City of Vancouver ***Planning - By-law Administration Bulletins***
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ROOF-MOUNTED ENERGY TECHNOLOGIES AND GREEN ROOFS (DISCRETIONARY HEIGHT INCREASES)

Authority - City Council Resolution
Effective February 3, 2009
Amended August 26, 2019

1 Introduction

On June 10, 2008, Vancouver City Council recommended the removal or mitigation of disincentives to greener building design practices. On February 3, 2009, Council amended Section 10.18.5 to introduce discretion to the Director of Planning to consider minor additional height for roof mounted renewable energy infrastructure or appropriate access to green roofs. (See 10.18.5(d))

The purpose of this bulletin is to provide clarification to staff and applicants on the types of roof mounted energy technologies or infrastructure for green roofs that will be considered by the Director of Planning for a building height increase, and the criteria that may apply in evaluating the additional height.

2 Roof-Mounted Energy Technologies

There are currently three common types of roof-mounted energy technology.

2.1 **Solar photovoltaic panels** convert light directly into electricity. Photovoltaics (PV) are the simplest form of alternative energy. There are no moving parts in PV modules and little maintenance is required.

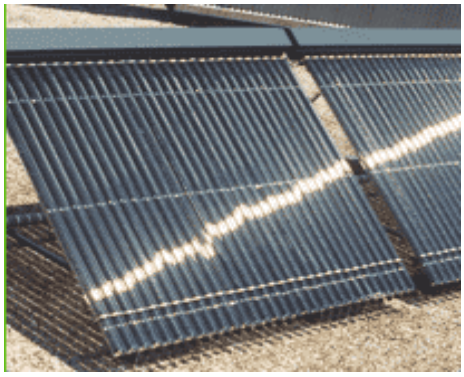
Example of roof-mounted photovoltaic modules.

(photo by Michael Pereckas)

2.2 **Solar thermal collectors** absorb solar radiation to provide heat. *Glazed flat plate* collectors are the most commonly used collectors for domestic applications. Generally flat-plate collectors consist of (1) a flat-plate absorber, which intercepts and absorbs the solar energy, (2) a transparent cover that allows solar energy to pass through, (3) a heat-transport fluid (air or water) flowing through tubes to remove heat from the absorber, and (4) a heat insulating backing. For storage, these systems typically use an insulated tank in or near the mechanical room.

Examples of glazed flat plate collectors

Another type of solar thermal collector is the *evacuated tube* collector. This type has multiple evacuated glass tubes containing solar absorbers and a fluid such as water and propylene glycol which conduct heat to domestic hot water or a hydronic heating system. The vacuum within the evacuated tubes reduces conducted heat losses.

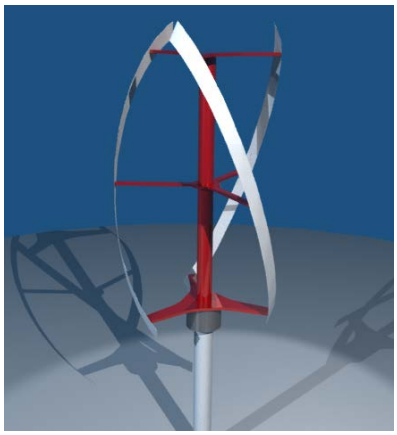


Examples of evacuated solar tube panels

The optimal orientation for both thermal and PV solar panels is due south, at an angle that captures the most sun. The optimal location is one with minimal shading from nearby trees or buildings.

2.3 **Wind turbines** use the wind to turn a rotor, which can be used to produce electricity or do other work. *Horizontal-axis* wind turbines have the main rotor aligned horizontally, like a traditional windmill. Modern versions typically take the form of propellers mounted on poles. Both versions work best when they are free to swing around to face the wind. Other types contain a series of scoops within an open framework.

Horizontal-axis wind turbine



Vertical-axis wind turbine

Building-mounted horizontal-axis turbines

Vertical-axis wind turbines have the main rotor aligned vertically, like an eggbeater, and do not need to swing around to face the wind. Several turbines may be lined up next to each other to aggregate power generation. "Micro" turbines, which fit on top of buildings, may be used instead of the farms of towering wind turbines seen in rural areas.

The ideal siting positions the units as high as possible in the given context, away from obstructions like large trees or other buildings, and with as little turbulence as possible.

On very small sites or constrained roof areas, rooftop energy equipment may occupy more than one third of the building width or one tenth of the roof area, especially in the case of flat plate solar collectors and horizontal-axis turbines. In these cases, careful design and integration of the equipment with the rest of the development is needed.

3 Access to and Infrastructure for Green Roofs

A green roof may be either intensively or extensively planted, but in either case it will include a growing medium and plants which offer a number of environmental benefits. *Intensive* green roofs are the traditional method of providing vegetation on a roof and usually include raised or inset planters with a substantial depth of soil which can be used to support a wide range of plant sizes, up to and including trees. *Extensive* green roofs are usually built up as a series of thin layers which provide a roofing membrane, root control, drainage, filtration, a lightweight growing medium (typically 152 mm or less in depth), and low-growing plants such as mosses and sedums.

Examples of green roofs

In some cases, the access to and/or infrastructure for green roofs may require a building height increase. Examples of access include stairs and elevators, where these provide direct access to the green roof. Depending on the extent of the roof, the nature of planting, and the intensity of use, additional infrastructure may be required to maintain the vegetation. In the case of urban agriculture, for example, this may include trellises, pergolas, tool sheds and storage space for gardening materials. Where possible, the planted area should be designed to minimize the amount of over height elements required to maintain it.

To be considered for a height increase, the planted area should occupy a substantial portion of the overall roof. For extensive green roofs, at least 50 % of the roof should be planted. For intensive green roofs, at least 25% of the roof area should be planted.

4 Discretionary Criteria

Discretionary height increases for roof mounted energy technologies or infrastructure for green roofs may be approved, provided the Director of Planning first considers the:

- siting and sizing of the installation or infrastructure in relation to views, overlook, shadowing, or noise impacts, and
- the design of the proposed form as it relates to the overall development and the existing context

For conditional development applications, the relevant Council policies and guidelines will also be considered. In all cases, compliance with the Vancouver Building By-law should be considered in advance.

5 Submission Requirements

To apply for an increase in height, the following material will be required in addition to standard submission requirements for development applications:

- A written rationale for the roof mounted technology or green roof which addresses the relevant sections of the by-laws, policies, guidelines, and the criteria noted above.

- Drawings illustrating the design and placement of the energy installation or green roof, and its infrastructure.

Depending on the technology proposed, the Director of Planning may require additional information or specifications.