Supports Item No. 1
PT&E Committee Agenda
February 13, 2013

CITY OF VANCOUVER

ADMINISTRATIVE REPORT

Report Date: January 15, 2013
Contact: Upkar Matharu
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VanRIMS No.: 08-2000-20
Meeting Date: February 13, 2013

TO: Standing Committee on Planning, Transportation and Environment

FROM: General Manager of Engineering Services
General Manager of Planning and Development Services

SUBJECT: Telecommunications Infrastructure in the City of Vancouver

RECOMMENDATION

A. THAT Council receive for reference the design options for antennae on private property as described in Appendix "A" that are used by staff and applicants in the review of permit applications.

B. THAT Council approve the "Contracting Protocol for Antenna Installations on City-Owned Poles" attached as Appendix "B" (the "Protocol"), to set forth guidelines and decision-criteria to be applied by the City in relation to license agreements for antenna installations on City-owned poles located in City streets.

C. THAT Council authorize the General Manager of Engineering Services and the Director of Legal Services to jointly negotiate, with telecommunications companies, a form of standard City license agreement for antenna installations on City-owned poles located in City streets, provided that prior to the execution and delivery of any such license agreement by the City, the approval of Council shall be obtained.

D. THAT, pending the approval of a form of license agreement as set out in Recommendation C, the General Manager of Engineering Services and the Director of Legal Services be authorized to jointly execute letter agreements with telecommunications companies undertaking pilot projects involving antenna installations on City-owned poles located in City streets, which letter agreements shall grant such companies access to such poles and shall govern such installations until license agreements in the Council-approved form have been executed, whereupon such license agreements shall apply, each as from the date of execution thereof.

E. THAT staff report back to Council in two years' time regarding impacts, challenges and successes related to the use of City street light poles for antenna installations, along with any recommendations for updating the Protocol.

REPORT SUMMARY

This report responds to two council motions regarding the installation of telecommunications antennae within the City of Vancouver.

On February 15TH, 2011, Council adopted a motion regarding "Neighbourhood Impacts from Installation of Wireless Antenna Systems in Vancouver." Council directed the City Manager to continue to work with telecommunications companies, federal agencies, and Vancouver Coastal Health to develop clear protocols and guidelines for the installation of telecommunications antennae in the city, that address citizen and industry concerns.

In 2011, acting on the motion, City staff and representatives from the telecommunications industry established a working group. The focus of the group was to address industry concerns regarding clarity of the City's approval process for antennae on buildings and the timeliness of approvals, and the City's concerns regarding safety with respect to the Building Code, as well as the aesthetic-design of antenna systems and their integration into the public realm. With the assistance of a consultant, Dialog, a matrix of design options was developed to improve the quality of approvable designs for installations, provide clarity and certainty of process for staff and applicants and address key design concerns. Over the past year, staff have implemented the use of the design matrix in 40 applications for antenna installations on buildings, and have reported a significant reduction in processing time. Staff recommend that Council receive for reference the design options for antennae on private property as described in Appendix "A", and note that the design options are a continuing work in progress, as staff and industry improve the use of different materials, and respond to changing technology and new approaches to installation.

On June 12TH, 2012, Council adopted another motion regarding antenna installations within the City, "Transforming Technology in Street Infrastructure". Council requested staff report back on work underway between the City and the telecommunications industry to address challenges that have been raised by the community related to unsightly cell infrastructure on private property, update policies for the installation of this infrastructure, assess the viability of the 'V-pole' and any other proposed technologies that address the growing demand for cellular and electric vehicle ("EV") infrastructure, and seek out pilot projects with the telecommunications, lighting and EV industries to test and implement innovative technologies using city infrastructure like street light poles.

During its development of the design matrix referred to above, the working group also identified the potential of using City street light poles for antenna installations. With the lack of tall buildings in residential areas, limited rooftop real estate in the Downtown, and increased demand for data services by consumers, street light poles were viewed as an effective alternative that would provide the needed street-level wireless penetration. In acting on the June 12TH, 2012 motion, staff began work on

assessing the viability of the 'V-Pole,' the modular utility pole with integrated Wi-Fi, cellular, LED street lighting and EV charging proposed by writer and artist Douglas Coupland. Staff recognized that the forward-thinking concept is still some years away from realization because of the technologies involved, but it clearly demonstrated the potential benefits and synergies that could be realised now, by using street light poles.

To assess the viability of using street light poles for antenna installations, staff conducted discussions with industry, reviewed practices from other municipalities, and participated in regional and national working groups. This work culminated in the development of the Protocol attached as Appendix "B", which is aligned with Council's priorities of infrastructure investment, green initiatives, economic development, and fostering external partnerships, and which establishes guidelines and decision-criteria, to be applied by the City, before entering into contracts permitting antenna installations on City street light poles. Added benefits realised by the City include generating new revenue/services without the need for incremental investments, and enabling the effective implementation of wireless networks, to better serve residents and businesses.

To test the application of guidelines and principles in the Protocol, the City is actively engaged in a series of non-exclusive pilot projects with telecommunication carriers ("carriers"), which include deployments of various antenna technologies, as well as the potential of integrating public amenities (e.g., power for food carts, power washing, lighting and EV charging) into antenna systems. One such pilot, initiated in 2012, between Rogers Communications, Emily Carr University, the Natural Sciences and Engineering Research Council and the City, set out to drive innovation and develop a prototype that integrated an antenna with a public amenity. To date, staff has evaluated the innovative designs presented by Rogers and Emily Carr University, and agreed on a location for the first installation. Work is currently underway planning for design and construction. Collaboration such as this will reduce the cost of installations dramatically and allow for the installation of more EV charging stations, if required.

In addition to providing Council with the design matrix, for reference, this report seeks Council approval of the Protocol, authorization to negotiate, with telecommunications companies, a form of standard City license agreement for antenna installations on City-owned poles and authorization to enter into temporary letter agreements governing pilot projects in the interim. This report also recommends that staff report back in two years' time with impacts, challenges and successes related to the use of City street light poles for antenna installations, along with any recommendations for updating the Protocol.

COUNCIL AUTHORITY/PREVIOUS DECISIONS

Council policy regarding antennae on private property is reflected in Section 10.27 of the Zoning and Development By-law.

On February 15TH, 2011, Council adopted a motion regarding "Neighbourhood Impacts from Installation of Wireless Antenna Systems in Vancouver." Council directed the City Manager to continue to work with telecommunications companies, federal agencies, and Vancouver Coastal Health to develop clear protocols and guidelines for

the installation of telecommunications antennae in the city, that address citizen and industry concerns.

On June 12TH, 2012, Council adopted a motion regarding "Transforming Technology in Street Infrastructure." Council requested staff report back on work underway between the City and the telecommunications industry to address challenges that have been raised by the community related to increasing cell infrastructure in Vancouver; review and update policies for the installation of this infrastructure; assess the viability of the 'V-pole' and any other proposed technologies that address the growing demand for cellular and electric vehicle ("EV") infrastructure; and seek out pilot projects with the telecommunications, lighting and EV industries to test and implement innovative technologies using city infrastructure like streetlight poles.

CITY MANAGER'S/GENERAL MANAGER'S COMMENTS

The General Manager of Planning and Development Services RECOMMENDS approval of recommendation A.

The General Manager of Engineering Services RECOMMENDS approval of recommendations B, C, D and E.

REPORT

Background/Context

There has been exponential growth in the global demand for wireless data services, and it is expected that in three years' time, there will be five times more mobile data traffic worldwide than there is today[1]. The growth is attributed to the evolution of wireless technology devices such as smart phones, tablets and notebooks, and their uptake by consumers. In Canada, it is projected that by 2014 there will be 29 million wireless subscribers, representing a penetration rate of more than 80% of the Canadian population[2]. Consumer hunger for data has meant that much of the existing wireless infrastructure no longer meets demand and, in their efforts to meet the service levels demanded by citizens and required for economic growth, wireless providers are focussing on the need to install additional antennae.

Understanding Vancouver's Wireless Landscape
Mobile devices transmit voice and data to local base stations. In Vancouver, these base stations consist of macrocells, minicells, microcells and Wi-Fi. Macrocells are high-powered cellular base stations that receive and transmit both voice and data, and are normally mounted on monopoles, towers and rooftops. Typically, these heights provide clearance from surrounding buildings and terrain, allowing signals to travel many kilometres. Minicells are medium-powered cellular base stations that receive and transmit both voice and data, and are normally mounted at street level on utility poles. They are cylindrical in form, a few metres tall, and provide coverage up to a kilometre. Microcells are low-powered cellular base stations that are the size of a

[1] CISCO Virtual Networking Index (VNI) Global Monthly Demand Forecast, www.cicsco.com
[2] www.eMarkter.com, May 2010

phonebook, and provide coverage of up to a few hundred metres. Wi-Fi consists of low-powered carrier-grade routers that only receive and transmit data, typically used when accessing the internet, and are mounted in outdoor applications or indoors within buildings. Generally, Wi-Fi routers have limited ranges of up to a hundred metres.

Established wireless providers generally have well developed macrocells that meet most of their current consumer demand, and augment their system with smaller antennae (microcells) to provide necessary service infill. Those wireless providers developing regional networks look for opportunities with the greatest return, and generally install macrocells or minicells in densely populated centralized areas.

As the demand for data services grows, many more infill antennae will be required. With industry's struggle to keep pace with consumer demand, there have been instances where providers have turned towards installing antenna systems without City approval, creating community concerns regarding unapproved installations that are inappropriate for the location. One such recent installation, in the Nanaimo-McGill neighbourhood, was the catalyst that sparked change. In 2011, with Council support, City staff and telecommunications industry representatives established a working group ("City-Industry Workgroup") to address concerns, and develop clear protocols and guidelines for the installation of antennae in the city, balancing citizen, industry and city needs. Industry concerns focused on the clarity of the City's approval process and the timeliness of approvals, while the City's concerns were related to safety with respect to the Building Code, as well as the aesthetic-design of antenna systems and their integration into the public realm.

Regulatory Context
The federal government, through Industry Canada, is responsible for regulating radio communication in Canada. Industry Canada requires that carriers notify and consult with appropriate land use authorities. The consultation is intended to provide an opportunity to have land-use concerns addressed while respecting federal jurisdiction for the installation and operation of telecommunications systems.

With respect to buildings, the City of Vancouver is the approving authority for development and building permits, thereby regulating building safety and urban design issues related to neighbourhood context.

Health & Safety
All telecommunications companies are licensed by Industry Canada and all telecommunications equipment must comply with Health Canada's Safety Code 6. Safety Code 6 determines the maximum output levels of radiofrequency electromagnetic energy (RF) permitted. RF is emitted from many electrical devices including everyday items such as computers, televisions and overhead lights. It is also emitted from airport radar, police car radios and radio and television transmission towers. Studies in Canada and other countries indicate there is no scientific or medical evidence that a person will experience adverse health effects from exposure to radiofrequency fields, provided that exposure is within the guidelines set out in Safety Code 6.

Comments from the Chief Medical Health Officer

The Vancouver Coastal Health Chief Medical Health Officer concludes, as has Health Canada, that in light of the current scientific understanding of the risks of RF exposures to the general public, the installation of base stations and cellular antennae in communities does not pose any adverse health risk, and that Safety Code 6 provides an appropriate level of protection. Furthermore, there is no public health benefit in practising prudent avoidance with respect to cellular base stations. However, telecommunication regulators and the industry need to be transparent in engaging communities and providing access to monitoring data to show compliance with expected standards. The Chief Medical Health Officer will continue to monitor new scientific knowledge in this area and will provide updates when necessary. For additional information to assist Council, a statement prepared by Vancouver Costal Health's Chief Medical Officer on health concerns regarding wireless communication facilities (June 2011) is attached as Appendix "C".

Strategic Analysis

The current rate of demand for cellular data will continue to rise in conjunction with business and resident needs, resulting in increased capacity demands on cellular systems. The implications for the City of Vancouver are twofold as carriers upgrade their networks to accommodate growth:

- The density of antenna installations will need to increase as infill sites are developed; and
- Antennae will be placed closer to ground level (e.g., from low-rise building rooftops, to hydro poles and potentially street light poles).

The City-Industry Workgroup established goals and principles relating to the installation of antennae within the City. The primary goal was to facilitate provision of telecommunications that promote economic development and competition, while maintaining a high quality of public realm and of design. Guiding principles adopted by the group included that:

- The City should support the data and cellular needs of residents and businesses;
- Antenna installations should fit into the neighbourhood context;
- Industry should co-locate antennae to limit the number of sites in the city;
- The City should rely on Health Canada and the Chief Medical Officer for guidelines on health implications of telecom infrastructure.

Significant progress has been made over the past year on the City's approach to dealing with two different types of antenna configurations: (1) antenna installations on privately owned buildings, and (2) antenna installations on City street light poles.

1. BUILDINGS

The City of Vancouver has regulated the installation of antenna on private property through the Zoning and Development By-law since 1997. Section 10.27 of the Zoning and Development By-law states:

> "Except as exempted by the provisions of 5.16 (antenna used for residential purposes), no person shall erect an antenna, including a satellite dish, without first obtaining a development permit from the Director of Planning".

Antennae are a permitted use in all district zoning schedules and classified as either a Public Utility or Radio Communication Station use.

The Director of Planning, through the permit process, evaluates the design appearance of antenna installations on buildings and the visual impacts on surrounding property owners and residents. Notification of surrounding property owners may be required if the Director of Planning determines the impacts are considered significant.

Design concerns occur within three main categories:

1. Impacts on specific property owners or tenants. This includes impacts on views, visibility and general appearance of installations as seen from surrounding properties.
2. Impacts on building design. This involves a determination on how the installation affects the architectural design of the building on which it is located.
3. General Urban Design Concerns. This is a review of any impact on the general public realm, streetscape or overall urban environment.

The City-Industry Workgroup obtained the services of the architectural firm, Dialog, to develop a framework of design options that would improve the quality of approvable designs for installations, provide clarity and certainty of process for staff and applicants and address the design concerns noted above. The design options are attached as Appendix "A" entitled "Cellular Antennas and Urban Integration". Staff have, as a working document, used the design options as a guide to the review of approximately 40 applications for antenna installations on buildings over the past year. Staff can report that processing times have been reduced (one week to permit issuance from sign-off of design) as an "over the counter" permit process. This reflects the utility of the design options, which have resulted in less negotiation over preferred designs, and replaced such negotiation with certainty of process and clarity on approvable designs for staff, the applicant and the public.

The design options are a continuing work in progress, as staff and industry improve the use of different materials, changing technology and new approaches to installation.

2. CITY STREET LIGHT POLES

Traditionally, because of the lack of tall buildings in residential areas, service providers have found it difficult to locate suitable antenna sites in such areas. This is becoming an issue now because the increased demand for data services is overwhelming more remote antenna sites. Even Downtown, existing installations on top of buildings will not meet the demands for service expected in the next few years. With both the limited amount of rooftop real estate and lack of effective street-level service penetration, coupled with growing wireless data use, service providers have been searching for alternatives.

In May 2012, Vancouver writer and artist Douglas Coupland unveiled the Vancouver-Pole ("V-Pole"). A modular utility pole that is connected to underground optical wiring, installed in urban settings, that would provide neighbourhoods with Wi-Fi and cellular service, LED street lighting, electric vehicle ("EV") charging, parking transactions and can act as an electronic neighbourhood bulletin board. This forward-thinking concept is some years away from realization due to the technologies involved; however, it clearly demonstrates the potential benefits and synergies that could be achieved today, using street light poles as antenna locations.

The Benefits of Using City Street Light Poles

Benefits of using street light poles, for the purpose of antenna installations, include:

- As the street light poles are owned by the City, the City maintains authority over all such installations;
- The City can administer siting and design criteria that support a well-balanced and consistent approach to integrating antenna systems into the public realm;
- The need for independent monopoles and towers could be reduced or eliminated;
- Antennae installations which require independent power connections could provide power for food carts, special events, EV charging stations and BIA initiatives, to name only a few ancillary amenities; and
- The City would generate new revenue or services, without the need for incremental investments.

Assessing the Use of Street Light Poles and Developing the Protocol

To assess the viability of using street light poles, staff conducted discussions with industry, reviewed practices from other municipalities, and participated in regional and national working groups. This work culminated in the drafting of a Protocol that sets forth guidelines and decision-criteria, to be applied by the City, before entering into contracts permitting antenna installations on City street light poles. Our approach to the development of the Protocol included:

- A staff-level working group that carried out periodic assessments of the draft Protocol to ensure alignment with the City's strategic priorities, including infrastructure investment, promoting green initiatives, and fostering partnerships and collaborations. The group also focused on the fundamental needs of the City with respect to street light poles and identified secondary uses for poles that would not adversely affect their primary function;
- Industry collaboration to develop a streamlined application process, design principles and guidelines;
- A comprehensive review of the practices from a number of other municipalities, including documenting monetary compensation collected for use of street light poles for antenna installations;
- Participation in the Regional Engineers Advisory Committee ("REAC") Working Group on Telecom Antenna Policy to discuss issues facing municipalities with respect to antenna systems, and explore the merits of antenna attachments to street infrastructure, with the end goal of developing common protocols, approval processes, design considerations and compensation; and

- Participation in the Federation of Canadian Municipalities ("FCM") and Canadian Wireless Telecommunications Association ("CWTA") Antenna Tower Working Group, to develop a national standard that strikes a balance between municipal and industry needs. Staff ensured that the fundamentals of the Protocol were consistent with the model protocol being developed by the working group.

Pilot Projects
To test the application of the Protocol, the City is actively engaged in a series of non-exclusive pilot projects with carriers. The pilot projects include implementations of minicells, microcells and Wi-Fi antennae. An overview of each project is contained in Appendix "D" to this report.

In addition to the pilot projects listed in Appendix "D", another project was initiated in early-2012, between Rogers Communications, Emily Carr University, NSERC and the City. The joint collaboration established a goal of driving innovation and utilizing a high standard of design, to develop a prototype that integrated a wireless antenna and associated costly power supply with a public benefit that requires power. The staff-level working group identified a number of such benefits in the form of public amenities, including among other things, food carts, special events, power washing, lighting and EV charging. Regardless of the type of amenity, for the City, the need for electric power for amenities is a recurring theme, and the opportunity to work with the telecommunications industry may fill that need. One amenity that has synergy with antenna installations, and which is also an integral part of the V-Pole concept, is EV charging. It served as the inspiration for the pole design that staff, working with Rogers and Emily Carr, has developed.

Vancouver is one of the first Canadian cities to require that all new houses and developments provide for capacity in electrical panels to permit the installation of future EV charging outlets. The City is also broadening EV charging into the public realm through the "Charge and Go Vancouver" project, where the City, in collaboration with the BC Government, BC Hydro and the FCM, is field testing plug-in EV charging infrastructure. The City has received funding for the installation of 67 stations and, working with UBC, has identified potential locations for the infrastructure. Several of these sites were identified by Rogers as potential locations for antennae and as a result, work began on bringing the two infrastructure projects together, as a cooperative build, at no incremental cost to the City. To date, the City has evaluated the innovative designs presented by Emily Carr and Rogers, and agreed on a location for the first installation. Work is underway planning for design and construction. Collaboration will reduce the cost of installations dramatically and allow for the installation of more EV charging stations, if required.

Only two pilot projects have been fully implemented, one antenna project with Telus and the other with Rogers. In each case, antennae have been installed on a temporary basis pursuant to a letter agreement entered into between the City and the respective company. Staff recommends that the City continue to permit new pilot projects, under similar letter agreements, in each case until a formal license agreement, in the form approved by City Council, has been executed.

The Protocol

The Protocol, attached as Appendix "B" in this report, sets forth the guidelines and decision-criteria proposed to be applied by the City in assessing whether, and on what terms, to enter into agreements that grant persons rights to install antennae on City-owned poles. It permits the City to realize all the various benefits of allowing installations of antennae on City street light poles, and it is designed to provide the telecommunications industry with certainty of process and charges, while providing the City with assurances that installations will meet all Protocol criteria. It also provides incentives for high-quality design and minimal negative visual impacts. It is intended to be supplemented by a standard form of City license agreement for pole installations, to be developed in the short-term, following adoption of the Protocol. The standard form of agreement should protect City, public realm and citizen interests, while providing stability and certainty for industry.

Contract Charges

The Protocol includes a list of standard charges for antenna installations, including plan review charges and annual pole rental charges. Plan review charges have been set at a level expected to recover the costs incurred by the City in reviewing proposals for antennae systems. The annual pole use charges are based on a comprehensive review of charges from other municipalities and other City departments, for similar antenna installations. Proposed charges for minicell antennae, and microcell and Wi-Fi antennae, are as follows:

Minicell Antenna

Plan Review: A one-time plan review charge of $1,200.

Annual Payment for Pole Use:

- $3,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is less than or equal to 12.0m;
- $4,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is greater than 12.0m but less than or equal to 13.0m;
- $5,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is greater than 13.0m but less than or equal to 14.0m;
- $6,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is greater than 14.0m but less than or equal to 14.4m;
- $7,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is greater than 14.4 but less than or equal to 14.9m.

Microcell and Wi-Fi Antennae

Microcell and Wi-Fi are emerging technologies and very few Canadian municipalities have established installations. As early adopters of this technology, staff recommends the City continue to permit installation of microcells and Wi-Fi devices on street light poles on a pilot basis, and report back to Council at a later date on their impact on the public realm. Currently, proposed fees are as follows:

Plan Review: A one-time plan review charge of $150.

Annual Payment for Pole Use:
It is anticipated that charges for a microcell or Wi-Fi antenna will range from $250 to $500 per pole.

***Special Considerations*:**
- For installations that integrate City-approved amenities into their design, such as power outlets and EV charging, the annual pole use payments would be reduced (or would not apply for a period of time), to offset the costs of the amenities;
- As an incentive for pole-antenna combinations that both incorporate innovative design or engineering and provide power outlets, the City will reduce the annual charges for pole use by ten percent for a consecutive period of ten years; and
- For minicell antennae, the annual payment for pole use will be reduced by $500 for those installations that do not require an above-ground kiosk. This incentive minimizes public realm clutter from additional street infrastructure, as well as addressing residential/BIA complaints of unsightly graffiti found on above-ground kiosks.

The City has also been approached by various telecommunication companies who, in lieu of the annual pole use payments, are interested in negotiating other public benefits provisions. Any such provisions would be considered only upon Council consent of the relevant license terms.

Next Steps
The Protocol provides that antenna license agreements shall only be in a form approved by Council. Following the approval of the Protocol by Council, staff would work with industry to develop the City's form of license agreement for use in respect of all street pole installations. Staff would then return to Council to seek Council's consent to the form, as well as standing authority to use the form, before entering into any specific licenses with any companies.

In addition, staff will report back to Council in two years' time regarding the:
- Impacts and challenges faced by the City in permitting street light pole use for antenna installations;
- Uptake of the opportunity by industry and progress made by other municipalities;
- Advancements in wireless technology, including an assessment of microcells and Wi-Fi technologies; and
- Recommendations for updating the Protocol, based on all the above.

Implications/Related Issues/Risk (if applicable)

Financial

Revenues generated from permitting the use of City street light poles, for the purpose of antenna installations include:

- Cost recoveries of a one-time plan review charge of $1,200 per installation of a minicell or $150 per installation of a microcell or Wi-Fi device; and
- An annual rental payment for pole use ranging from $3,000 to $7,000 per pole for a minicell antenna, depending on total pole height including antenna, and $250 to $500 for installation of microcell or Wi-Fi device.

While it is difficult to predict the number of installations in the next two years, early numbers from carriers, who are in discussions with the City, indicate a modest number of antenna installations, as described in this report. The true financial potential of the opportunity presented, is the contribution to the health of Vancouver's economy, the reduction in capital costs in the provision of public benefits such as electric vehicle charging stations, and generating new revenues.

CONCLUSION

In responding to Council's motion on February 15TH, 2011, staff recommends that Council receive for reference the design options for antennae on private property as described in Appendix “A” of this report.

In responding to Council's motion on June 12TH, 2012, staff recommends that Council approve the "Contracting Protocol for Antenna Installations on City-Owned Poles" as attached to this report, and authorize the General Manager of Engineering Services and the Director of Legal Services to jointly negotiate , with telecommunications companies, a form of standard City license agreement for antenna installations on City-owned poles located in City streets, provided that prior to the execution and delivery of any such license agreement by the City, the approval of Council shall be obtained . Pending the approval of a form of license agreement, staff recommend that the General Manager of Engineering Services and the Director of Legal Services be authorized to jointly execute letter agreements with telecommunications companies undertaking pilot projects involving antenna installations on City-owned poles located in City streets, granting companies access to poles until license agreements in the Council-approved form have been executed.

Staff also recommend that the City continue to pursue new opportunities with carriers wishing to install antennae on to City street light poles, and report back to Council in two years regarding the results of the pilots, advancements in wireless technology and any recommendations for updating the Protocol.

* * * * *

Cellular Antennas and Urban Integration:
City of Vancouver

Version 1.0

2011-11-23

DIALOG™

1A

IS COMPATIBLE WITH **2** | VARIANCE WITH **3** | INCOMPATIBLE WITH **4**

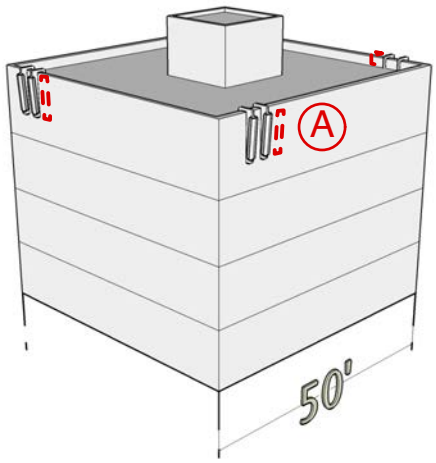
Unscreened Cell Antenna Face Mount
50' (15 m) - 75' (23 m) Facade Length

Mounting Requirements Checklist:

- ☐ Number of Allowable Units per Building Face as per Graphic Representations Below
- ☐ Antenna Units Grouped
- ☐ Antenna Units Mounted on Same Plane
- ☐ Mounting/Cabling Hardware Cleanly Housed
- ☐ Same Type of Antenna Units On All Facades of the Building
- ☐ Maximum Spacing Between Antennas = Height of Antenna Unit
- ☐ Tops of Antennas Aligned
- ☐ Antenna Colours to Match Building Face Behind Unit
- ☐ Minimum Building Height 30' (9 m)

Ⓐ

Note:
Typical All Unit Types:
One Additional Unit Permitted per Facade for Buildings Above 150' in Height



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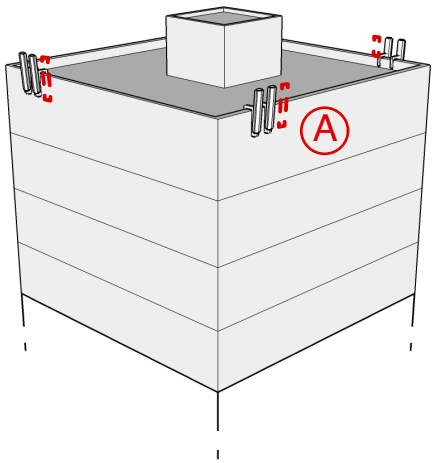
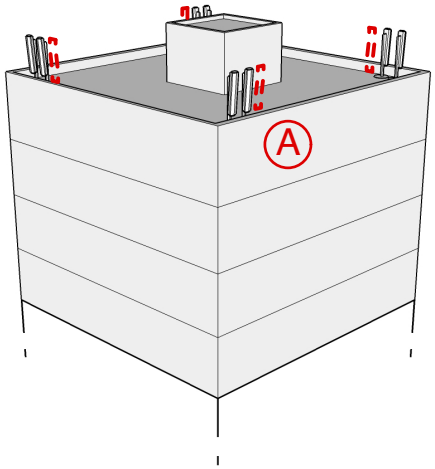
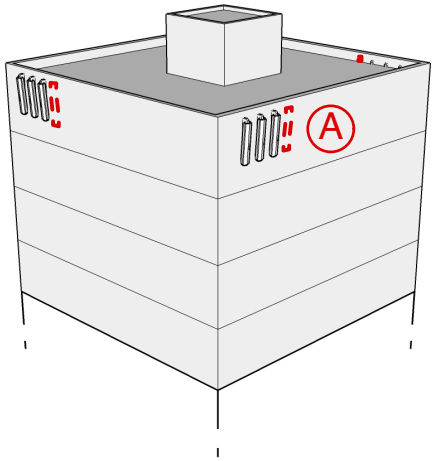


Partly Skylined: **2 / face**



Roof Edge Skylined: **2 / face**



Through-wall Face Mount: **3 / face**

1B IS COMPATIBLE WITH 2 VARIANCE WITH 3 INCOMPATIBLE WITH 4

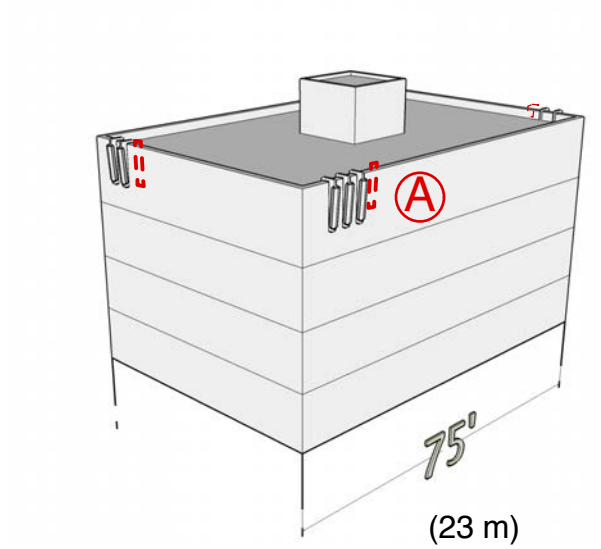
Unscreened Cell Antenna Face Mount
75' (23 m) - 125' (38 m) Facade Length

Mounting Requirements Checklist:

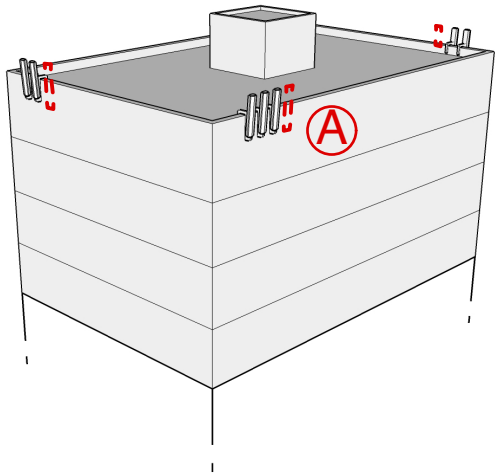
- ☐ Number of Allowable Units per Building Face as per Graphic Representations Below
- ☐ Antenna Units Grouped
- ☐ Antenna Units Mounted on Same Plane
- ☐ Mounting/Cabling Hardware Cleanly Housed
- ☐ Same Type of Antenna Units On All Facades of the Building
- ☐ Maximum Spacing Between Antennas = Height of Antenna Unit
- ☐ Tops of Antennas Aligned
- ☐ Antenna Colours to Match Building Face Behind Unit
- ☐ Minimum Building Height 30' (9 m)

Ⓐ

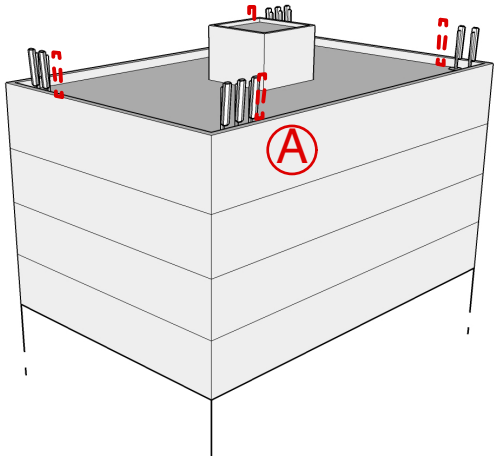
Note:
Typical All Unit Types:
One Additional Unit Permitted per Facade for Buildings Above 150' in Height



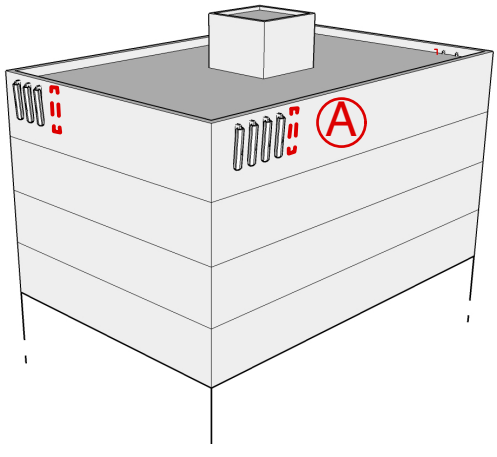
Over Parapet: **3 / face**



Partly Skylined: **3 / face**



Roof Edge Skylined: **3 / face**



Through-wall Face Mount: **4 / face**

1C IS COMPATIBLE WITH 2 VARIANCE WITH 3 INCOMPATIBLE WITH 4

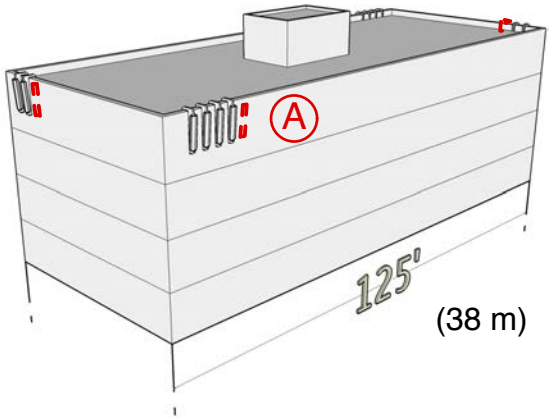
Unscreened Cell Antenna Face Mount
125' (38 m) - 150' (46 m) Facade Length

Mounting Requirements Checklist:

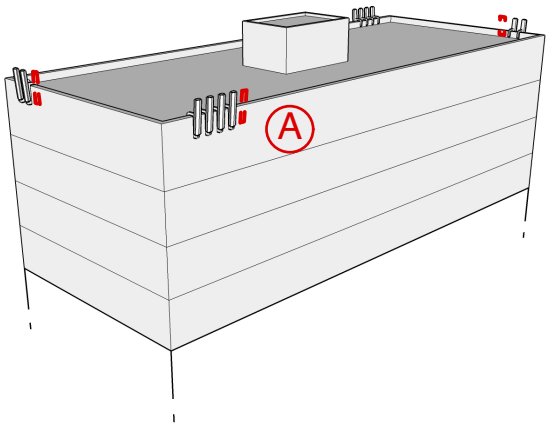
- ☐ Number of Allowable Units per Building Face as per Graphic Representations Below
- ☐ Antenna Units Grouped
- ☐ Antenna Units Mounted on Same Plane
- ☐ Mounting/Cabling Hardware Cleanly Housed
- ☐ Same Type of Antenna Units On All Facades of the Building
- ☐ Maximum Spacing Between Antennas = Height of Antenna Unit
- ☐ Tops of Antennas Aligned
- ☐ Antenna Colours to Match Building Face Behind Unit
- ☐ Minimum Building Height 30' (9 m)

Ⓐ

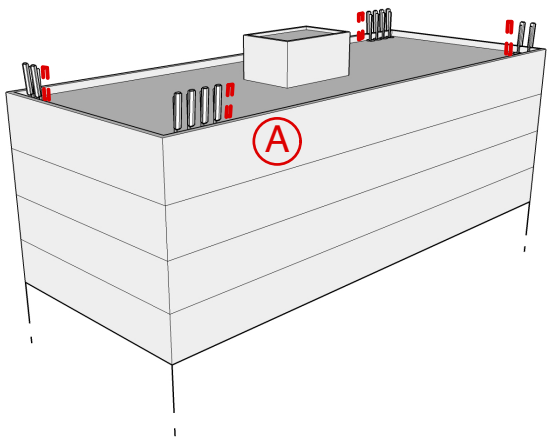
Note:
Typical All Unit Types:
One Additional Unit Permitted per Facade for Buildings Above 150' in Height



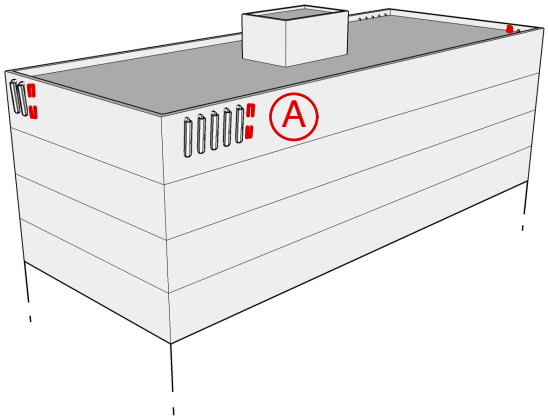
Over Parapet: **4 / face**



Partly Skylined: **4 / face**



Roof Edge Skylined: **4 / face**



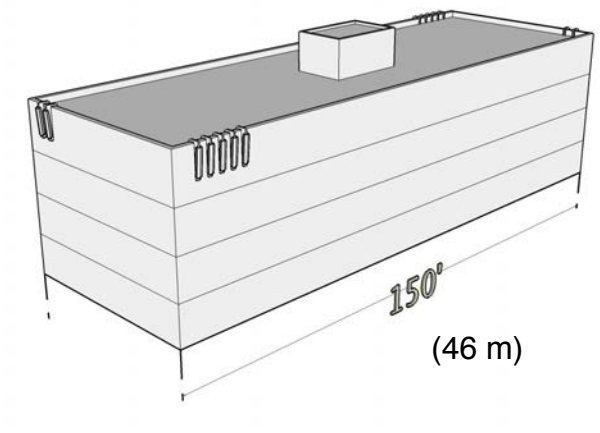
Through-wall Face Mount: **5 / face**

1D IS COMPATIBLE WITH 2 VARIANCE WITH 3 INCOMPATIBLE WITH 4

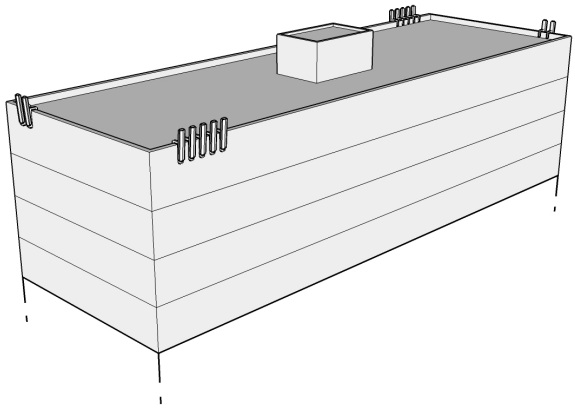
Unscreened Cell Antenna Face Mount
150' (46 m) - 200' (61 m) Facade Length

Mounting Requirements Checklist:

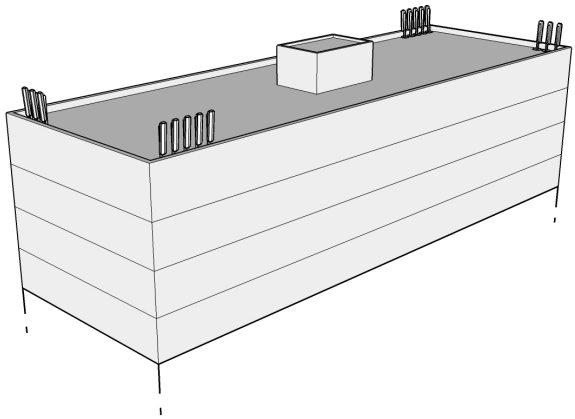
- ☐ Number of Allowable Units per Building Face as per Graphic Representations Below
- ☐ Antenna Units Grouped
- ☐ Antenna Units Mounted on Same Plane
- ☐ Mounting/Cabling Hardware Cleanly Housed
- ☐ Same Type of Antenna Units On All Facades of the Building
- ☐ Maximum Spacing Between Antennas = Height of Antenna Unit
- ☐ Tops of Antennas Aligned
- ☐ Antenna Colours to Match Building Face Behind Unit
- ☐ Minimum Building Height 30' (9 m)



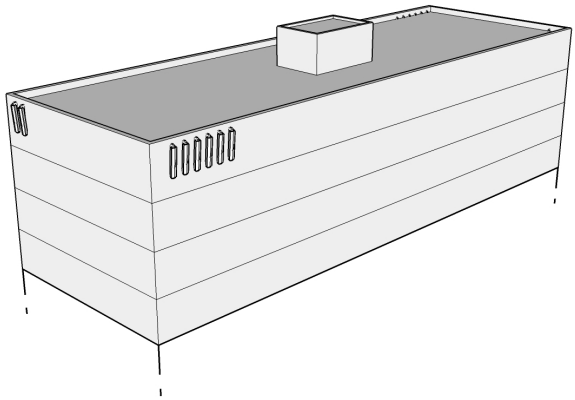
Over Parapet: **5 / face**



Partly Skylined: **5 / face**



Roof Edge Skylined: **5 / face**



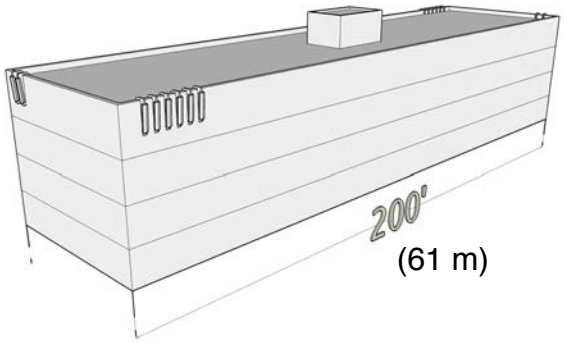
Through-wall Face Mount: **6 / face**

1E IS COMPATIBLE WITH 2 VARIANCE WITH 3 INCOMPATIBLE WITH 4

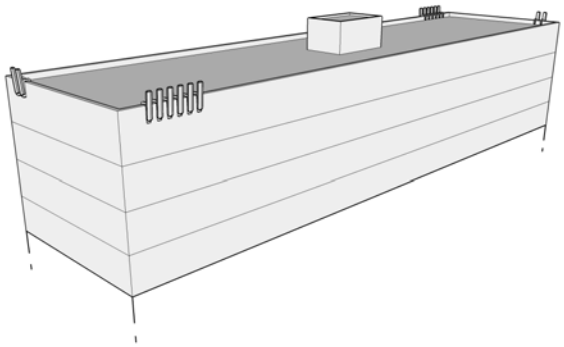
Unscreened Cell Antenna Face Mount Above 200' (61 m) Facade Length

Mounting Requirements Checklist:

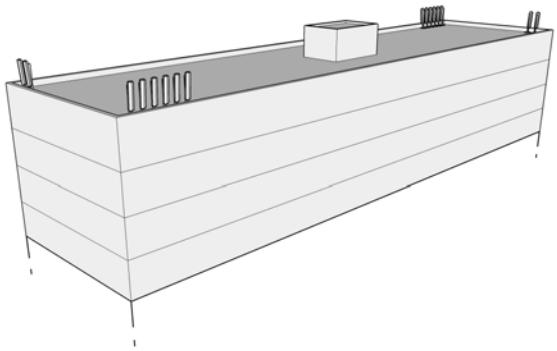
- ☐ Number of Allowable Units per Building Face as per Graphic Representations Below
- ☐ Antenna Units Grouped
- ☐ Antenna Units Mounted on Same Plane
- ☐ Mounting/Cabling Hardware Cleanly Housed
- ☐ Same Type of Antenna Units On All Facades of the Building
- ☐ Maximum Spacing Between Antennas = Height of Antenna Unit
- ☐ Tops of Antennas Aligned
- ☐ Antenna Colours to Match Building Face Behind Unit
- ☐ Minimum Building Height 30' (9 m)



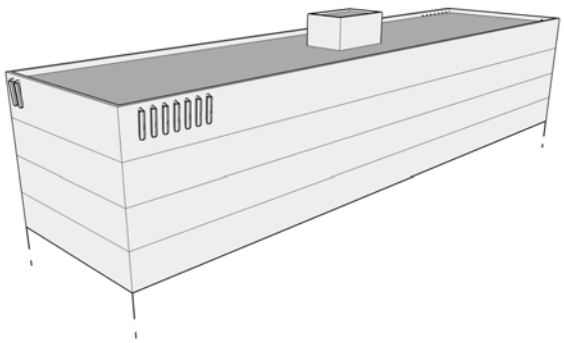
Over Parapet: **6 / face**



Partly Skylined: **6 / face**



Roof Edge Skylined: **6 / face**



Through-wall Face Mount: **7 / face**

2A IS COMPATIBLE WITH 1 4 VARIANCE WITH - INCOMPATIBLE WITH 3

Penthouse Antennas (Screened Extension)

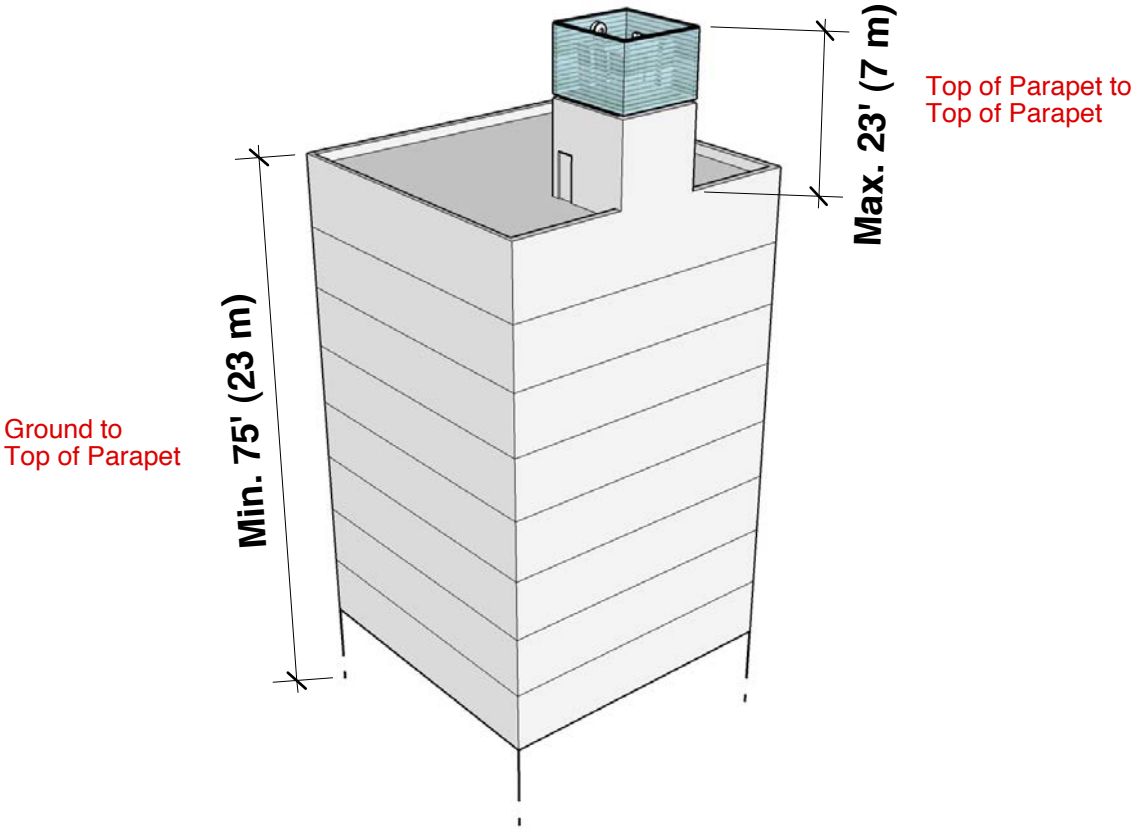
Installation Requirements Checklist:

- ☐ No 'Sky-Lined' Antennas or Associated Equipment
- ☐ Extensions Respect Massing of Existing Penthouse
- ☐ 85' (26 m) Minimum Setback to Adjacent Buildings
- ☐ Minimum Building Height 75' (23 m)

Notes:

1. Unlimited Antennas Allowed
2. No Setback Restriction from Building Edge Behind Unit

PENTHOUSE EXTENSION



2B IS COMPATIBLE WITH 1 4 VARIANCE WITH - INCOMPATIBLE WITH 3

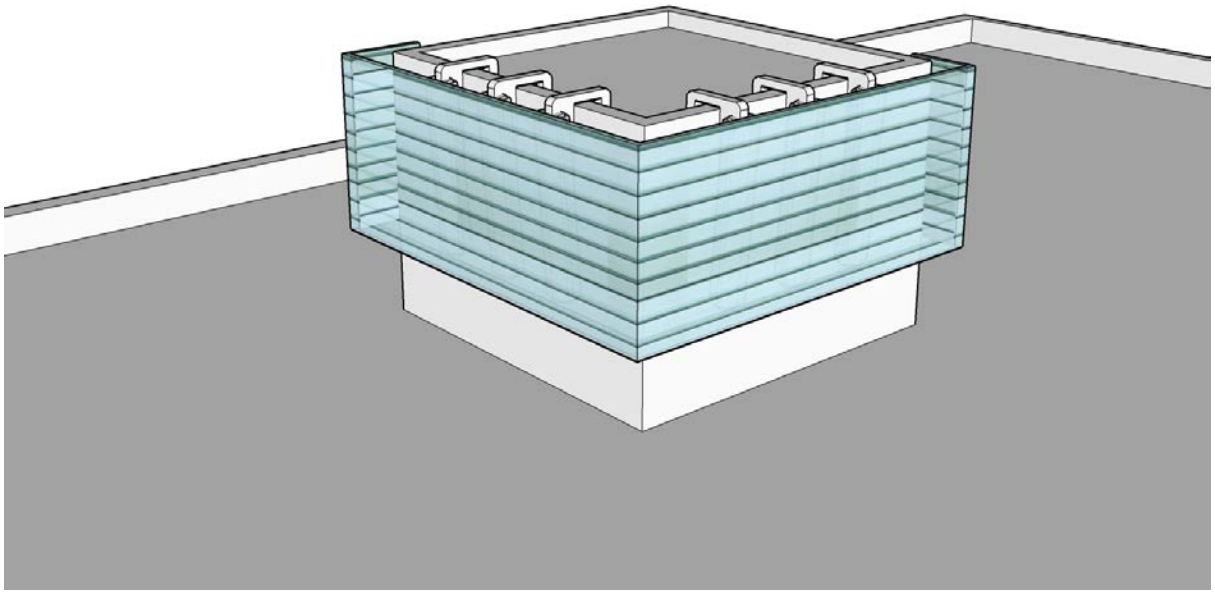
Penthouse Antennas (Screened at Existing)

Mounting Requirements Checklist:

☐ No 'Sky-Lined' Antennas or Associated Equipment

☐ *No Restrictions for Setback From Building Edge for Naked Installations TBC*

PENTHOUSE SCREEN



3A IS COMPATIBLE WITH - VARIANCE WITH 1 4 - INCOMPATIBLE WITH -

Unscreened Antennas on Existing Penthouse

Mounting Requirements Checklist:

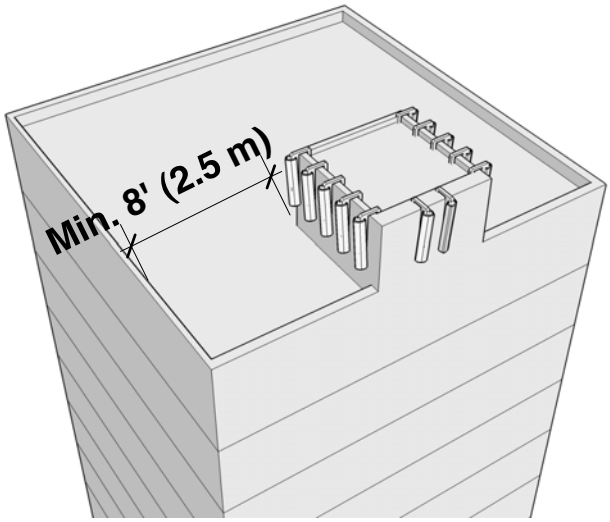
- ☐ Antenna Units Mounted on Same Plane
- ☐ Mounting/Cabling Hardware Cleanly Housed
- ☐ Tops of Antennas Aligned
- ☐ No 'Sky-Lining' of Antennas or Associated Equipment
- ☐ Antenna Colours to Match Building Face Behind Unit

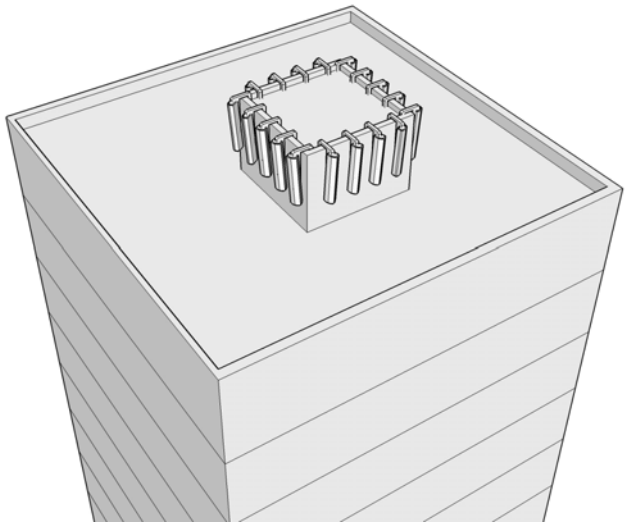
Notes:

1. Unlimited Number of Units Per Face, Except on Penthouse Walls Flush with Exterior of Building: See Unscreened Face Mount 1A-1E for Allowable Numbers Based on Facade Length

2. 8' (2.5 m) Setback From Building Edge to Achieve Unlimited Number of Units (Note Exception Above)

EXISTING PENTHOUSE WALLS





3B IS COMPATIBLE WITH - VARIANCE WITH 1 4 INCOMPATIBLE WITH - Unscreened Antennas on Penthouse Addition

Mounting Requirements Checklist:

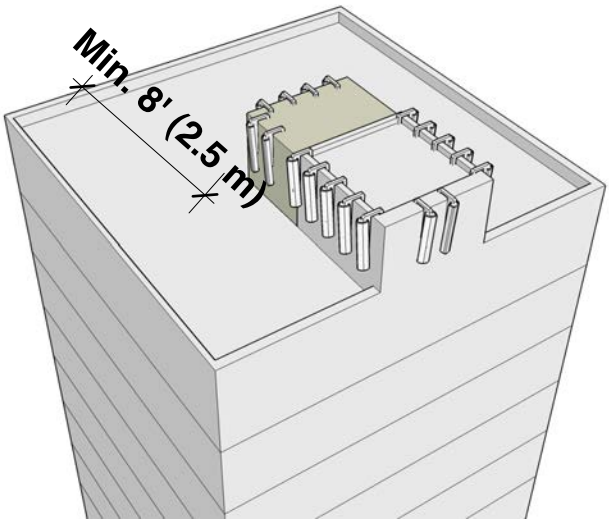
- ☐ Antenna Units Mounted on Same Plane
- ☐ Mounting/Cabling Hardware Cleanly Housed
- ☐ Tops of Antennas Aligned
- ☐ No 'Sky-Lining' of Antennas or Associated Equipment
- ☐ Antenna Colours to Match Building Face Behind Unit

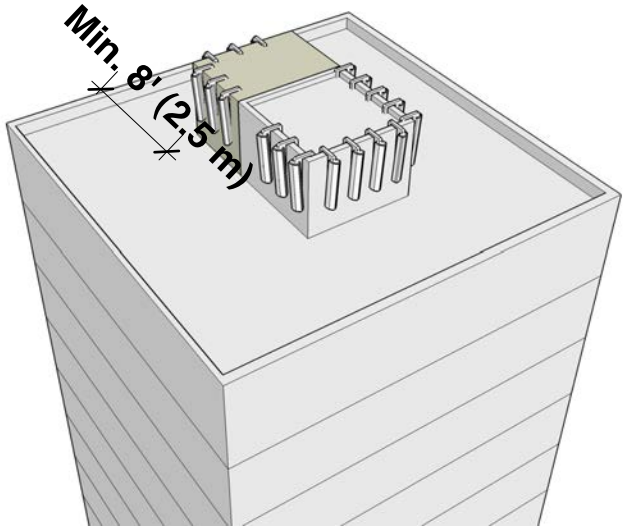
Notes:

1. Unlimited Number of Units Per Face, Except on Penthouse Walls Flush with Exterior of Building: See Unscreened Face Mount 1A-1E for Allowable Numbers Based on Facade Length

2. 8' (2.5 m) Setback From Building Edge to Achieve Unlimited Number of Units (Note Exception Above)

PENTHOUSE ADDITION





3C IS COMPATIBLE WITH - VARIANCE WITH 14 - INCOMPATIBLE WITH -

Unscreened Antennas on New Penthouse Structure

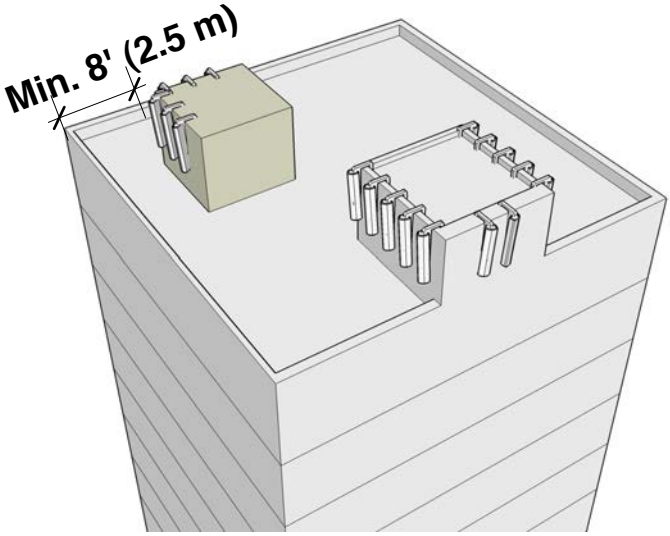
Mounting Requirements Checklist:

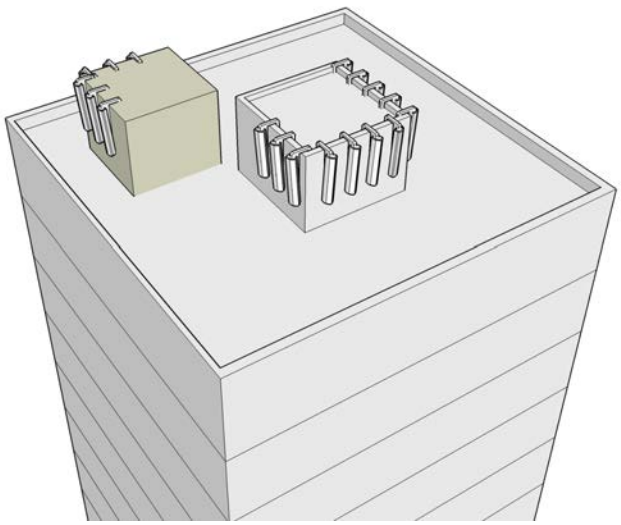
- ☐ Antenna Units Mounted on Same Plane
- ☐ Mounting/Cabling Hardware Cleanly Housed
- ☐ Tops of Antennas Aligned
- ☐ No 'Sky-Lining' of Antennas or Associated Equipment
- ☐ Antenna Colours to Match Building Face Behind Unit
- ☐ 20% Maximum Roof Coverage
- ☐ 85' (26 m) Setback to Adjacent Buildings
- ☐ 10' (3 m) Setback from Building Edge for Naked Installations
- ☐ Minimum Building Height 75' (23 m) for Penthouse Extensions

Note:

1. Unlimited Number of Units

NEW PENTHOUSE STRUCTURE





4A

IS COMPATIBLE WITH **2** VARIANCE WITH **3** INCOMPATIBLE WITH **1**

Partial Height Screened Roof Edge Installations

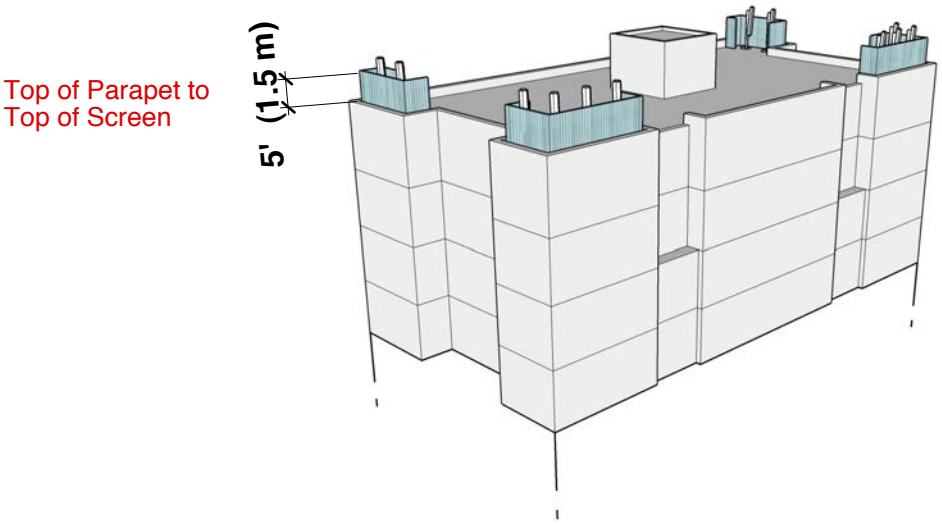
Installation Requirements Checklist:

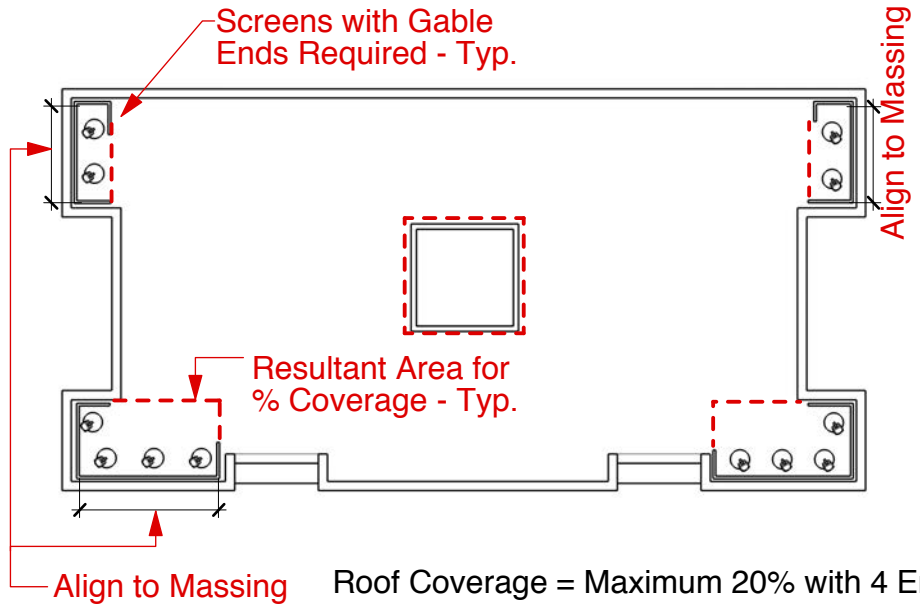
- ☐ Maximum 5' (1.5 m) Height Above Parapet for Screens
- ☐ 1' (300 mm) Minimum Setback from Parapet
- ☐ Maximum 20% Roof Coverage (Including Existing Penthouse)
- ☐ Maximum 4 Enclosures
- ☐ Screens to be Respectful of Building Massing - Typ.

Notes:

1. Unlimited Number of Units
2. 'Sky-Lined' Installation Assumed

4 ENCLOSURES, 20% COVERAGE





Roof Coverage = Maximum 20% with 4 Enclosures Max.
(%Coverage to Include Existing Penthouse)

4B IS COMPATIBLE WITH 2 VARIANCE WITH 3 INCOMPATIBLE WITH 1

Partial Screened Roof Edge Installations

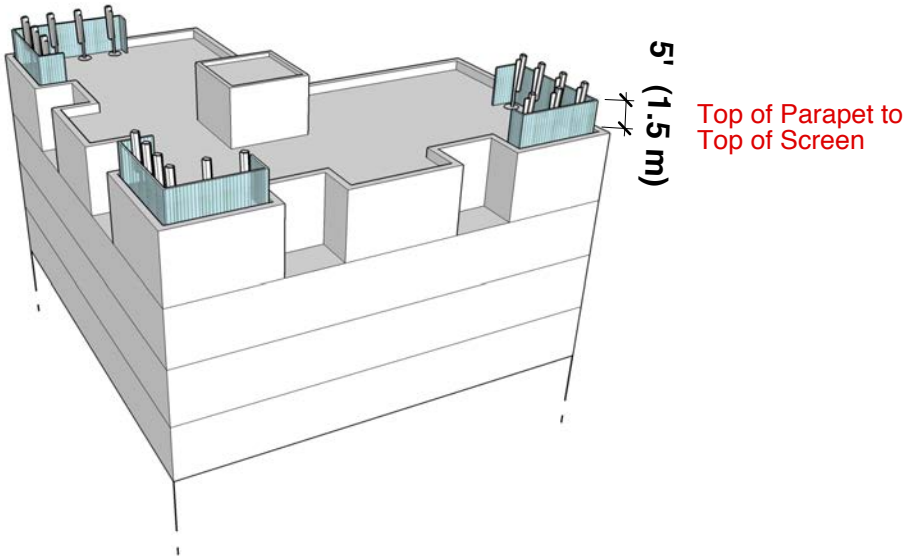
Installation Requirements Checklist:

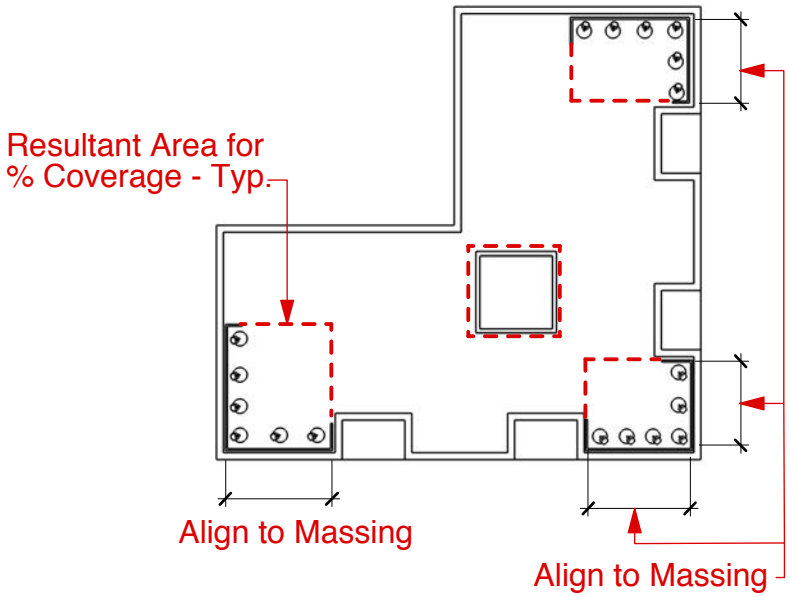
- ☐ Maximum 5' (1.5 m) Height Above Parapet for Screens
- ☐ 1' (300 mm) Minimum Setback from Parapet
- ☐ Maximum 30% Roof Coverage (Including Existing Penthouse)
- ☐ Maximum 3 Enclosures
- ☐ Screens to be Respectful of Building Massing - Typ.

Notes:

1. Unlimited Number of Units
2. 'Sky-Lined' Installation Assumed

3 ENCLOSURES, 30% COVERAGE





Roof Coverage = Maximum 30% with 3 Enclosures Max.
(%Coverage to Include Existing Penthouse)

4C IS COMPATIBLE WITH 2 VARIANCE WITH 3 INCOMPATIBLE WITH 1 — Partial Screened Roof Edge Installations

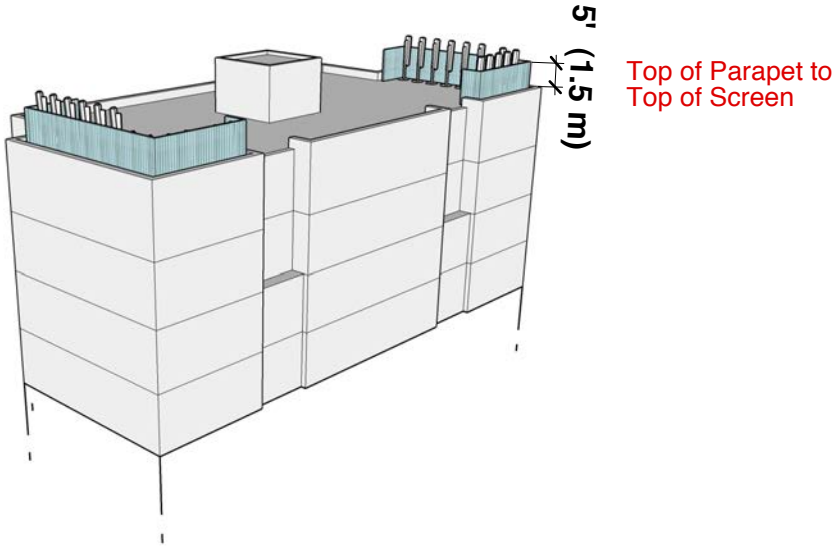
Installation Requirements Checklist:

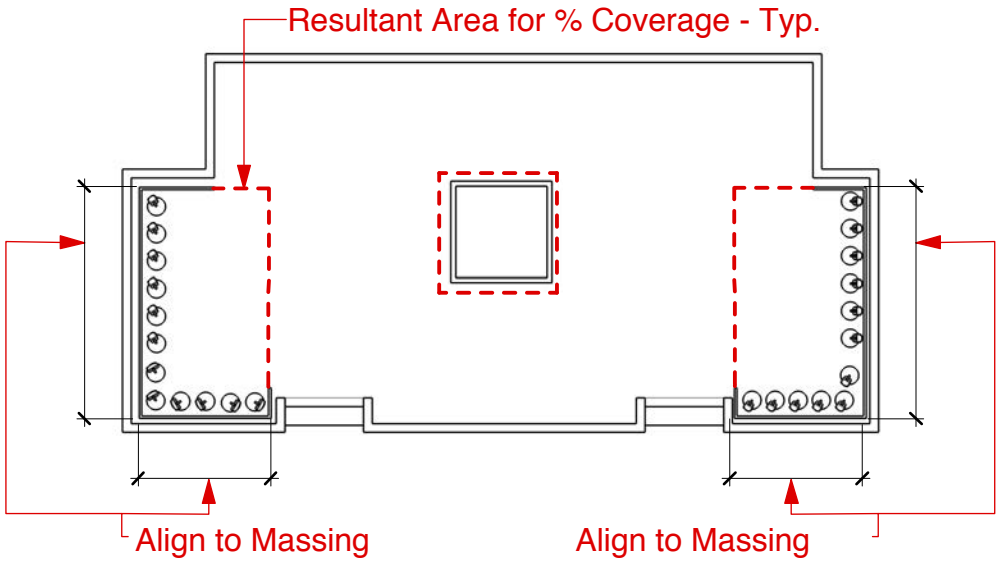
- ☐ Maximum 5' (1.5 m) Height Above Parapet for Screens
- ☐ 1' (300 mm) Minimum Setback from Parapet
- ☐ Maximum 40% Roof Coverage (Including Existing Penthouse)
- ☐ Maximum 2 Enclosures
- ☐ Screens to be Respectful of Building Massing - Typ.

Notes:

1. Unlimited Number of Units
2. 'Sky-Lined' Installation Assumed

2 ENCLOSURES, 40% COVERAGE





Roof Coverage = Maximum 40% with 2 Enclosures Max.
(%Coverage to Include Existing Penthouse)

ENGINEERING SERVICES
UTILITIES MANAGEMENT BRANCH

CONTRACTING PROTOCOL FOR ANTENNA INSTALLATIONS ON CITY-OWNED POLES

PURPOSE

The purpose of this protocol is to set forth certain guidelines and decision-criteria to be applied by the City of Vancouver (the "City") in assessing whether, and on what terms, to enter into agreements that grant persons rights to install antennae on City-owned poles. The City urges persons seeking to enter into such agreements with the City ("Proponents") to refer to this protocol before proposing any such agreements. The City reserves the right to revise this protocol at any time, and from time to time.

SCOPE

This protocol applies to the assessment of all proposed agreements between the City and other parties relating to antenna installations on poles owned by the City, as well as ancillary street level-systems. In the circumstances in which the City enters into an agreement that grants a Proponent a right to install any such antenna, the Proponent is not required to obtain a building or development permit, but the Proponent must obtain any other required permits.

REGULATORY CONTEXT

In Canada, the federal government, through Industry Canada and Health Canada, is primarily responsible for regulating wireless telecommunications and antennae. Proponents are responsible for ensuring that they comply with all federal legal requirements, including, without limitation and to the extent applicable, Industry Canada's Client Procedures Circular 2-0-03 and Health Canada's Safety Code 6. The City may require evidence of compliance with applicable federal, provincial or City requirements before it enters into an agreement with a Proponent that grants the Proponent the right to install antennae on City-owned poles (any such agreement, a "License Agreement").

GUIDING PRINCIPLES

The following guiding principles describe certain City objectives that inform the remainder of this protocol.

Infrastructure Investment Facilitate telecommunication infrastructure growth that supports the technology needs of the Vancouver business community and propels economic development.

Promoting Green Initiatives Encourage undertakings that support the Greenest City Action Plan, such as the provision of power for food carts, special events and electric vehicle charging stations.

Partnerships & Collaborations Cultivate strong business relationships and seek opportunities to leverage benefits from strategic partnerships and collaborations.

DESIGN PRINCIPLES

The following design principles have been established by the City to support a well-balanced approach to integrating antenna systems into the public realm.

- Efforts should be made to minimise the size of antenna systems.
- Design and site decisions should respect view corridors.
- Antenna systems should be sympathetic to their environment and be designed in a manner that compliments the surrounding architecture and built form.
- Innovation in design, including the integration of public amenities into antenna systems, is encouraged.

CITY GUIDELINES AND REQUIREMENTS

1. PROPOSAL AND APPROVAL PROCESS

1.1 Pre-Proposal Consultation

The City's Engineering Services Department requires that Proponents undertake pre-proposal consultation, with City staff, to discuss proposed antenna system installations on City-owned poles.

1.2 Proposal Requirements

A Proponent must submit a proposal to the City's Engineering Services Department before the City will enter into any License Agreement. At minimum, the Proponent must provide:

- A company name and contact information;
- A description of the intended purpose of the antenna system;
- A site plan identifying the proposed locations of antennae and associated mechanical equipment, as well as the locations of existing antenna systems;
- Photo-realistic renderings of the proposed antenna system;
- Any other information requested during the pre-proposal consultation.

The proposal must be accompanied by the plan review charge.

1.3 Proposal Review and Approval Process

The review and approval process established by the City is outlined below.

1. The City will review the proposal submitted for completeness.
2. An onsite meeting may be required to discuss the proposed installation.

3. Following the proposal review and the onsite meeting, if any, the City will respond within seven business days, either granting preliminary approval or notifying the Proponent of the City's decision to not enter into a License Agreement.
4. Following preliminary approval, if any, the Proponent must submit an engineering drawing of the proposed installation, including a site-plan and detailed side-view, with dimensions and elevations. Drawing submissions must adhere to the specifications set out in the City's Utilities Design and Construction Manual.
5. The City will endeavour to issue final drawing approvals within 10 business days, unless drawing revisions are necessary.
6. Final permission to proceed will be granted only upon the execution of a License Agreement with the City.

Engineering Services may establish more specific review and approval procedures in conformity with the foregoing.

1.4 Proponent Responsibilities

Each Proponent will be responsible for:

- Securing all required authorizations, approvals and permits, prior to commencing construction (including required City permits);
- All costs associated with modifying or replacing City-owned poles; and
- Provision for supplying and maintaining power and all other associated costs.

2. NOTIFICATION REQUIREMENTS

Engineering Services may establish public or community notification requirements in respect of particular types of poles and placement locations from time to time in conformity with this protocol.

3. LOCATION AND SITING

3.1 Antenna Placement Criteria

When considering placements of antennae on City-owned poles, the City will be guided by the following preferences. It is preferable that antennae be:

- Within commercial and industrial-zoned districts;
- On arterial streets (see "reference streets" on VanMap);
- Adjacent to parks, green spaces, golf courses and industrial areas;
- In a manner that does not adversely impact view corridors; and
- Not directly in front of doors, windows, balconies or residential frontages.

The City may enter into License Agreements contrary to these preferences in its discretion, but in those circumstances, the City is more likely to require the relevant Proponent to undertake public or community notification.

3.2 Mechanical Equipment Placement Criteria

Mechanical equipment, namely antenna kiosks, shall meet the requirements set out in Sections 3.8, 6.12 and 6.13 of the Utilities Design and Construction Manual.

Exceptions to mechanical equipment placement criteria will be evaluated on a case-by-case basis, however where requirements cannot be met, the City may require such equipment to be located in an underground vault.

4. DESIGN GUIDELINES

4.1 General

- Proponents will be responsible for all design work, including but not limited to, geotechnical investigation, structural and foundation design, and electrical design work for antenna systems.
- All underground design work must adhere to the requirements set out in the Utilities Design and Construction Manual.

4.2 Pole and Antenna Design

- Antennae designed to be mounted on top of a City-owned pole must be cylindrical in form and fabricated to match the diameter of the supporting pole. Panel antennae will only be permitted exceptionally;
- The total height of a City-owned pole and any attached antenna must be no more than 14.9 metres; and
- When possible, an antenna must be painted and textured to match the supporting pole.

4.3 Mechanical Equipment Design

- Kiosks must be designed in a manner which integrates them into their surroundings, including through the use of decorative wraps that are graffiti-resistant;
- Kiosk dimensions must not exceed 1 cubic metre; and
- Cables and wires must be concealed or covered.

5. CONSTRUCTION REQUIREMENTS

All construction work must meet the requirements set out in the Utilities Design and Construction Manual.

6. CONTRACT CHARGES

6.1 Minicell Installations

Plan Review

Prior to entering into a License Agreement for a minicell installation, the City will require the payment of $1,200 to offset City costs for plan review.

Annual Payments for Pole Use

The ongoing consideration required by the City under License Agreements for minicell installations will be as follows:

- $3,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is less than or equal to 12.0m;
- $4,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is greater than 12.0m but less than or equal to 13.0m;
- $5,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is greater than 13.0m but less than or equal to 14.0;
- $6,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is greater than 14.0m but less than or equal to 14.4m; and
- $7,000 per pole, for each new pole installation where the total height of the new pole-antenna combination is greater than 14.4m but less than or equal to 14.9m.

Special Considerations

As an incentive for pole-antenna combinations that both (1) incorporate innovative design or engineering and (2) provide power outlets, the City will reduce the annual charges for pole use by ten percent for a period of ten years for such installations (as determined by the City).

In addition, the annual payment for pole use will be reduced by $500 for those installations that do not require an aboveground kiosk.

For purposes hereof "minicell" refers to a top-mount antenna, cylindrical in form that is integrated into the top of a street light pole.

6.2 Microcell and Wi-Fi Installations

Plan Review

Prior to entering into a License Agreement for any installation other than a minicell installation, the City will require the payment of $150 to offset City costs for plan review.

Annual Payments for Pole Use

It is anticipated that the ongoing consideration required by the City under License Agreements for installation of microcell or Wi-Fi devices will range from $250 to $500 per pole. Charges for these installations shall be approved by Vancouver City Council at a later date.

7. PUBLIC BENEFITS

Proponents are encouraged to consider innovative designs that incorporate public amenities into antenna systems. On occasion, the City may require Proponents to integrate power supply for amenities into their designs or provide other public benefits, and be responsible for all associated costs. Power could be used for,

among other things, food carts, special events, power washing, lighting or electric vehicle charging. In such cases, annual pole use payments would be reduced (or would not apply for a period of time) in order to offset the costs of the amenities or other public benefits (but without taking into account Proponent's financing charges).

8. LICENSE AGREEMENT TERMS

License Agreements shall be in the form approved by Vancouver City Council. License agreements shall be terminable by the City, including as a result of any community or neighbourhood opposition.

Vancouver Coastal Health
Promoting wellness. Ensuring care.

Statement of the Chief Medical Health Officer

June, 2011

Health Concerns About Cellular Phone Transmission Antennae and Base Stations

In 2005, in response to community concerns and after reviewing the evidence, the Vancouver Coastal Health Chief Medical Health Officer concluded that the installation of cellular antennae in the community did not create health risks for the public, and that Health Canada's Safety Code 6 provided an appropriate level of protection. At that time, the Chief Medical Health Officer also committed to undertake periodic reviews of the evidence and to provide public updates as necessary. The Chief Medical Health Officer provides the following updated evidence review and associated conclusions:

Background on Cellular Transmission Technology

The original cellular (analog) technology uses the radiofrequency part of the electromagnetic spectrum between 800-900 MHz (near the FM/TV, AM Radio bands and cordless telephone frequencies). The newer digital technology uses the frequency bands of 800-900 MHz and 1800-2200 MHz and relies on antennae of significantly less power than the analog system, emitting significantly lower radiofrequency (RF) radiation. Cellular communication operates through a network of base stations that transmits and receives signals. The area covered by a base station is called a cell – giving rise to the name cell phone. The number of base stations (cells) in an area varies, depending on the concentration of cell phone users. For example, compared to smaller communities, the number of base stations is greater in populated urban centres, with many cell phone users. Each base station consists of signal processing equipment, power supply, and one or more antennae. The antennae are the most visible parts of base stations. However, a network of many lower powered based stations may result in lower levels of RF radiation exposure to the public compared to a network that uses a few higher powered base stations covering the same area. This is because the power required to communicate between a cell phone and base station increases as the distance between the cell phone and the base station increases.

Conclusions At A Glance

1. The international scientific consensus remains unchanged: radiation from cellular base stations is far too low to cause adverse health effects in the community.

2. There is no public health benefit from prudent avoidance regarding base stations.

3. Telecommunication regulators and the industry need to be explicitly transparent in engaging communities and providing access to monitoring data to show compliance with expected standards.

To meet the demand for service, increasing numbers of cellular base stations have been installed across the country. However, it is not easy for the public to access information on the number, types, and locations of cellular base stations in their community. This difficulty has contributed to public concerns regarding potential harm from these installations.

Health Risks

The study of RF radiation and its possible effect on health is growing steadily. Since the last report in 2005, reviews from recognized scientific organizations include the International Commission on Non-Ionizing Radiation Protection (ICNIRP) 2009 Review, the European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) 2009 Review, the Swedish Radiation Safety Authority, SSM, Independent Expert Group on Electromagnetic Fields 2009 Report, and the Health Canada Safety Code 6 revised in 2009. The scientific consensus remains unchanged: radiation from cellular base stations is far too low to cause adverse health effects in the community. The current Canadian (Safety Code 6 revised 2009) and international standards such as ICNIRP provide significant safety margins for public exposure to RF.

In Safety Code 6 (2009), Health Canada states:

> *"The scientific literature with respect to possible biological effects of RF energy has been monitored by Health Canada scientists on an ongoing basis since the last version of Safety Code 6 was published in 1999. During this time, a significant number of new studies have evaluated the potential for acute and chronic RF energy exposures to elicit possible effects on a wide range of biological endpoints including: human cancers (epidemiology); rodent lifetime mortality; tumor initiation, promotion and co-promotion; mutagenicity and DNA damage; EEG activity; memory, behaviour and cognitive functions; gene and protein expression; cardiovascular function; immune response; reproductive outcomes; and perceived electromagnetic hypersensitivity (EHS) among others. Numerous authoritative reviews have summarized this literature.*
>
> *Despite the advent of thousands of additional research studies on RF energy and health, the predominant adverse health effects associated with RF energy exposures in the frequency range from 3 kHz to 300 GHz still relate to the occurrence of tissue heating and excitable tissue stimulation from short-term (acute) exposures. At present, there is no scientific basis for the premise of chronic and/or cumulative health risks from RF energy at levels below the limits outlined in Safety Code 6. Proposed effects from RF energy exposures in the frequency range between 100 kHz and 300 GHz, at levels below the threshold to produce thermal effects, have been reviewed. At present, these effects have not been scientifically established, nor are their implications for human health sufficiently well understood. Additionally, a lack of evidence of causality, biological plausibility and reproducibility greatly weaken the support for the hypothesis for such effects. Thus, these proposed outcomes do not provide a credible foundation for making science-based recommendations for limiting human exposures to low-intensity RF energy."*

Critics of Safety Code 6 have challenged the adequacy of the Canadian standard to protect the public from effects other than those resulting from the thermal heating of cells in the body. However, when scientifically sound methods are used to assess the evidence, Health Canada's conclusions are consistent with the conclusions reached by other credible scientific bodies. In its review of evidence in 2009, the ICNIRP states:

> *"It is the opinion of ICNIRP that the scientific literature published since the 1998 guidelines has provided no evidence of any adverse effects below the basic restrictions and does not necessitate an immediate revision of its guidance on limiting exposure to high frequency electromagnetic fields. The biological basis of such guidance remains the avoidance of adverse effects such as "work stoppage" caused by mild wholebody heat stress and/or tissue damage caused by excessive localized heating (D'Andrea et al. 2007). With regard to non-thermal interactions, it is in principle impossible to disprove their possible existence but the plausibility of the various non-thermal mechanisms that have been proposed is very low. In addition, the recent in vitro and animal genotoxicity and carcinogenicity studies are rather consistent overall and indicate that such effects are unlikely at low levels of exposure. Therefore, ICNIRP reconfirms the 1998 basic restrictions in the frequency range 100 kHz–300 GHz until further notice."*

Similarly, SCENIHR of the European Commission in its 2009 review states:

> *"It is concluded from three independent lines of evidence (epidemiological, animal and in vitro studies) that exposure to RF fields is unlikely to lead to an increase in cancer in humans. However, as the widespread duration of exposure of humans to RF fields from mobile phones is shorter than the induction time of some cancers, further studies are required to identify whether considerably longer-term (well beyond ten years) human exposure to such phones might pose some cancer risk.*
>
> *Regarding non-carcinogenic outcomes, several studies were performed on subjects reporting subjective symptoms. In the previous opinion, it was concluded that scientific studies had failed to provide support for a relationship between RF exposure and self reported symptoms. Although an association between RF exposure and single symptoms was indicated in some new studies, taken together, there is a lack of consistency in the findings. Therefore, the conclusion that scientific studies have failed to provide support for an effect of RF fields on self-reported symptoms still holds. Scientific studies have indicated that a nocebo effect (an adverse non-specific effect that is caused by expectation or belief that something is harmful) may play a role in symptom formation. As in the previous opinion, there is no evidence supporting that individuals, including those attributing symptoms to RF exposure, are able to detect RF fields. There is some evidence that RF fields can influence EEG patterns and sleep in humans. However, the health relevance is uncertain and mechanistic explanation is lacking. Further investigation of these effects is needed. Other studies on functions/aspects of the nervous system, such as cognitive functions, sensory functions, structural stability, and cellular responses show no or no consistent effects. Recent studies have not shown effects from RF fields on human or animal reproduction and development. No new data have appeared that indicate any other effects on human health."*

In its 2009 Report, the Independent Expert Group of the Swedish Radiation Safety Authority SSM concludes regarding cancer and transmitters:

> *"The majority of studies on cancer among people who are exposed to RF from radio- or TV-transmitters or from mobile phone base stations have relied on too crude proxies for exposure to provide meaningful results. Indeed, only two studies, both on childhood leukaemia, have used models to assess individual exposure and both of those provide evidence against an association. One cannot conclusively exclude the possibility of an increased cancer risk in people exposed to RF from transmitters based on these results. However, these results in combination with the negative animal data and very low exposure from transmitters make it highly unlikely that living in the vicinity of a transmitter implicates an increased risk of cancer."*
>
> Regarding electromagnetic hypersensitivity, the SSM expert group writes:
>
> *"While the symptoms experienced by patients with perceived electromagnetic hypersensitivity are very real and some subjects suffer severely, there is no evidence that RF exposure is a causal factor. In a number of experimental provocation studies, persons who consider themselves electrically hypersensitive and healthy volunteers have been exposed to either sham or real RF fields, but symptoms have not been more prevalent during RF exposure than during sham in any of the experimental groups. Several studies have indicated a nocebo effect, i.e. an adverse effect caused by an expectation that something is harmful. Associations have been found between self-reported exposure and the outcomes, whereas no associations were seen with measured RF exposure."*

Canadian Exposure Assessments

In 1997, Health Canada conducted a survey of radiofrequency radiation from cellular base stations in and around 5 schools in Vancouver, in response to the concerns raised by nearby residents earlier that year. The measurements revealed that:

- The highest level of electromagnetic radiation from a PCS antenna (across the street) was more than 6,000 times below the Safety Code 6 levels.
- In three of the schools the levels of radiation from all PCS digital antenna were actually lower than the normal AM and FM radio signals that have been in the area for decades.

In 2003, Health Canada released the results of comprehensive ground level RF measurements representative of human exposures near base stations within the Regional Municipality of Ottawa. The highest power density measured was 3000 times below Safety Code 6. Health Canada considers these measurements as likely representative of levels in other Canadian urban areas.

In 2010, the Public Health Department of the Health and Social Services Agency of Montreal was asked to assess two cell phone base station sites located near schools in Outremont, an urban residential neighbourhood. One location has 12 antennae (130 m to 145 m away respectively from two primary schools) and the other has three (50 m from a high school). The investigation team estimated that the level of exposure to students would be over 5000 times below Safety Code 6 inside the school and over 1000 times below Safety Code 6 on school playgrounds and adjacent streets. The team also reviewed the scientific literature on the subject and concluded that:

> *"The results of numerous scientific studies conducted to date do not argue in favour for a causal relation between RF exposure and health impact at exposure commonly encountered, whether cancer or more general symptoms. Moreover, no mechanism of action of RF on cells or human and animal tissues has been shown. However, due to uncertainties still present in this area of research, health agencies recommend further studies in some promising avenues (e.g. for cell phone users). As for cellular antennae, given the very low exposure levels and research results to date, most experts believe it is unlikely that this exposure, well below the limits allowed, can cause effects on the health of the population."*

In May 2011, the International Agency for Research on Cancer (IARC) placed radio frequency electromagnetic fields in its group 2B classification – possibly carcinogenic to humans. IARC defines group 2B as a category used

> *"for agents for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals. It may also be used when there is inadequate evidence of carcinogenicity in humans but there is sufficient evidence of carcinogenicity in experimental animals. In some instances, an agent for which there is inadequate evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals together with supporting evidence from mechanistic and other relevant data may be placed in this group. An agent may be classified in this category solely on the basis of strong evidence from mechanistic and other relevant data."*

Agents in Group 2B are not proven carcinogens. Details of the IARC review is expected to be published in July 2011. In the meantime, the IARC does make it clear that the primary reason for the Group 2B classification relates to uncertainty regarding long term heavy cell phone use and certain rare brain cancer. The type of radio frequency exposure of concern is associated with using the cell phone close to the ear. As stated above, the energy of radio frequency field from cell phone base stations experienced by the general public is thousands of times lower than from a cell phone near the head. The IARC conclusion therefore does not alter the assessment for radio frequency exposure due to cell phone base stations.

"Prudent Avoidance"

The practice of "prudent avoidance" has been advocated by some in their opposition to specific location of cellular base stations in the vicinity of schools, child care centres or residential buildings. "Prudent avoidance" in these situations does not result in any increased level of protection. It would be difficult, if not impossible, to "prudently avoid" some level of exposure to RF fields in an urban setting, whether it be from AM, FM, TV or cellular phones. The Medical Health Officer concludes that scientific evidence provides no basis for recommending prudent avoidance with respect to cellular base stations. There is no public health benefit. In fact, prudent avoidance ignores the reality that the area immediately below an antenna has the lowest RF levels.

Community Consultation and Public Access to Information

Despite reassuring evidence, some members of the public remain concerned about the presence of cell phone antennae and base stations. Telecommunications regulators and industry can do a better job in providing information (particularly about base station types and locations), as well as providing meaningful opportunities for public consultation when planning base stations. Industry Canada in 2009 established public and local government consultation guidelines for permit applications for mobile phone base stations. The requirement for consultation unfortunately applies only to antennae 15 metres or higher. There are a number of practices the telecommunications regulators and industry can implement to mitigate public concerns. These include:

- Meaningful discussion with communities.
- Clear and publicly accessible supporting documents when deploying base stations.
- Greater consideration for site sharing, where possible.
- Greater consideration for sensitive location and design.
- Improved public access to information on network compliance with Safety Code 6.
- Prompt response to community enquiries about base stations.
- Periodic but systematic and comprehensive measurements of population level exposure to RF to monitor trends.

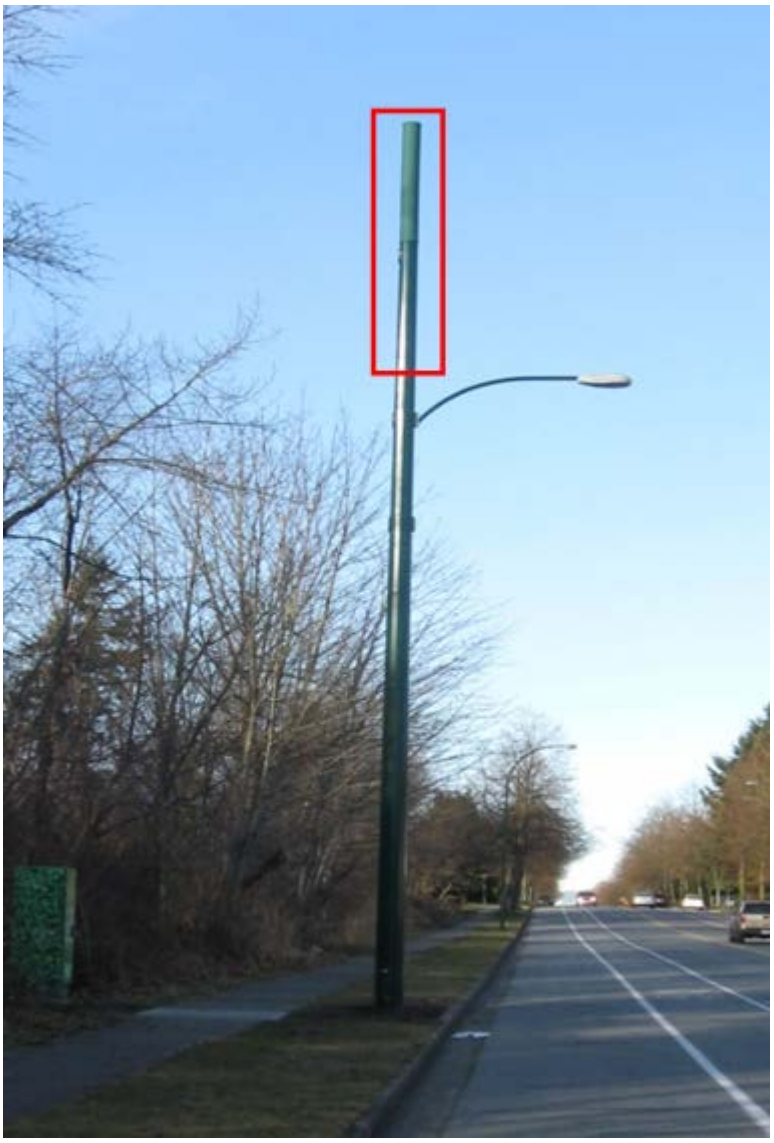
Conclusion

As has Health Canada, the Chief Medical Health Officer concludes that, in light of the current scientific understanding of the risks of RF exposures to the public, the installation of base stations and cellular antennae in the community do not pose an adverse health risk and Safety Code 6 provides an appropriate level of protection. However, public engagement by telecommunication regulators and industry concerning the installation of base stations and antennae needs improvement.

The Chief Medical Health Officer will continue to monitor new scientific knowledge in this area and will provide updates when necessary.

Chief Medical Health Officer

Pilot Projects



Rogers Minicell

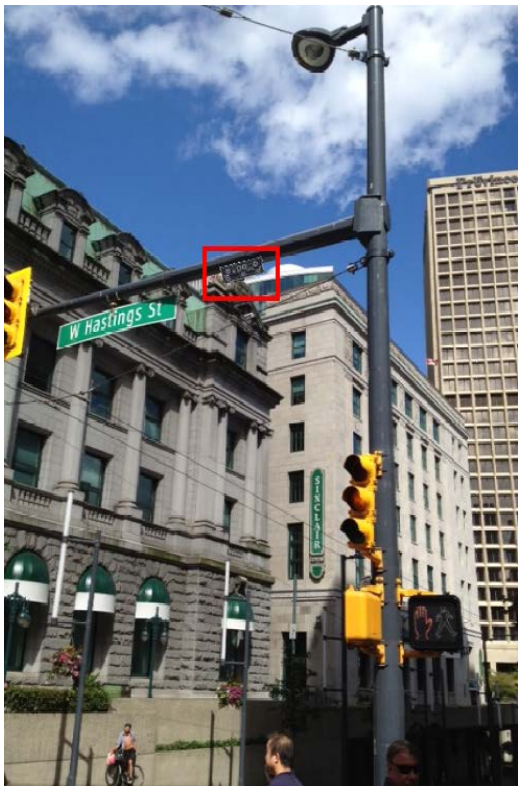
The picture to the left is an example of a Rogers Communications minicell, and is one of two currently installed in the City, both of which are located in the Fraserview Golf Course area. Many of the lesser established carriers, as well as new entrants into the Vancouver wireless market, are looking towards minicells as the next generation of wireless infrastructure. Installations generally range in height from 12 to 15 metres (i.e. two to five metres higher than a typical pole without a microcell), with an accompanying kiosk.

Staff are pleased with the built form of this minicell. The design demonstrates the willingness of carriers to address aesthetics in the design of antenna systems, even though they do result in higher design and construction costs. An added benefit to the City comes in the form of infrastructure improvements, as minicells typically require replacement of existing poles with new re-engineered poles. All costs associated with the design, manufacturing and construction are the responsibility of carriers.

The City of Surrey is currently piloting an identical minicell with Mobilicity, and additional carriers have shown interest in pursuing similar installations. Within Vancouver, both Rogers and Wind Mobile have indicated their interest in installing a total of 30 minicells in the next two years.

TELUS Microcell

The picture to the left is an installation of a TELUS Communications microcell, currently installed along Granville Street. This microcell is one of twelve currently installed as a part of the microcell pilot, with an additional 70 planned for installation within the next two years. The devices themselves are relatively small, and require an equally small utility box, mounted in the same location on the pole as the microcell. Existing street light poles require minimal preparation work to accept microcells, and the microcells use minimal space within the pole for wiring.



Shaw Wi-Fi (Proposed)

The picture to the left is a rendering that illustrates a pilot Shaw Communications access point, currently proposed for installation along Granville Street. The devices themselves are small and unobtrusive, and do not require any additional supporting infrastructure such as kiosks. As the devices provide only limited coverage, numerous access points are necessary to provide broad coverage.

Shaw Communications has approached many cities in Western Canada with similar requests to install Wi-Fi devices on municipal poles, and locally, have received the support of the South Granville and Downtown BIA's.