

Structured Cabling Requirements

AHS Standard

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Technology Architecture & Solutions, Network Services

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2 Document Revisions

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2.2	6-Jul-16	Lisa-Marie Budda	Edits
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3 Acronyms and Abbreviations

This document includes the following acronyms and abbreviations:

- AHS Alberta Health Services
- TAS Technology and Architecture Services

4 Purpose

This is the Alberta Health Services (AHS) standard which must be followed for Structured Data Cabling within all new and renovated AHS Acute Care facilities. Exceptions that deviate from this standard must have written approval from AHS TAS Team and AHS Telecommunications Services representatives assigned to project initiative.

5 Standards References

- ANSI/TIA-568-X.0, Generic Telecommunications Cabling for Customer Premises
- ANSI/TIA-568-X.1, Commercial Building Telecommunications Cabling Standard
- ANSI/TIA-568-X.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standards
- ANSI/TIA-568-X.3, Optical Fiber Cabling Components Standard
- ANSI/TIA-568-X.4, Broadband Coaxial Cabling and Components Standard
- ANSI/TIA-569, Telecommunications Pathways and Spaces
- ANSI/TIA-606, Administration Standard for Telecommunications Infrastructure
- ANSI/TIA-607, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
- ANSI/TIA-1179, Healthcare Facility Telecommunications Infrastructure Standard
- TIA TSB-162, Telecommunications Cabling Guidelines for Wireless Access Points
- ANSI/TIA-526-7-A, Optical Power Loss Measurements of Installed Single mode Fiber Cable Plant
- ANSI/TIA-526-14-C, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant

6 Requirements

This section describes the requirements for UTP and Fiber Optic Structured cabling installation, including:

- System certification
- Cable system manufacturers
- Illustrations
- Work summary
- Cabling limitations

6.1 Cabling System

1. Definition –
 - a. End to End Structured Cabling Solution - Same manufacturer/vendor from wall jack and cover plate, cable, cable jack at patch panel, and patch panel
2. Cable system consistency - Only one manufacturer/vendor may provide an end-to-end structured cabling solution (UTP and fibre) for each project. However for existing sites, once precedence for a manufacturer/vendor has been set for an existing to remain patch panel with

cables remaining, that manufacturer/vendor shall be used for the End to End Structured Cabling Solution for that patch panel.

3. The following objects are required to form a complete system:
 - Telecommunication outlets
 - Modular jacks
 - Fiber optic connectors
 - Patch panels
 - Racks – Standard 19" EIA Steel 45RU 4-Post rack, 30" depth, and #12-24 threaded mounting holes.
 - Rack cable management system – vertical 10" double sided
 - Cable
 - Cable tray
 - Conduits

6.2 Cable Concealment

Install the cable within a conduit or surface raceway when the cabling would be in an exposed location or concealed within inaccessible walls or ceilings. For other locations, install the cable in the ceiling space cable tray or a conduit.

6.3 Shop Drawings, Record Drawings, and Manuals

Telecommunications Contractors must submit:

- Shop drawings prior to commencing installation to AHS, including manufacture's technical documentation on all components used in the structured cabling system.
- Electronic copies to the project team and AHS at project completion of the following documents:
 - System certification
 - All cable test results
 - Zone maps
 - Record drawings

Record drawings must include all structured cable drops, all changes made during construction, and other pertinent details. Indicate label name for each outlet using labeling and identification of each cable as specified in section 7.3.

PDF copy of the record drawings is required.

6.4 Summary of Work

1. Telecommunications Contractors must supply and install a complete structured cabling system based on a physical star wiring topology.
2. The cabling system must be designed and installed in accordance with manufacturer's recommendations.
3. Telecommunications Contractors are responsible for the supply, installation, and termination of all:
 - a. horizontal cables from workstations to TRs

- b. riser (vertical) cabling
 - c. 2U 48 port patch panels
 - d. IDC Punch Down Blocks
 - e. Rack Mount 110 Wiring Block Patch Panels (1U 48 Port Patch Panel) for analog
 - f. racks
 - g. horizontal and vertical cable managers
 - h. telecommunication outlets
 - i. modular jacks
4. Telecommunications Contractors are responsible for labeling and identification of all cables as specified in section 8.3.
 5. Telecommunications Contractors must anchor all required communication racks, brackets, IDC Punch Down Blocks, and cable trays to the wall or floor as appropriate.
 6. Vertical riser cable must be a combination of Single Mode and OM4 Multimode Fiber Optic Cabling. Vertical riser cable over 722 feet (220 m) must be Single Mode Fiber Optic Cabling.
 7. Vertical riser cables for voice must be either:
 - a. CAT 3 for wall mounted IDC Punch Down Blocks
 - b. CAT 6 for Rack Mount 110 Wiring Block Patch Panels

7 Installation

This section describes requirements for:

- Horizontal UTP Data Cabling
- Vertical Fiber Optic Data Cabling
- Cable Labeling
- Cable Testing

7.1 Horizontal UTP Data Cabling

This section describes the requirements for installing horizontal UTP data cabling.

7.1.1 Cabling Segments

Cabling must be installed in unbroken segments from a central TR to an individual communication outlet location. No intermediate punch down blocks, splices or breakout boxes may be installed between the TR and the communication outlet.

7.1.2 Telecommunications Room

In the TR:

A 10 foot (3m) service loop must be accommodated.

Maximum Cable count per rack is 384 UTP cables; initial install shall be designed to 288 cables maximum to allow additional future growth in each rack.

All cables must be dressed neatly in bundles of 24 or 48 as a maximum per bundle.

7.1.3 Telecommunications Outlet Location

Telecommunications Outlets are an assembly of components consisting of one or more connectors mounted on a faceplate, housing, or supported bracket. Regarding telecommunications outlets:

1. At each telecommunications outlets location, cables must be terminated in a wall-mounted, ceiling-mounted, or systems furniture T 568(A) compliant telecommunications outlet from specified manufacturers.
2. No service loop is required at the cabling's workstation-end.

7.1.4 Physical Characteristics

Physical cable characteristics include:

1. Type - As recommended by ANSI/TIA-1179
2. New Installations (New Patch Panels) - Category 6A unshielded twisted pair (UTP) as defined in ANSI/TIA-586-X.2, 500MHz minimum channel bandwidth.
3. Existing installations - Minimum Category 6 unshielded twisted pair (UTP) as defined in ANSI/TIA-586-X.2, 300MHz minimum channel bandwidth.
4. Yellow color jacket.
5. EIA/TIA-568A Pin/Pair assignment
6. Patch cables - Include two 7ft (2.1m) patch cables per horizontal cable run.
7. Fire rating: As per Safety Codes Act

7.1.5 Cable Trays and Conduits, Wire Mold

All cabling must be installed inside walls or ceiling spaces within conduit or flex tray to the following specifications:

1. Cable trays must be wire mesh, sized appropriately to the amount of cables used for the project so that the amount of cables does not exceed a 40% fill rate.
2. Cable trays should be installed above drop ceilings in corridors and not above offices or inaccessible spaces.
3. All Raceways must be installed as per Canadian Electrical Code.
4. Cable trays passing through a hard ceiling must have access ceiling panels installed at 5 foot (1.5m) intervals.
5. Access ceiling panels should be within 2 feet (0.65m) from the cable tray; panels must not be mounted directly underneath the cable tray.
6. Cable trays must be continuous from end-to-end. Corners, offsets, or height variations must be achieved using manufacturer-specified hardware and methods.
7. Cable trays must comply with manufacturer's methods for hanging, extending and supporting, and loading.
8. Where cable trays are used, a conduit must run from the cable tray to the Telecommunications Outlet. The conduit must be secured and bonded accordingly.
9. For cable trays shared with other low voltage systems:
 - a. install a separator in the cable tray;
 - b. dedicate one-third of the tray for the low voltage system;
 - c. Dedicate two-thirds of the tray for structured cabling.
 - d. the separator must be bonded properly;

- e. the structured cabling side must not be shared with other systems; and
 - f. The structured cabling side must maintain the 40% fill rate.
10. Install a #6 AWG copper bonding conductor to bond all sections of the cable tray system to the ground buses in the relevant logistics room.

7.1.6 Conduit Fill Rates

As per cabling manufactures standards, must not exceed 40% fill rate.

7.1.7 Concealed Cabling

Any exposed cable run that cannot meet the standards outlined in sections 7.1 must be enclosed in an appropriate raceway.

- **Surface Mount Raceway.** Cable that cannot be run inside a protected space must be enclosed in a protective surface raceway. Protective raceways must be permanently attached to underlying wall surfaces with appropriate wall anchors. If the raceway also provides power to an area near data cables, the data cables must be in a separate channel at least 2 inch (5.08cm) away from the power cables.
- **System Furniture.** Terminations must reside within the furniture system as specified by the furniture manufacturer design for data cabling. This includes terminating, labeling, and testing of installed data cables. All termination components (excluding the modular jacks) within the system furniture will be supplied by the furniture manufacturer, unless otherwise specified within the tender document.

7.1.8 Securing Cables

Cable securing requirements include:

1. All cables must be dressed neatly.
2. All cables must be physically secured to prevent accidental dislocation or damage.
3. Do not secure cabling to:
 - a. the outside of a conduit;
 - b. gas pipes;
 - c. plumbing pipes;
 - d. steam pipes; or
 - e. Any other functional pipes.

7.1.9 Number of Cables

The number of modular outlets per location is a minimum standard based on VoIP deployment.

<u>Location</u>	<u>Minimum UTP Cables Per Outlet</u>
Workstation – Offices	2
Workstation – Cubicles	1
Workstation – Drop-ins	1
Wall-mount Phones	1

Printer Stations	2
Security & Building Management System (BMS) Panels	2
Meeting Rooms	2 (per wall)
Nurses' Desks	4
Ceiling Telecommunication Outlets (easily accessible)	1
Ceiling Telecommunication Outlets (not easily accessible)	2
Clinical – Rooms	2
Clinical – Other Areas	TBD (clinician business requirements)
Other	TBD (project business requirements)

7.1.10 Data Cable Termination

7.1.10.1 Workstation

Workstation data cable termination requirements include:

1. Identify each modular jack on the telecommunication outlet faceplate according to the labeling standard in section 7.3
2. Each specified telecommunication outlet must have a minimum of two outlets for modular jacks.
3. Telecommunication outlet face plate must be white-colored.
4. Each module jack shall be Yellow for Data.
5. Telecommunication outlets must be flush mounted.
6. No floor level installations without prior written approval from the AHS.
7. Telecommunication outlets that must be surface mounted must be well-secured.
8. Telecommunication outlets must not be mounted on or within; temporary, moveable or removable surfaces; doors, access hatches or ceiling spaces.

NOTE: Please work with the local TAS Rep on jack colors as there may be requirements for color coding in separate racks for other entities.

7.1.10.2 Ceiling Terminations

Ceiling data terminations are required for various devices that are mounted on the ceiling (e.g., wireless access points, IP security cameras, and projectors). Refer to TSB-162 for installation practices. Ensure contractor coordinates with AHS for detailed information on ceiling mounts. All ceiling mount installation must be surface mounted.

7.1.10.3 Telecommunications Room

TR data cable termination requirements include:

1. All TR cables must be terminated on a UTP patch panel installed in a data rack. Punch down modular jacks on UTP patch panels in the TR.
2. All cables must be left with a service loop approximately between the patch panel and the point at which the cable enters the TR. Excess cable should be run down the side of the data rack in basket style tray and looped back up again to the patch panel where it ultimately terminates.

3. All data lines must follow a neat uniform path; data lines must not separate away from any of the other data lines in the bundle (the only exception is where the data lines “fan out” at the patch panel into individual modular jacks).
4. The twist of each individual pair must be maintained up to the connection point at the patch panel connection area.
5. All cables from a given room must be punched onto adjacent modular jacks in the same order that they are numbered within the room.
6. Cables must be punched down in sequential order, increasing by room number.

7.1.11 Voice Tie Cable – Riser Cable

Riser cable voice tie cables requirements include:

1. In the TR, vertical riser cables for analog voice services (tie cables) must be terminated on IDC punch down blocks that are firmly connected to a plywood backboard.
2. At least 10 feet (3m) of service loop tie cable must remain to facilitate future changes.
3. AHS must approve the type and location of any blocks and plywood backboards prior to installation.
4. From the wall-mounted IDC Punch Down Block, tie cables must be run to the designated analog rack and terminated onto Rack Mount 110 Wiring Block Patch Panels (1U 48 Port Patch Panel). Specifically, for the tie cable from the IDC Punch Down Block to the Rack Mount 110 Wiring Block Patch Panels. At the wall mounted IDC Punch Down Block, these cables must be terminated on the top portion of the Punch Down Block. Sufficient quantities of IDC Punch Down Blocks and Rack Mount 110 Wiring Block Patch Panels (1U 48 Port Patch Panel) to accommodate all analogue requirements must be installed; consultation with AHS Telecommunications Services may be required.

7.2 Vertical & Horizontal Fiber Optic Data Cabling

This section describes the requirements for installing vertical fiber optic data cabling.

7.2.1 Cabling Segments

Cabling must be installed in unbroken segments between TRs and the Network Core Rooms (NCR). No intermediate punch down blocks or splices may be installed between the TRs and NCRs.

1. Fiber Optic cables must be terminated on compliant patch panels from specified manufacturers.
2. A 10 foot (3m) service loop will be accommodated in the TR.
3. If TR has 2 rows of racks fiber shall be installed in a compliant wall mount fusion splice enclosure from specified manufacturers.
 - a. Fiber strands from each core room will be split 50% to each row of racks.
 - b. Appropriate LC pigtail fiber terminations are to be used to extent to each row of racks compliant patch panels.
 - c. Appropriate LC pigtail fiber shall run in a mechanical protection fiber duct from wall enclosure to rack mounted patch panel.

7.2.2 Cable Trays and Conduits

1. When installing the fiber optic cable in a structured cable tray system:
 - a. the fiber optic (backbone or campus) cables must be installed as per requirements of the Safety Codes Act;
 - b. the duct must then be secured to either the side rail of the cable tray or bottom rungs, every 4 feet (1.3m) using a Velcro strap;
 - c. during installation, the bend radius must adhere to the specifications in the previous point;
 - d. all bends and offsets within the cable tray must meet the minimum bend radius of the fiber optic cable being installed; and
 - e. The fiber duct must be secured at all bends and offsets after installation using a Velcro strap to ensure the minimum bend radius is maintained.
2. If the fiber optic cable is installed in conduit:
 - a. a pull or junction box must be installed on every floor and the cable must be looped inside the pull or junction box on each floor for strain relief;
 - b. the cable should not be pulled through more than two 90-degree bends at one time; if more than two 90-degree bends are required, a pull or junction box must be installed and the fiber optic cable installed from a central point
3. Fiber optic cable installed in vertical riser (backbone riser or campus only) is not required to be installed in duct or conduit. If installing without a conduit:
 - a. fiber support grips must be used;
 - b. the maximum span allowed between grips will be 6 feet;
 - c. Velcro straps must be used to secure the cables to the fiber support grips; and
 - d. Non-standard plastic tie wraps are not allowed.
4. Non fire rated Fiber duct shall not be used to install fiber cable in a riser.

7.2.3 Number of Fiber Strands

The minimum multimode column specifies the number of cables bundled using OM4 50/125µm (850nm laser-optimized) tight-buffered strands per TR. The minimum single mode column specifies the number of cables bundled using 8/125µm (900µm) tight-buffered strands per TR from each NCR.

If the number of racks in a TR is greater than 6 please consult with local TAS rep to discuss required amount of fiber strands.

<u>Minimum Length</u>	<u>Maximum Length</u>	<u>Minimum Multimode</u>	<u>Minimum Single Mode</u>
300 feet (90m)	722 feet (220m)	24	12
722 feet (220m)	9840 feet (3000 m)		36

7.2.4 Fiber Cable Termination – Telecommunications Room

Data cable terminations must be made using Fiber Optic LC connectors from the specified manufacturers. The connectors must match the cabling chosen to provide a complete end-to-end solution. General requirements for fiber optic data cable termination are as follows:

1. All multimode and single mode fiber strands must be terminated using fusion splicing technique and appropriate LC pigtail fiber terminations.

2. All TR cables must be terminated on rack-mounted 1-2 fiber optic patch panels installed in a data rack.
3. All NCR cables must be terminated on rack-mounted 4U fiber optic patch panels installed in a data rack designated for fiber distribution.
4. All panels must include:
 - a. shelves with brackets for 19" frame mounting;
 - b. panels loaded with duplex LC couplings or adapters (as needed for the specific TR);
 - c. cover plate; and
 - d. Jumper supports.
 - e. Fusion splicing tray system if fusion splicing is not done is a separate wall enclosure.
5. The fiber optic panels must be installed at the top of the equipment rack.
6. All fiber optic cables must follow a neat uniform path; cables may not separate away from any of the other cables in the bundle (except where the fiber cables "fan out" at the patch panel into the individual patch panel modules).
7. All cables from a given remote TR must be punched onto adjacent fiber optic connectors in the same order that they are numbered within the remote NCR.
8. Cables must be punched down in sequential TR number increasing order.

7.3 Labeling

This section describes labeling of AHS Structured Cabling.

7.3.1 Labels

The use of electronic label makers labeling cables, patch panels, and end termination telecommunication outlets is required.

Each cable must be labeled. Use printed (not hand-written) laminated labels between 3 and 6 inches from the cable ends.

Labels must be clean and legible, without smudges, fingerprints, and dirt. The labels must:

- be lettered using permanent black on a white background;
- have lettering be 1.18 inch (3mm) high; and
- Have tag dimensions 0.5 inch (12mm) high by 1.5 inch (38mm) long.

7.3.2 Data Cable Labeling – Telecommunications Room

Telecommunication room patch panel labels must:

- identify the end termination location; and
- point to the end termination room and telecommunication outlet modular jack;
- be laminated; and
- Be positioned above the designated patch panel modular jack.

Fiber optic data cable termination labels must meet the following requirements:

1. Labels must identify the remote TR location and the location within that TR.
 - a. In the Remote TR:

- i. All racks must have a number assigned.
 - ii. All patch panels must have a letter assigned.
- b. All cables must be labeled using the:
 - i. TR number;
 - ii. rack number (e.g., 1, 2, 3, ...);
 - iii. panel letter (e.g., A, B, C, ...); and
 - iv. Fiber optic connector number (e.g., 1, 2, 3 ...).

End device room number suffixes must adhere to a format of **###-N** where:

- **###** represents the room number; and
- **N** represents the modular jack sequence number, starting at 1.

Room number suffixes begin at the first telecommunications outlet modular jack to the left of the primary entrance door. The suffixes are numbered sequentially, clockwise around the room. In Data Centers, the rack number should replace the room number on the labeling.

Example labels:

- The first modular jack in room 245 would be labeled 245-1.
- The second modular jack in room 245 would be 245-2.
- The third label for a cable going to room 245 would be 245-3.
- A fiber optic cable pulled from TR #1DR5, rack 1, panel A, and fiber optic connector pair 5 would be: **1DR5-1A-5**.

Note that room numbers as identified on site drawings **must** be used.

7.3.3 Data Cable Termination Labels – Workstation and Ceiling

Data cable termination labels must meet the following requirements:

1. Labels in the work area must identify the TR location and the location within that TR.
2. All racks must have a number assigned.
3. All patch panels must have a letter assigned.
4. All cables must be labeled using the:
 - a. TR number;
 - b. rack number (e.g., 1, 2, 3, ...);
 - c. panel letter (e.g., A, B, C, ...); and
 - d. Modular jack number (e.g., 1, 2, 3 ...).
5. Laminated labels should be positioned above the faceplate.

7.4 Compliance Testing

This section describes testing for horizontal UTP cables and fiber optic cable.

7.4.1 Horizontal UTP Cable

AHS requires all data communication pairs be tested for full UTP specification compliance. Telecommunications Contractors must provide test result documentation for all conductor pairs of each

cable. The test result documentation must include all UTP testing parameters. Further, the test results of electrical characteristics must be provided in an electronic PDF media format, having the workstation location modular jack number easily identified.

Tests must be run from the logistics closet patch panel through the installed modular jack at the workspace-end of the cable (i.e., the permanent link). All cables must be verified bi-directionally on a Level III tester that is calibrated according to the manufacturer's specifications. Five percent of the installed cables require Channel Testing using the CAT6/6A Channel setting of the Level III tester. All cables must meet or exceed the manufacturer's performance values.

Testing must be conducted in accordance with the published standard ANSI/TIA/EIA 568-X.0. All four pairs must meet or exceed current CAT6/6A specifications; cables that do not meet or exceed current CAT6/6A specifications must be inspected for anomalies and re-terminated or replaced if necessary to ensure compliance.

7.4.2 Fiber Optic Testing

Test in accordance to TIA-586-X.0 guidelines. Perform an end-to-end attenuation test to verify a quality installation and to ensure high-quality system performance.

8 Exceptions

AHS must approve any exceptions to the design requirements in writing before work begins. Requests for clarification or exceptions to these specifications must be directed to AHS.

9 Contact

AHS.NetworkStructuredCabling@albertahealthservices.ca

10 Approval

This document is approved by:

Approved By		
Name: Robert Dobson	Title: Director, Network Services	Date: dd / mm / yyyy 19/10/2016
Signature: 		