

Note to the Designer/Architect/Engineer: These Specifications are basic minimum criteria to be met in preparing the final project specifications for this section, which is the responsibility of the Designer

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1.0 GENERAL

- .1 York University requires Wi-Fi infrastructure design services to determine optimum placement of Wi-Fi Access Points and antennae to accommodate the daily needs of its students, faculty, researchers and staff. The University wishes to deliver no less than a defined minimum standard of Wi-Fi services to all students are particularly in high density areas which may accumulate upwards of 300 people at a time.
- .2 The Wi-Fi infrastructure must be capable of accepting associations from all active client devices concurrently assuming all spaces in the building are occupied to the maximum safe occupancy limit.
- .3 The building must also be capable of supporting mass concurrent roaming of client associations between APs (such as during change-over times between classes).
- .4 The placement of APs must take into account the risk of performance impacts to stationary clients (e.g. in class room/lecture hall) posed by drive-by associations due to active clients passing by or congregating outside of classroom/lecture halls.

1.2 Wi-Fi Design Objectives

- .1 The Wi-Fi infrastructures must be capable of accepting associations from all active client devices concurrently assuming all spaces in the building are occupied to the maximum safe occupancy limit.
- .2 Must be capable of supporting mass concurrent roaming of client associations between APs, *such as during change-over times between classes).
- .3 The design objective is to ensure optimal coverage and performance of the 5GHz band.
- .4 Where the design specifies APs with built-in antennae, it is York University's preference to have such APs mounted such that they are parallel to the floor.

- .5 Due to the frequent presence of low-altitude commercial air traffic over the Keele campus, the WLAN designer **must avoid** use of DFS channels in the 5GHz band.
- 6 Minimum acceptable levels of per-client device downstream performance are as follows:

Solution Option	2.4 GHz band	5 GHz band
A	1 Mbps	2 Mbps
B	0.5 Mbps	2 Mbps

- .7 It is necessary to plan for service coverage in those portions of mechanical spaces where building automation equipment is installed. Minimum acceptable signal strength in the vicinity of building automation systems is -67 dBm. This is an exception to -62 dBm objective for public spaces.
- .8 The design for Wi-Fi network service is not required to include the following areas:
 - a) Elevator Interiors
 - b) Enclosed stairwells
 - c) Washrooms
 - d) Spaces exterior to the building envelope unless otherwise indicated in writing.

1.3 Assumptions

- .1 Wi-Fi APs are capable of supporting 802.11a/g/n/ac.
- .2 Two Wi-Fi client devices per person;
 - a) Each person has a Wi-Fi enabled smartphone, and
 - b) Each person also has a laptop or a tablet device (even distribution).
- .3 At least 50% of smartphones and 50% of laptops and tablets are capable of operating in the 5 GHz band (percentages expected to increase year-over-year).
- .4 At least 60% of Wi-Fi client devices support 802.11n (expected to increase year-over-year).
- .5 No Wi-Fi client devices require support of 802.11b.
- .6 Client associations are not permitted at data rates below 12Mbps.

- .7 1000Base-T network access with 802.3at for all AP mounting locations.

1.4 Wireless Access Point Location Specifications

- .1 One CAT 6 cable shall be provided to each AP location.
- .2 The length shall not exceed the 90 Meter run.
- .3 All APs will be mounted below ceiling tiles. No APs should be mounted above ceiling tiles or enclosed within a ceiling.
- .4 APs will not be mounted within any cable trays or duct work.
- .5 APs will not be encased within ceilings or walls unless approved by the Manager, Network Development.
- .6 APs should be placed such that they are not obstructed by structural or equipment components.
- .7 APs will be identified on drawings using the Data symbol with AP adjacent to it as shown in diagram 1A.



- .8 The placement of APs must provide a minimum of -62dBm signal strength and minimum signal-to-noise ratio 25 dB in the 5GHz Band throughout the targeted areas.

1.6 Wireless Design

- .1 The design contractor will provide a marked up floor plan in AutoCAD. DWG format showing;
 - a) Location and unique identifier per AP.
 - b) Location and unique identifier per antenna mount if external to AP.
 - c) Type and orientation per AP and /or antenna mount ID.
 - d) Location and unique identifier per Spectrum Analysis sensor (whether or not integrated w/AP).
- .2 Per building bill of materials list in Microsoft Excel format showing model numbers and quantities for each of access point equipment antennae, spectrum analysis sensor equipment and mounting hardware.

- .3 Recommended configuration templates for controllers and APs including per radio channel assignments,
- .4 Softcopy of predicative model of per floor signal coverage (Ekahau Site Survey format is preferred).
- .5 The design shall reasonably account for the influence of structural materials and other local conditions on meeting the design objectives as well as on the feasibility of AP placements. (e.g. no Aps in the middle of projection walls, no Aps in operationally inaccessible locations, no Aps on designated decorative surfaces).

1.7 Wireless Post Install Design

- .1 A post survey will be conducted approximately one month after groups have move into the building.

2.0 Interior Installations

- .1 APs will be installed below a maximum height of 6.1 meters.
- .2 Where possible, access points shall be installed at the intersection of ceiling T-rails, such that the ceiling grid clip straddles the T-rail intersection.
- .3 Patch cables shall be routed such that they are not visible from below the access point.
- .4 Internal antennas APs should be mounted parallel to floor, on ceiling o wall mount using angle bracket.
- .5 At the level of the lighting layer, with no visible obstructions.
- .6 At a height between 3 meters and 4.2 meters.





2.1 Structural or Solid Ceiling Mounts

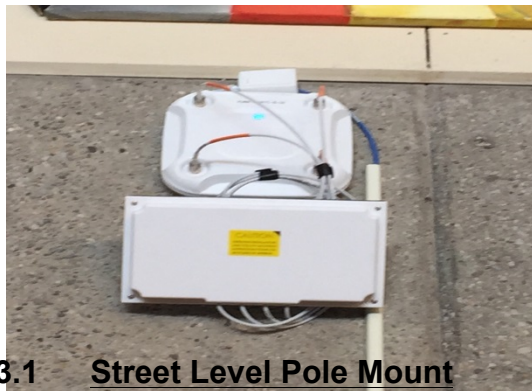
- .1 APs will be installed below a maximum height of 6100 mm.
- .2 Installed surface boxes must use reinforced mounting points.
- .3 Surface mounted APs, cables shall be routed to location via surface mounted raceway and side entry double gang box.
- .4 In the case of structural ceilings where concealed 27mm conduit is used, a double gang deep masonry back box (MDV-2) or double gang deep back box and mud ring shall be installed.

2.2 Wall Mount

- .1 APs will be installed below a maximum height of 6.1 meters and typically are installed at a height of 3.6 meters.
- .2 Wall mounting is to be avoided as it puts the AP in a horizontal plane, which is problematic for signal propagation.
- .3 If wall mounting is unavoidable, angle AP mounting brackets will be supplied.
- .4 Wall mounted locations will use a single gang back box.
- .5 Wall plate APs should be mounted flush against the wall.
- .6 Should be mounted not less than 7.6 cm above desk height.

3.0 Outdoor Locations.

- .1 External AP Antennas should be mounted precisely as specified by the WLAN design document.
- .2 Parallel to floor or, at a 45-degree angle to the floor.
- .3 With no visible obstructions in line of sight.
- .4 At a height between 3.6 and 6 meters.
- .5 Horizontal direction of the antenna as indicated by the WLAN design.
- .6 AP should be mounted close enough to the antenna for the cables to reach the antenna but in a manner that the cables are away from the antenna's line of sight and the cables should be connected as shown in the diagram below. (Yellow stickers to be removed)
- .7 The APs themselves are plenum rated and may be installed above ceilings.



3.1 Street Level Pole Mount



- .1 AC power and optical fibre to the pole shall be provided if the distance between the building communications room and the pole-mounted access point exceeds 90 meters.
- .2 APs shall be mounted to poles according to the design of the pole, within a 3000 to 7500 mm range, with ideal mounting height at 4500 mm.
- .3 Cable terminations shall be enclosed in an outdoor NEMA Type 4 or similar enclosure.

3.2 Exterior Building Wall Mount

- .1 Provisions shall be made in the building design for the attachment of a metal plate to which outdoor AP mounting brackets can be affixed.

- .2 APs shall be mounted at a height of between 3000 to 7500 mm. with ideal mounting height at 4500mm.

3.3 Roof Mounting

- .1 Roof mounts shall be considered if the building height is no greater than 10.5 meters.
- .2 Provide one 27mm conduit stub up/out in the vicinity of the indicated roof top AP location.
- .3 The conduit stub shall be capable of preventing rodent ingress.
- .4 Roof top masts are to be parapet mounted at the building edge to minimize the radio shadow at the base of the building.

4.0 PRODUCTS

- .1 Internal Wireless AP installation is Cisco AP 2600/3600/3700i Omnidirectional Antenna.
- .2 External Wireless AP installation is Cisco AP 3700e with External Directional Antenna AIR-ANT2566.
- .3 Wall Plate Wireless AP installation is Cisco AP 702W Wall Plate.

4.1 Drawings

- .1 All as built drawings will be received with final cable locations and numbering per UIT-IPA standards in DWG. format.
- .2 All site surveys will be conducted using the Ekahau software.
- .3 All drawings will be in AutoCAD. DWG format version 2014.

5.0 EXECUTION

- .1 Pathways will be installed with a minimum of 7.6 centimeters of clear vertical space above the ceiling tiles to ensure accessibility and adequate clearance for pulling additional cables.

- .2 Distance between where an AP is marked on the survey and where it is physically installed should not exceed 1 meter.
- .3 Install APs as labeled per location for example AP1 must be installed in location labeled AP1 on drawing.

6.0 Referenced

- .1 For further reference, please see the cisco AP installation guide:
www.cisco.com/c/en/us/td/docs/wireless/technology/apdeploy/8-0/Cisco_Aironet_3700AP.html

End of Section