

Section 27 21 33  
Data Communications Wi-Fi Access Points

**Part 1 General**

1.1 Objective

- 1.1.1 This section specifies requirements for the design/layout, and installation of communications data outlets that are to serve IEEE 802.11 wireless access points (WAPs).
- 1.1.2 It shall be mandatory that these standards and specifications, for communications infrastructure related work on the University campus, are adhered to stringently by all Toronto Metropolitan University (TMU) staff and external contractors.
- 1.1.3 All work associated with these specifications shall comply with the Canadian Electrical Code (part 1), Ontario Electrical Safety Code (OESC) and the Ontario Building Code.
- 1.1.4 Wiring standards are dynamic and constantly changing due to continually evolving networking standards. Computing and Communication Services (CCS) holds the responsibility for approving changes to these specifications and all parties shall be responsible for acquiring the latest approved copy of these standards for use on any project.
- 1.1.5 These standards cover the basic requirements for all projects in new and existing buildings.
- 1.1.6 The department, Communications Services of CCS, Computing and Communications Services is responsible for the communications infrastructure at the University. CCS in consultation with building occupants are to be involved in the design process.
- 1.1.7 Toronto Metropolitan University appointed designates shall be consulted during the design and construction phases, and must approve all the designs prior to the construction phase. CCS is to be consulted as questions arise during the construction phase.

1.2 General Intent

- 1.2.1 The general intent of this document is to provide the architect, interior designer, engineers, Registered Communications Distribution Designer (RCDD) and Communications Contractor the tools necessary to ensure that all Toronto Metropolitan University standard telecommunications requirements are met where it relates to Wi-Fi Access Points.
- 1.2.2 Toronto Metropolitan University reserves the right to modify these requirements based on the needs of a particular project, however, the requirements outlined in this document shall represent the initial design requirements for any new project unless advised otherwise by Toronto Metropolitan University.
- 1.2.3 Where the architect, interior designer, corporate real estate or engineer wish to deviate from the Toronto Metropolitan University Communications Design Standards prior written approval shall be obtained from Toronto Metropolitan University.

1.3 Design Requirements

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- 1.3.1 A single surface-mount or recessed box shall be specified at locations for wireless node connectivity. Each access point location shall contain two (2) data wires for connectivity. The locations may be specified on the wall below the suspended ceiling as a surface-mount box or attached to the ceiling grid.
- 1.3.2 CCS personnel will specify outlet locations during building design process.
- 1.3.3 A. Coverage areas
  - 1. All building spaces shall have coverage for currently supported Wi-Fi standards (this includes 802.11a/b/g/n/ac at a minimum SNR of 25dBm)
  - 2. Outdoor coverage around the exterior of the building shall be provided for all high-user areas and where practical in other areas. Outdoor access points should be mounted at a height of between 4.57 m (15 ft) and 9.15 m (30 ft) and spaced approximately 38.1 m (125 ft) apart.
    - a) Outdoor wireless coverage may require building exterior wall penetration, the mounting of antennas on the building exterior and underground pathways to strategic WAP outdoor mounting locations such as emergency call boxes and signs.
    - b) Coordinate with CCS during design for best indoor and outdoor locations.
- B. Density of communication outlets for WAPs
  - 1. Residence halls – one per room
  - 2. Other typical buildings – one per 58.08 gross sq. m. ( 625 gross square feet).
  - 3. Unique requirements
    - a) For areas where high end-device density is anticipated, special consideration for wireless coverage shall be examined.
      - 1) Generally, 25 end-devices (not persons) per WAP.
      - 2) As wireless technology rapidly evolves, changes to RF spectrum usage may trigger changes to WAP density and mounting.
    - b) Auditoriums and large classrooms utilize applications requiring a high density of WAP coverage and also require special accommodations for WAP installations. The WAP density is driven by concurrent users sessions and bandwidth requirements in the space instead of area coverage. Close consultation with CCS is required.
    - 3) Proper installation and mounting of WAPs in these spaces may result in WAPs with moderate to high visibility. Mounting above a hard deck ceiling or below a hard floor or in proximity to metal building components, HVAC ducts, etc. can diminish the wireless signal beyond the tolerances for a high-density deployment.
    - 4) Cabling pathways to ceiling mount WAP locations as well floor or wall locations must be planned. Pathways are to be rigid conduit placed above ceiling, or in the wall.
- C. Identification on drawing floor plans
  - 1. Communications data outlets for WAPs shall have a distinct symbol on the drawings.
- D. Cabling infrastructure
  - 1. Each communications data outlet for a WAP is to be served by two (2) category 5e, 6 or 6a outlets/cables, depending on the building structured cabling design.
  - 2. Cable locations/mounting will be designed for below ceiling and flush mounted WAPs. Any exceptions, such as high-density locations, shall be approved by CCS.
  - 3. The outlet backbox shall be affixed to the structure.

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1.3.4 Patch Cords

Provide (1) 7' and (1) 1' patch cord. Patch cords can be coiled to reduce slack cordage. Cordage shall not be placed on top of ceiling tiles.

1.4 Related Documents

1.4.1 The latest versions of the following codes, standards, and guidelines shall be followed. Bring to CCS' immediate attention where construction documents or conditions differ from requirements in codes, standards, guidelines and specifications.

1.4.2 The following standards:

1. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises
2. ANSI/TIA 568-C.1, Commercial Building Telecommunications Cabling Standard
3. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standards
4. ANSI/TIA -568-C.3, Optical Fiber Cabling Components Standard.
5. ANSI/TIA-568-C.4, Broadband Coaxial Cabling and Components Standard
6. TIA-569-D, Commercial Building Standard for Telecommunications Pathways and Spaces
7. TIA-162-A Telecommunications Cabling Guidelines for Wireless Access Points
8. TIA-4966 Telecommunications Infrastructure Standard for Educational Facilities

1.4.3 The following guidelines:

1. BICSI, Telecommunications Distribution Methods Manual (TDMM)
2. BICSI, Information Transport Systems Installation Methods Manual (ITSIMM)
  
3. BICSI-003 Information Technology Systems Design and Implementation Best Practices for Educational Institutions and Facilities

1.4.4 The following project specifications:

1. 27 05 26 Grounding and Bonding for Communications
2. 27 05 53 Identification for Communications Systems
3. 27 08 10 Optical Fiber Testing and Measurement
4. 27 08 20 Copper Testing
5. 27 11 19 Communications Terminations Blocks and Patch Panels
6. 27 13 23 Communications Optical Fiber Backbone Cabling
7. 27 15 13 Communications Horizontal Copper Cable
8. 27 15 43 Communications Faceplates and Modular Jacks
9. 27 16 19 Communications Patch Cords, Station Cords, and Cross Connect Wire

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1.5 Quality Assurance

- 1.5.1 The Communications Contractor shall install all equipment and material in accordance with the standards aforementioned in this section.
- 1.5.2 Quality and workmanship shall be at the highest of professional tradesman levels to be accepted for completion. The Communications Consultant shall have the sole right to reject any work not in accordance with industry standards.
- 1.5.3 All work shall also be performed in accordance with the latest BICSI installation standards and best practices.
- 1.5.4 Communications Contractors shall provide installers trained in all applicable codes, standards, regulations and installation standards as well as have structured cabling industry certification, such as BICSI or NCS.
- 1.5.5 All installers shall have successfully completed the approved manufacturer's installation training program .The Client reserves the right to receive written proof of such training at any time during the project. If such proof is not provided the Communications Contractor will remove the installer from the site immediately and replace the installer within 24 hours.
- 1.5.6 The maximum horizontal run length shall not exceed 90-meters. If the 90 meter constraint cannot be met, the Communications Contractor shall notify the CCS immediately (prior to installation).

**Part 2 Product**

2.1 General

- 2.1.1 All equipment and products supplied shall be new and free of all manufacturer defects and delivery or installation damage.
- 2.1.2 All equipment and products supplied shall meet all manufacturer listed characteristics as identified in the latest manufacturer catalogue.
- 2.1.3 All products shall meet all applicable codes and standards and bare the UL/ULC label, be CSA approved and meet FCC/CRTC Regulations.
- 2.1.4 All products shall be provided in accordance with local, provincial and national fire ratings for the installation on this project.
  - A. CCS will provide the WAPs and related equipment(brackets, POE switches, controllers) in its scope of the project, and can provide the architect specifications for aesthetic concerns. Equipment changes frequently, so the project must get the current part numbers from CCS.
  - B. Typically used WAP models (as of July 2015)
    - 1. Aruba AP-225 Wireless Access Point 802.11ac, 3x3:3, dual radio, integrated antennas
    - 2. Aruba AP-275 Outdoor Wireless Access Point 802.11ac, 3x3:3, dual radio, integrated antennas
    - 3. RFM-ARUBA-225-WMB Description: RFM BRACKET ARUBA 225 WALL MOUNT IVORY

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RFM-ARUBA224-BRKT Description: RFM BRACKET ARUBA 225 2 PIECE DESIGN  
IVORY

### Part 3 Execution

#### 3.1 General

- 3.1.1 The Communications Contractor shall supply all materials, labour, tools and equipment to provide a complete warranted installation as outlined in the contract documents and suitable to the approval of the Client, Communications Consultant and inspection bodies having jurisdiction.
- 3.1.2 The Communications Contractor shall be responsible for installing and providing pulling strings, ropes and fishing walls wherever conduit is not installed or conduit is installed without these provisions.
- 3.1.3 Provide continuity of all existing services while completing the specified installation. Losses due to interruption of services will be the responsibility of the Communications Contractor.
- 3.1.4 Arrange for all shutdowns (1) week prior in writing with the Project Manager and those in control of services shall be disrupted. All overtime costs, fees, security and other requirements shall be the full responsibility of the Communications Contractor.
- 3.1.5 Should services be interrupted accidentally the Communications Contractor shall provide material and labour to re-establish services immediately and shall continue without stoppage until all services have been re-established. All material and labour costs including overtime shall be borne solely by the Communications Contractor. Any material and/or labour costs including overtime associated with other trades and/or the General Contractor to assist in any way the Communications Contractor in re-establishing services shall be borne solely by the Communications Contractor.
- 3.1.6 The Communications Contractor shall write down the following information prior/during installation to be given to CCS Network personnel. This information is required to provision the WAP's and complete the network side of the installation. CCS will provide the Wireless Access Point (WAP) Installation Requirements guide for the contractor to complete.
  - Building name – Building within which the WAP's are being installed
  - Physical Location – Please note the area/room number/orientation
  - Cable number – The cable number corresponding to the patch panel
  - Media Access Control (MAC) address – This is located on the back side of the WAP - see the sticker with two bar codes, one is labeled "MAC". Please transfer the sticker to the template.

#### 3.2 Labour

- 3.2.1 The Communications Contractor shall provide only skilled, trained tradesmen experienced in the installation of a certified installation. Sub-contractors, if used, must be approved by the Client before the commencement of the project.

#### 3.3 Installation

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- 3.3.1 Adequate space and provisions shall be left for removal of components and servicing of equipment, with minimum inconvenience to the operation of systems.
- 3.3.2 Communications Cabling shall not touch or be supported from piping, ductwork, conduits, ceiling supports or any other service / equipment. Communications Cabling shall be supported by approved j-hooks, cable slings, ladder / basket tray and/or conduit as outlined in this document.
- 3.4 Quality Control
  - 3.4.1 All CAT5E/CAT6/6A cabling links in the wireless access point installation shall be tested for the following, in accordance with the field test specifications defined in ANSI/TIA-568-C.2 "Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard".
  - 3.4.2 All fiber optic cabling links in the wireless access point installation shall be tested for the following, in accordance with the field test specifications defined in ANSI/TIA-568-C.0 "Generic Telecommunications Cabling for Customer Premises"
- 3.5 Coordination
  - 3.5.1 Work causing noise, dust and/or odour shall be performed during evenings and/or weekends to prevent disturbance to the operation of the Client's or surrounding businesses. Work shall be performed at agreed times and in coordination with each party. All damages caused for work performed not in compliance with this item shall be the responsibility of the Communications Contractor.
  - 3.5.2 Communications Contractor shall coordinate with TMU to ensure the protection of the active LAN Hardware from dust and debris.
- 3.6 Site Conditions
  - 3.6.1 The Communications Contractor is responsible for maintaining a clean work environment and is responsible for the removal of all debris on a daily basis. Debris and removed materials shall be disposed of in conformance with all local by laws and regulations. Failing to comply and after reasonable time and written notice the General Contractor reserves the right to hire cleaners to complete the cleaning and back charge the Communications Contractor.
  - 3.6.2 The Communications Contractor shall be responsible for the removal and reinstallation of all floor or ceiling tiles, hatch ways or access panels. All items shall be removed and replaced on a daily basis and left in the original condition. Special caution shall be taken to not break, chip or discolour with dirt or finger prints any such items. The Communications Contractor will be fully responsible for repair or replacement of all damaged pieces at the discretion of the Project Manager or Client.
  - 3.6.3 All materials and installation throughout the project will remain the responsibility of the Communications Contractor until final completion for the project is accepted by the Client. Damages to any item installed shall be replaced or repaired by the Communications Contractor to provide a complete final installation at no additional cost to the Client.
- 3.7 Safety

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- 3.7.1 The Communications Contractor shall adhere to all safety laws, rules and regulations issued by the authorities having jurisdiction, General Contractor, Project Manager and the Client.
  - 3.7.2 At all times maintain clear fire exits, emergency routes and access to emergency equipment including fire hose cabinets, fire extinguishers and stand pipe connections.
  - 3.7.3 Smoking and combustion of any materials is strictly prohibited on all sites.
  - 3.7.4 Provide protection as required by the authorities having jurisdiction to all employees for work performed in typically inaccessible or concealed spaces.
- 3.8 Site Adjustments
- 3.8.1 Locations of all equipment, outlets or devices prior to installation may be revised to within (3) meters without any additional cost or change request.
  - 3.8.2 Portions of the project may be at any time identified in writing to be "On Hold". Work in these areas shall not be started, continued or completed until further direction is received. No additional cost shall be accepted by the Client for areas put on hold.
- 3.9 Substitutions
- 3.9.1 Substitution of any product shall be prior approved in writing by only TMU CCS and the Communications Consultant.
  - 3.9.2 The procedure for substitution approval will include the written submission by the Communications Contractor including the following:
    - .1 Original specified product
    - .2 Proposed product being substituted
    - .3 Reason for substitution
    - .4 Shop drawings indicating all technical specifications
    - .5 Financial advantage
    - .6 Schedule delivery date
    - .7 Written approval from certifying system manufacturer
  - 3.9.3 Based on the review of the information requested above, the Client and/or Communications Consultant reserve the right to reject any proposed substitution without delay or cost to the project or the Client.
- 3.10 Material Handling
- 3.10.1 The Communications Contractor is responsible for the delivery of all materials to site and transportation to the work place in accordance with all safety regulations and procedures.
  - 3.10.2 Make arrangements and schedule all hoisting with Building Management and the General Contractor.
  - 3.10.3 Provide and be responsible for lockable storage for all tools and material required to complete the installation through the duration of the project. Once the project is complete remove all tools and excess materials within 2 business days.

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- 3.10.4 The Client and its representatives shall in no way be held liable for any missing material, equipment or tools required to complete the installation.
- 3.11 Cutting, Patching and Repairing
  - 3.11.1 It is the responsibility of the Communications Contractor to perform all cutting, patching and repair related to the Communications Cabling work including any penetrations through walls or floors.
- 3.12 Firestopping
  - 3.12.1 The Communications Contractor is required to properly fire-stop any penetrations through fire barriers utilized for the placement of telecom cabling. Provide fire resistant intumescent materials to restore fire ratings to wall, floor, or ceiling penetrations according to local, provincial and national codes.
  - 3.12.2 Fire stop systems shall meet the requirements of ULC Standard CAN/ULC-S115.
- 3.13 Hoisting Facilities
  - 3.13.1 This Division shall provide its own hoisting facilities regardless of height required to perform work.
  - 3.13.2 Hoisting facilities may be provided by the General Contractor, although the General Contractor may at its own discretion not allow the Communications Contractor to make use of such.

End of Section 27 21 33