
- Labelling

Submit upon completion of data cabling installation on CD in AutoCAD format all details regarding the installation:

- Comm room location
- Voice/Data cabling routing
- Voice/Data wallplate outlet locations on floor plan maps complete with wallplate ID's

Submit labeling samples for patch panel jacks, wallplates, horizontal cables, and patch cables for approval prior to commencing work.

14. Execution – Co-ordination

- Co-ordinate all cabling work with the HHS HITS/Telecom/BioMedical /Engineering/Security/Multi-Media- Services.
- Prior to start of work, Contractor to present methodology/process for pulling, terminating, testing and labelling cables – CAT6A, fiber optic, voice trunk, pig tails.

Documentation for other type cabling systems to be provided as requested by the department.

15. Testing and Verification

Permanent Link Horizontal CAT6A cabling to be tested to EIA/TIA 568B Category 6A Standard for the following:

- Circuit/Cable identification
- Wire Map
- Length
- Impedance
- Resistance
- Capacitance
- Near End Cross Talk
- ACR, PS ACR
- PSNEXT
- ELFEXT
- PSELFEXT
- Return loss

Testing to be done with comm. room lights on and rack grounded.

Fibre Optic cabling to be tested for the following:

Test each strand for dB loss.
Test each cable strand with light source meter compliant with TIA/EIA-568-B Standard
Test each cable whose length is in excess of 400 feet (122 metres) with an Optical Time Domain Reflectometer per TIA/EIA 455-61

If a fault or sub-standard condition is discovered during inspection and testing:

The dates on which such conditions were first noted and ultimately corrected shall be entered in the log.
The cause shall be identified and corrected.
The affected tests shall be repeated for that strand.
Any previous tests where the results could have been affected by the corrective action shall also be repeated.

Document results for each strand in CD format. Format shall include tables indicating the expected results and the actual results.

Testing/Verification for other type cabling systems to be provided as required by the department.

15. Testing and Verification continued

Provide Permanent Link testing for each CAT 6A cable installed per TIA/EIA 568B testing standards

Use Micro Test Omniscanner or Fluke Meter DSP4300 or higher

If a fault or sub-standard condition is discovered during inspection and testing:

The dates on which such conditions were first noted and ultimately corrected shall be entered in the log.
The cause shall be identified and corrected.
The affected tests shall be repeated for that circuit.
Any previous tests where the results could have been affected by the corrective action shall also be repeated.

Document results for each cable and patch cord in CD format. Format shall include tables indicating the expected results and the actual results.

Copper Backbone Cabling (Voice Trunk):

Test for:
Continuity/Opens
Shorts
Grounds
Polarity
Length

16. Voice Trunk Cabling

Bix Mounts/Connectors (Voice)

Note: HHS is standardized on the following vendor types:

NORDX/CDT QMBBIX Series
- 250-pair mounts (or as agreed upon with Telecom) complete with 10 BIX Connectors and 5 designation strips and labels
- Mounts suitable for wall mounting
- Mounts complete with distribution rings for wire management.

- Label BIX connector designation strips using Owner's Final Room Numbers (not Architectural Room Numbers).

Copper Cabling (Voice Trunk)

Pair count (quantities as required), #24 AWG, solid copper, CSA PCC FT4 (CMR) jacket
Superior ESSEX AR Series or approved equal
Provide BIX mounts in quantities indicated filled complete with BIX connectors and designation strips for backbone and horizontal cabling terminated in communication rooms and Main Telephone Room.

Bix Mount for Cat 6 pig tails (from comm rack to wall board)

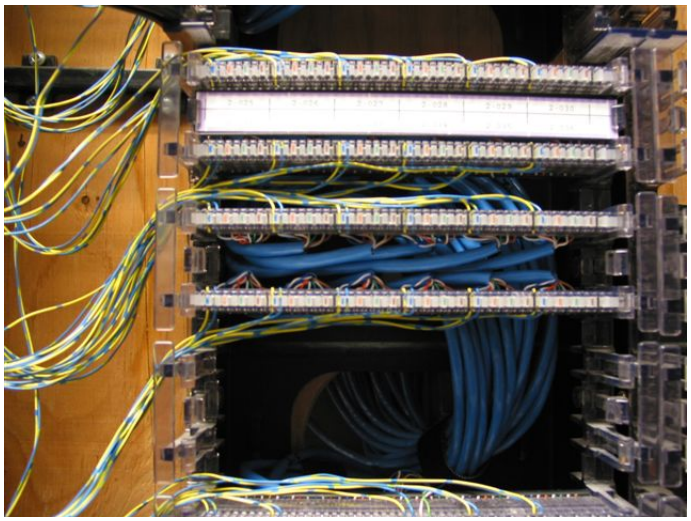
Giga Bix Mount 12 connector AX101472
Giga Bix Connector 6 port AX101447
Giga Bix Wire Guard AX101486
Giga Bix Designation strip AX101483
Kit containing all of the above for 72 ports AX101470. Quantities as required.

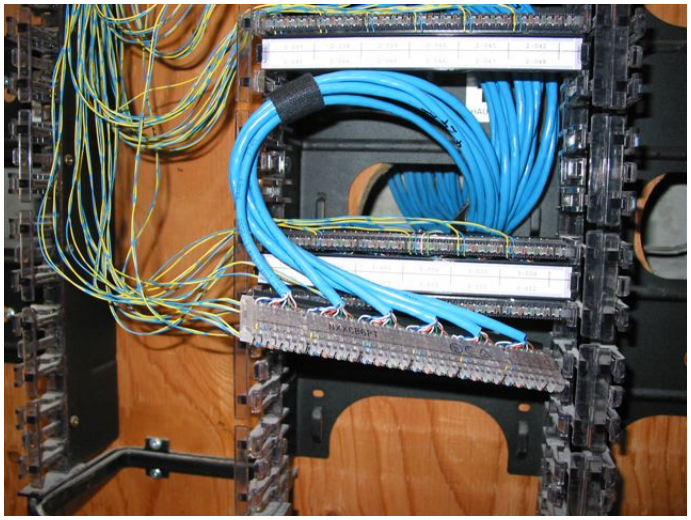
Bix mount for 25, 50, 100, 250 pair voice trunk cable

Bix 10a Mount 250 pair A0270164
Bix 1A connector A0266828
Bix 1A4 connector A0393146
See below pictures for Bix block/pig tails at wallboard and rack.

Document results in CD format. Format shall include tables indicating the expected results and the actual results.

16. Voice Cabling continued - Cat 6 Bix Mount for pig tails





17. Wireless Guidelines

As per new standards for HHS connectivity for computing devices/phones:

The following devices will be or will have the potential to become wireless:
Includes:

- all HHS approved handheld Laptops
- all HHS approved handheld PDA'S
- all HHS approved handheld Tablets
- all HHS approved desktop and handheld IP phones
- all HHS approved BioMedical ***mobile pumps*** for ***infusion data collection*** use
- all HHS, HITS supplied, thin client computers (currently Wyse)

The following devices will continue to be wired:
Includes:

- all HHS approved networked printers
- all HHS approved embossers (or the like)
- all HHS approved 3rd party equipment (GE Med, Siemens, Toshiba, Kodak, etc)
- all HHS approved lab instruments
- all HHS, HITS supplied, ***desktop p.c.'s*** for **regular, *standard suite of applications*** use
- all HHS, HITS supplied, ***desktop p.c.'s*** for ***high resolution***
- ***(e.g. PACS) applications, web browser viewing*** use
- all HHS approved ***desktop p.c.'s*** for ***specific (e.g. PACS GE Centricity) review stations*** use
- all HHS approved ***bedside p.c.'s*** for ***patient infotainment applications*** use
- all HHS approved ***BioMedical p.c.'s*** for ***real time patient monitoring*** use
- all HHS approved Wireless Access Points
- all HHS approved desktop phones (as required)

18. HHS Cabling Direction for HITS/Telecom/Patient Monitoring/other

HHS Cabling Direction for HITS/Telecom/Patient Monitoring/other

There will be a requirement for one CAT 6A data line for every one of the following types of devices:

Includes:
P.C.'s
All Printers (including multifunction laser, thermal)
Embossers
Lab instruments
PACS Centricity Review stations
3rd party equipment (e.g. Radiology)
Wireless Access Points
Observation cameras
Patient Monitoring
Kiosks
Fax machines
Multi-Media equipment
Phones
Signage boards
Donor boards
Debit/Cash Register systems

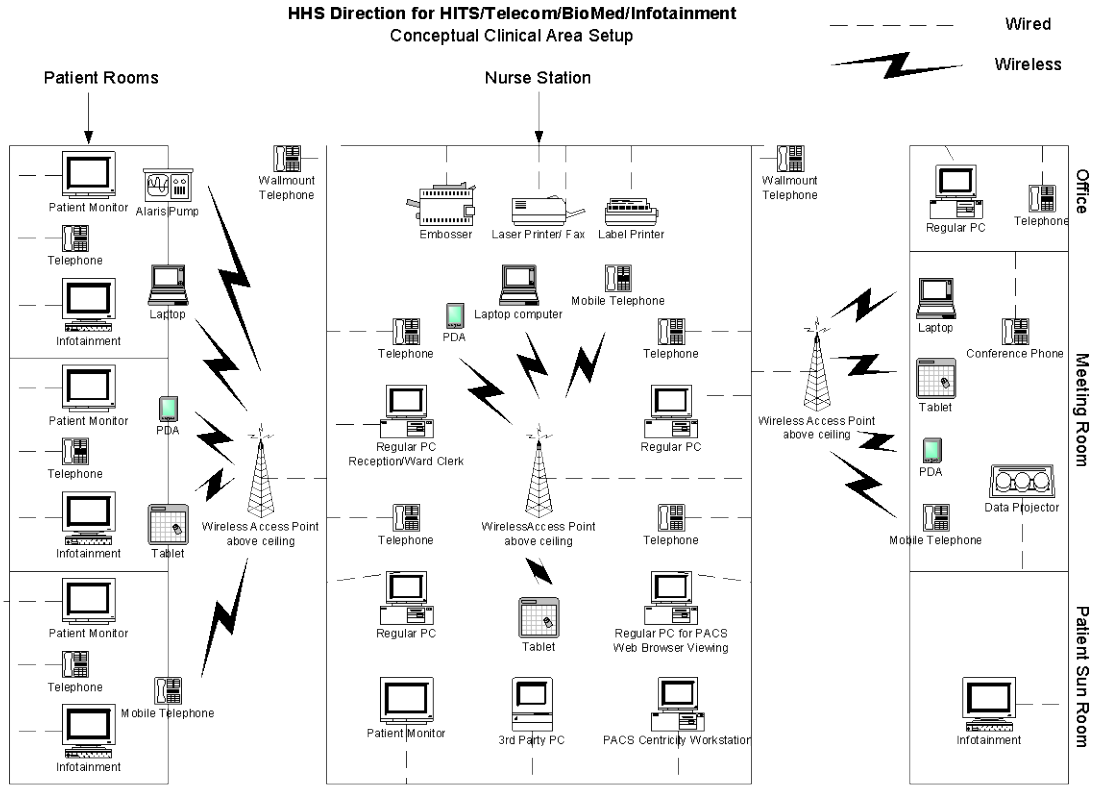
Note 1: The printer/fax may be combined and therefore requiring 2 CAT 6A data lines (1 for data and 1 for voice).

Note 2: If VOIP phone, regular p.c. to connect to back of phone (where applicable)

Note 3: If TDM phone, regular p.c. to connect direct to wallplate or potentially be made wireless (if thin client computer)

Note 4: As part of department moves from one building/wing/floor/area to another building/wing/floor/area, any TDM phones will become wired or wireless VOIP.

18. HHS Cabling Direction for HITS/Telecom/Biomed/other continued



19. Power Requirements for Devices

Emergency power (not limited to the following), will be required, subject to approval process):

Patient Monitoring
All Printers (including multifunction laser, thermal)
Embossers
PACS Centricity Review stations
3rd party equipment (e.g. Radiology)
Fax machines
Important p.c.'s (e.g. Ward Clerk/Reception p.c.)
Other devices (e.g. Acudose Cabinets)

20. Appendix A - Current HHS Communication Room Locations/ID's

Site	Current Closet	old closet splice point	Building	Floor	Location
MUMC	1C7		Main	1st	Red Area 1C7B
MUMC	232		Main	2nd	Red Area 2G32C
MUMC	311		Main	3rd	Red Area 3D11C
MUMC	4D8		Main	4th	Red Area 4D8C
MUMC	3GC		Main	3rd	Red Area 3G51
MUMC	3C7		Main	3rd	Purple Area 3H7
MUMC	3N5		Main	3rd	Blue Area 3N6C
MUMC	2N5		Main	2nd	Blue Area 2N5
MUMC	P10		Main	1st	Blue Area 1P40
MUMC	2QC		Main	2nd	Yellow Area 2Q36C
MUMC	2S3		Main	2nd	Yellow Area 2S3
MUMC	329		Main	3rd	Yellow Area 3X29
MUMC	411		Main	4th	Yellow Area 4W11B
MUMC	336		Main	3rd	Yellow Area 336
MUMC		2-33C to **232**	Main	2nd	beside shaft 33
MUMC		3-57c to **329**	Main	3rd	beside shaft 57
MUMC		2-38C to **2S3**	Main	2nd	beside shaft 38
MUMC		3-54C to **311**	Main	3rd	beside shaft 54
MUMC		2-34C to **232**	Main	2nd	beside shaft 34
MUMC		4-48C to **411**	Main	4th	beside shaft 48
MUMC		2-35C to **232**	Main	2nd	beside shaft 35
MUMC		4-33C to **4D8**	Main	4th	beside shaft 33
MUMC		2-48C to **2S3**	Main	2nd	beside shaft 48
MUMC		3-74C to **3C7**	Main	3rd	beside shaft 74
General	BST		Main	Basement	Outside of Pharmacy

					Storage
General	1Y1		Main	1st	Outside of Pop Health
General	1EL		Main	1st	Across from Pharmacy
General	1PT		Main	1st	Beside Pathology
General	2RD		Main	2nd	Across from Pod 3
General	3SL		Main	3rd	Outside of Blood Bank
General	4WS		Main	4th	Beside 4 West Nurse Station
General	7WS		Main	7th	Beside 7 West Nurse Station
General	3UP		North Wing	3 Upper	Beside Stairwell
General	6NT		North Wing	6th	Beside Housekeeping Room
General	2EW		East Wing	2nd	Beside Old Vault Room
General	4EW		East Wing	4th	Nearby Elevators
General	BMC		McMaster Wing	Basement	Across Theater Auditorium
General	4MC		McMaster Wing	4th	Beside Room 423
General	RMP		Parking Ramp	Level B	Outside of RIA Lab
General	JRS		Junior Residence	Basement	Mechanical Room
General	3HU		HIU	3rd	Beside Waiting Area
General	MSN		293 Wellington	North Side	off hallway, outside of ICT
General	MSS		293 Wellington	South Side	off main hallway
General	R1S		Rehab	South Side	off hallway
General	R2S		Rehab	South Side	off hallway
General	R3S		Rehab	North Side	off hallway
General	R1N		Rehab	North Side	off hallway
General	R2N		Rehab	North Side	off hallway
General	R3N		Rehab	North Side	off hallway
General		1ST ELEV to **1EL**	Main	1st	Beside Pharmacy
General		2 RAD to **2RD**	Main	2nd	off hallway, across Pod 3
General		3 O.R. to **3SL**	Main	3rd	off hallway, across Patient Holding
General		5TH MAC to	McMaster	5th	old Linen Chute

		4MC			
General		7 WEST to **7WS**	Main	7th	off hallway, beside power closet
General		4 WEST to **4WS**	Main	4th	off hallway, beside power closet
General		7TH MAC to **4MC**	McMaster	7th	old Linen Chute
General		2ND MAC to **BMC**	McMaster	2nd	old Linen Chute
General		3 ICU to **2RD**	Main	3rd	off hallway, beside power closet
General		3 ELEV to **3SL**	Main	3rd	off hallway, across service elevator
General		2 E.R. to **1Y1**	Main	2nd	off hallway, across Cardiac Suite
General		1ST PATH to **1PT**	Main	1st	off hallway, across Forensic offices
General		1ST STRS to **BST**	Main	1st	off hallway, across Nutrition Services
General		BSMT to **BST**	Main	Basement	off hallway, outside Pharmacy storage
Juravinski	C90		90 (E/F)	1st	Beside Telecom Room
Juravinski	490		90 (E/F)	4th	Across from Elevators
Juravinski	G60		60 (G)	Ground	Off Hallway to JCC
Juravinski	260		60 (G)	2nd	Beside Reception Desk
Juravinski	140		40 (M)	1st	Behind Elevators
Juravinski	540		40 (M)	5th	Across from Elevators
Juravinski	G15		15 (H)	Ground	Beside Maintenance Shop
Juravinski	215		15 (H)	2nd	Across from Elevators
Juravinski	BLR		25 (K)	2nd	Beside Control Room
Juravinski	CON		Concession Ramp	Mechanical Room	Beside Parking Office
Juravinski	POP		Poplar Ramp	Mechanical Room	1st floor
Juravinski	J0S		new build	Level 0 South	Off main hallway
Juravinski	J1S		new build	1st South	Off main hallway
Juravinski	J3S		new build	3rd South	Off main hallway
Juravinski	J4S		new build	4th South	Off main hallway
Juravinski	J0N		new build	Level 0 North	Off main hallway

Juravinski	J1N		new build	1st North	Off main hallway
Juravinski	J3N		new build	3rd North	Off main hallway
Juravinski	J4N		new build	4th North	Off main hallway
Juravinski	J0E		new build	Level 0 South East	Off hallway outside of OR rooms
Juravinski	J1E		new build	1st South East	Off hallway inside DI office area
Juravinski	J3E		new build	3rd South East	Off hallway inside Clinical Teaching Unit offices
Juravinski	J0W		border of new build/old 90	Level 0 West	Off hallway, across E/F Elevators
Juravinski	J1W		border of new build/old 90	1st West	Off hallway, across E/F Elevators
Juravinski	J3W		border of new build/old 90	3rd West	Off hallway, across E/F Elevators
Juravinski	J4W		border of new build/old 90	4th West	Off hallway, across E/F Elevators
Juravinski		1ST 40 to **140**	40 (M)	1st	inside Electrical Room beside Elevator
Juravinski		GRND 15 to **G15**	15 (H)	Ground	inside CSR Holding Area
Juravinski		2ND 15 to **215**	15 (H)	2nd	other side of wall to current closet
Juravinski		2ND 60 to **260**	60 (G)	2nd	on side wall within current closet
100 King W	KG23		Former Stelco Towers	23rd	Nearby elevators
100 King W	KG22		Former Stelco Towers	22nd	Nearby elevators
100 King W	KG21		Former Stelco	21st	Nearby elevators

			Towers		
Chedoke	HOB		Holbrook	Basement	Telecom Room
Chedoke	WRD		Wilcox	Basement	Room within B06
Chedoke	WC2		Wilcox	2nd	By Elevators
Chedoke	CEN		Central	3rd	Within Office Area
Chedoke	STH		Southam	2nd	Off Hallway
Chedoke	WQ2		West Quarters	2nd	Within Office Area
Chedoke	CBO		Ewart Angus	Basement	In Electrical Room
SPH	LES		Main Building	Lower East	by Classroom B
SPH	LWS		Main Building	Lower West	by entrance to South Wing
SPH	1ES		Main Building	1st East	beside Dental Clinic
SPH	3WS		Main Building	3rd West	near 3 West
SPH	PVS		Pavilion	2nd floor	by Elevators
SPH	PVN		Pavilion	2nd floor	inside secured patient area
688 Concession	688		Main building	2nd floor	near back entrance staircase to 2nd floor
529 Concession	529		Main building	1st floor	near back entrance
West End Clinic	WEC		Main building	1st floor	inside and back of UCC
40 Wellington	WEL		Main building	Main floor	inside of BAHT area
Barton Lot	BPL		Barton Parking Lot	Cabinet	Inside of cabinet
RJCHC	RJ1W		RJCHC	1st	Off main hallway, West side
RJCHC	RJ2W		RJCHC	2nd	Off main hallway, West side
RJCHC	RJ3W		RJCHC	3rd	Off main hallway, West side
RJCHC	RJ4W		RJCHC	4th	Off main hallway, West side
RJCHC	RJ4E		RJCHC	4th	Off main hallway,

					East side
WLMH	AGB		Alexander Globe	Main floor	By door entrance
WLMH	BCE		Basement Central	Basement floor	Inside DI
WLMH	BFR		Basement Front	Basement floor	Inside old Accounting
WLMH	DPV		Deer Park Villa	Main floor	Off hallway
WLMH	GCN		Ground Central	Main floor	Off hallway
JCC	CC0S		By South Elevators	Level 0	Off hallway
JCC	CC0N		By North Elevators	Level 0	Off hallway
JCC	CC1S		By South Elevators	Level 1	Off hallway
JCC	CC1N		By North Elevators	Level 1	Off hallway
JCC	CC2S		By South Elevators	Level 2	Off hallway
JCC	CC2N		By North Elevators	Level 2	Off hallway
JCC	CC3S		By South Elevators	Level 3	Off hallway
JCC	CC3N		By North Elevators	Level 3	Off hallway
JCC	CC4S		By South Elevators	Level 4	Off hallway
JCC	CC4N		By North Elevators	Level 4	Off hallway

21. Existing Cabling De-commissioning (Renovation)

For each and every cable that is required to be decommissioned, the following is required:

- HITS notified of the wallplate ID
- Horizontal cable tested first to ensure end to end connectivity before decommissioning
- Horizontal cable removed from the backside of communication room patch panel, corresponding jack
- Cable is completely removed from office/area back to communication room (or minimally cut above ceiling) – please consult Engineering
- Wallplates and labels removed from wall

i.e.:

office end - RM135-241-140

comm. room end – backside of patch panel for jack 241 (5th patch panel, punch down jack 45)

This work needs to be accounted for in any renovation project that entails removing existing cabling.

Decommissioning for Telecom cabling is to follow suit per the above as much as possible. Cabling may be going to rack or wall mount Bix blocks.

22. Relocating an existing HITS communication room

Relocating an existing HHS HITS communication room

Requires the project/contractor to do the following items:

a. determine all wallplate locations (cables) that go back to the comm room and plot on floor plan with wallplate ID's, including wireless access point locations (if existing)

b. build new comm room, as per HHS Infrastructure spec

c. pull new CAT 6A cables from locations (as required) back to new comm rooms, given 295 feet (90 metre) length spec

d. cutover 'active' wallplates with computing/telephony devices from existing wallplate to new wallplate (as required) with HITS/Telecom (3rd party) assistance

e. remove all old wallplates; and cabling right back to the existing comm room, as per HHS Infrastructure spec

f. provide new patch cables (quantities as required) for new or existing comm room or both, as per HHS Infrastructure spec

g. install new rack system build as per HHS infrastructure spec

h. install voice trunk cabling (as required)

i. provide new patch panels/wire managers (quantities as required), as per HHS Infrastructure spec

Items for costing:

A. Comm room build which includes rack system (with CAT 6A patch panels), fibre optic pull (with fibre patch panels), UPS

B. Average cost for new cable pull (includes terminate, test and label)

C. Cost to determine all existing wallplate locations (plus time to map onto floor plan)

D. Cost to cutover all 'active' wallplates with computing/telephony devices

E. Cost for patch cables

F. Average cost to remove old cable

Relocating an existing HITS communication room continued

G. Cost to install, configure switches, activate and cross-connect switch

H. Voice trunk cabling from comm room to Telephone Room, plus pig tail cabling within comm room

<u>if converting p.c. to wireless instead:</u>
I. cost of wireless card

J. cost of pulling cable/installing WAP

The project is to budget for the following:
1. Contractor time and material
2. HITS/Telecom (3rd party) time
3. HITS material (potential wireless cards)
4. Identify ongoing operating costs

***** The project would be impacting clients as follows***:**
i. disruption to client community to pull new cables to existing wallplate locations and ceilings (for WAP's)
ii. service interruption to client community and computing/telephony devices to cutover from old to new wallplates (cables) or install wireless card
iii. disruption to client community to remove existing wallplates and cabling back up to ceiling

Run rate to cutover 'active' wallplates with computing/telephony devices from old to new wallplates:

15 minutes? per computing device @ 4 devices per hour times 7 hours? = 28 per day?

or

30 minutes? per computing device @ 2 devices per hour times 7 hours? = 14 per day?

23. Cabling practices for MUMC – re: HHS vs University

For any cabling at MUMC, regardless if it is for HHS or University staff and devices, **if it is within HHS physical space,** it is to be cabled to HHS communication room.

There is to be **no cabling of University staff and devices**, to University communication room, if it within HHS physical space.

This also applies to Wireless Access Points. There are to be **no University WAPs within HHS physical space.**

Capital Development/Engineering to consult with HITS for HHS space vs University space understanding at the time of project request.

24. New Building – construction requirements

For new buildings, the following must be included:

- Multiple pathways (conduits) to the base building (containing the central locations for HITS and Telecom) of the site. Two entrance facilities to new building, located at opposite ends of building.

- Multiple pathways (conduits) to the street for connectivity to 3rd parties (Bell, Atria, etc). Two entrance facilities to new building, located at opposite ends of building.

- All communication rooms are to be minimally 300 square feet. Room layout for racks, wallboard BIX blocks, etc, to be as per noted previously in this document (communication room layout). Final sizing and layout to be determined at time of design stage with all requirements of room understood.

- Communication rooms must be situated off of main hallways, not sub-hallways within clinical/staff occupied space. No washrooms situated beside or above. The number of communication rooms required is to be determined at design stage.

- Multiple pathways (conduits) to the floors for connectivity to 3rd parties (eg. Bell) for Hi Speed internet services that may be required separate from the HHS data network and/or for single business telephone lines that may be required.