

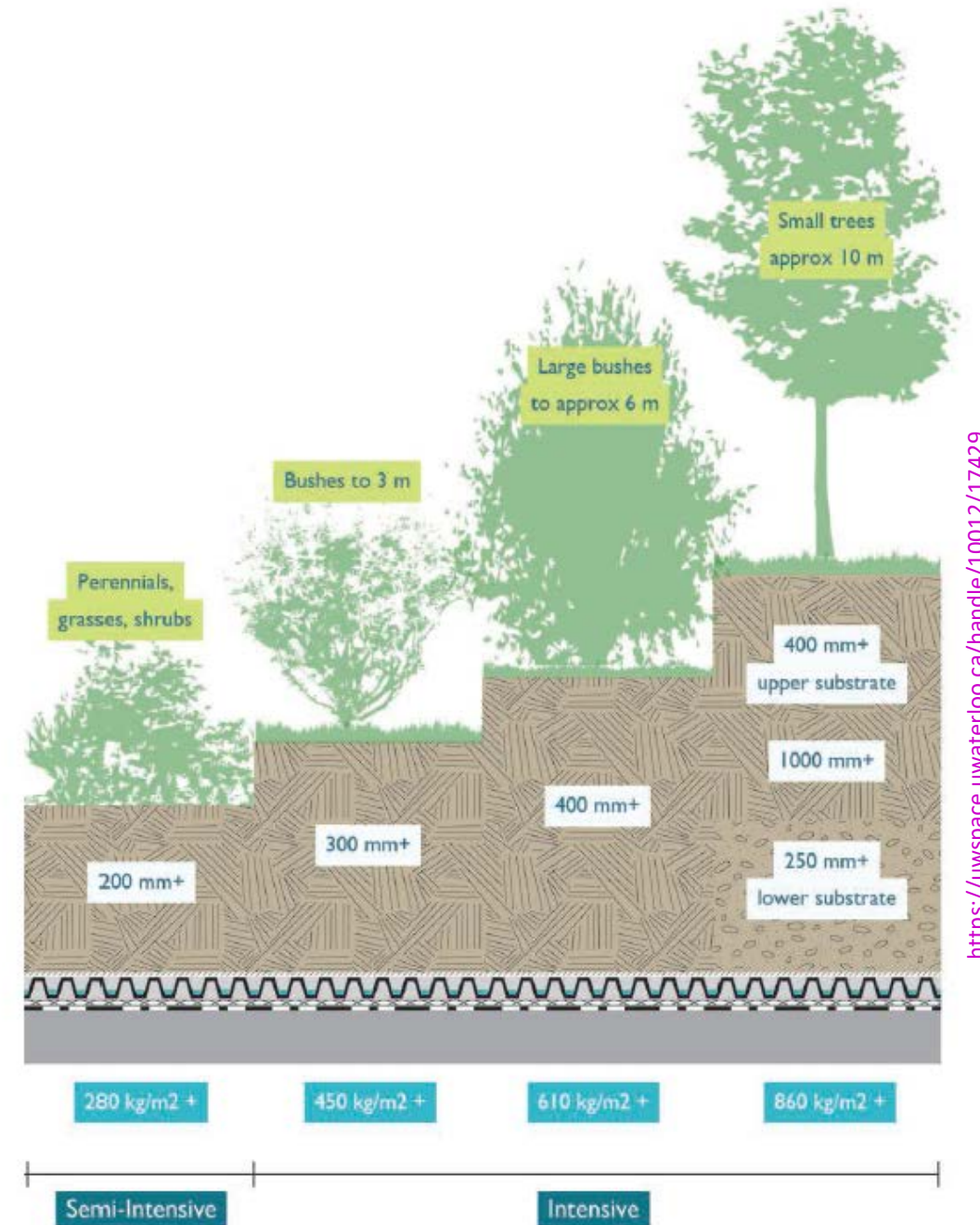
GREEN ROOFS GREEN WALLS



- A significant environmental improvement to roofing applications has been the “invention” or “adoption” of green roof practices.
- Green roofs are installed over a modified version of more conventional flat roofs, and are normally comprised of a “system” that is sold by several green roof manufacturers (like Soprema)
- These roofs have been used widely in Europe for many years

Two main types:

- **intensive** (thicker growth medium required for larger plants)
- **extensive** (thinner, lighter growth medium required for smaller plants) - *this one is more popular*





Very old green roof over the Halifax Citadel.

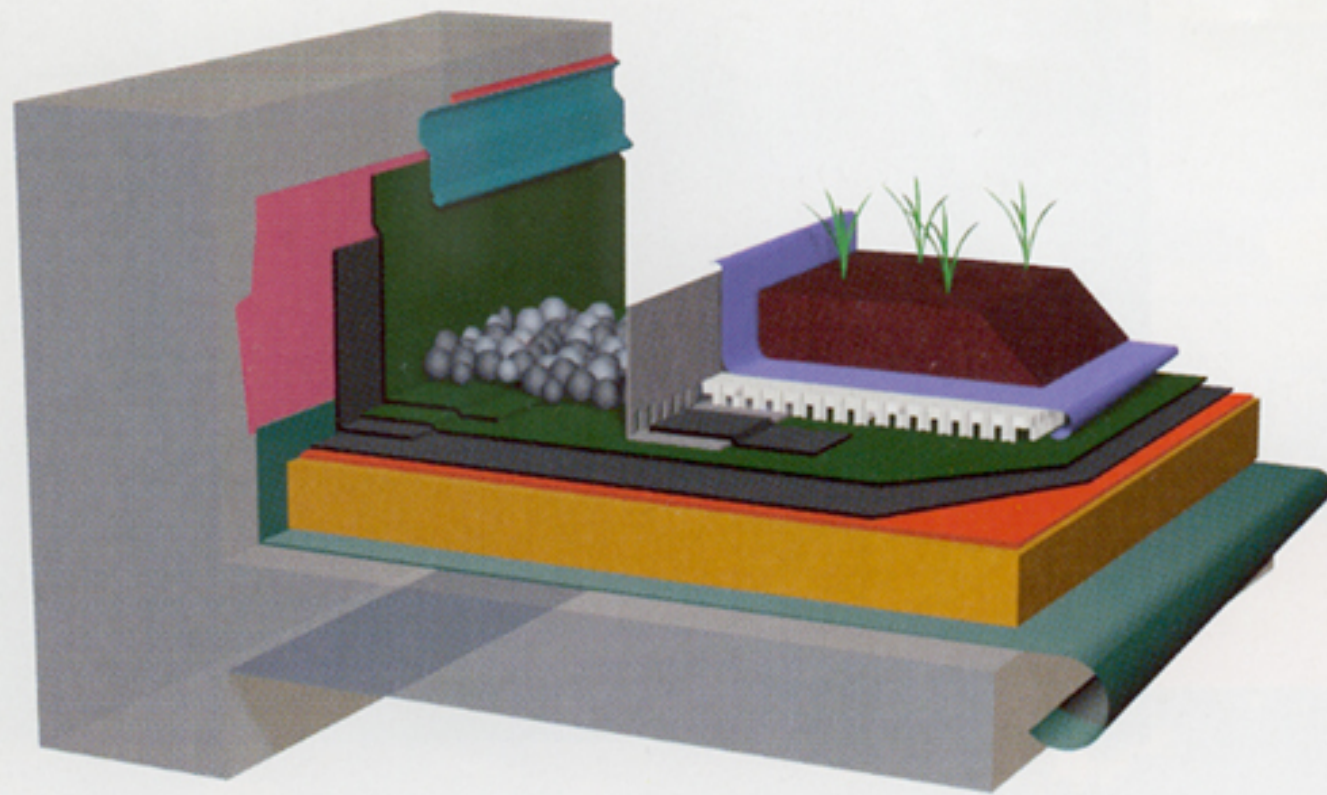




Sopranature

NATURE RULES THE ROOF!





-  Vegetation
-  Sopraflor Growing Medium
-  Soprafiltre
-  Sopradrain PSE or GEO
-  Curb
-  Ballast
-  Sopralene Flam Jardin Cap Sheet
-  Base Sheet Options:
Sopralene Flam 180
or Elastophene Flam
or Self-adhesive Membrane
-  Elastocol 500 Primer
-  Support Panel for Membrane
-  High Density Thermal Insulation
-  Caulking Mastic
-  Vapour Barrier
-  Metal Flashing
-  Support

THE SOPRANATURE SYSTEM

THE SOPRANATURE SYSTEM

SOPRALENE FLAM JARDIN WATERPROOFING MEMBRANE The 2-ply SOPRALENE FLAM JARDIN system waterproofs the deck. The membrane contains root repelling agents that prevent root penetration.

DRAINAGE LAYER Its purpose is to facilitate water flow to the roof drains. It is composed of one of the following materials, depending on roof slope: SOPRADRAIN PSE expanded polystyrene (0-5% slope), or SOPRADRAIN GEO drainage geotextile (>5%).

FILTER SOPRAFILTER is a non-woven synthetic geotextile that prevents fine particles from clogging the drainage layer.

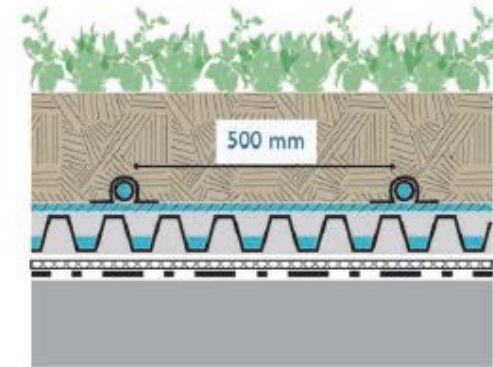
GROWING MEDIUM SOPRAFLOR growing medium is designed and manufactured to achieve optimum water retention, permeability, density and resistance to erosion in order to support lush vegetation over the entire roof.

VEGETATION The vegetation is an integral part of the SOPRANATURE system and has been selected for its ability to adapt to extreme weather conditions. In extensive systems, ground covers are used, that is, annuals, biennials and perennials that regenerate themselves and spread naturally over the growing medium. In semi-intensive systems, perennials, shrubs and grass grow in an irrigated rooftop garden.

EDGE PROTECTION

Edges and roof structures must be protected by a 500 mm band of gravel or pavers. A prefabricated border of precast concrete, metal or wood is installed to contain the vegetation areas.

Subsurface Irrigation



Plant layer

System substrate

Drip irrigation line

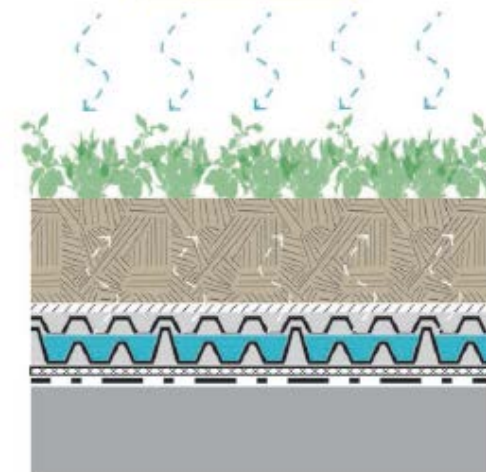
Filter fabric carrying water to substrate

Drainage board

Protection layer

Root resistant waterproofing membrane

Water Retention



Plant species

System substrate

Filter fabric

Drainage board

Rainwater storage

Protection layer

Root resistant waterproofing membrane



Sopravert is Sarnafil's European green roof system. It maintains that the green roof also helps to buffer from the effects of sound as well as weather, and controls/delays runoff from heavy rain.

Mountain Equipment Coop, Toronto:

- This environmentally conscious retailer has chosen to use green building practices on their buildings.



Vancouver Public Library:



- The green roof on VPL is not accessible to the public (has no guard rails at the edge) and is planted with grasses. The idea being to reduce urban heat island while providing a nice view for taller buildings adjacent



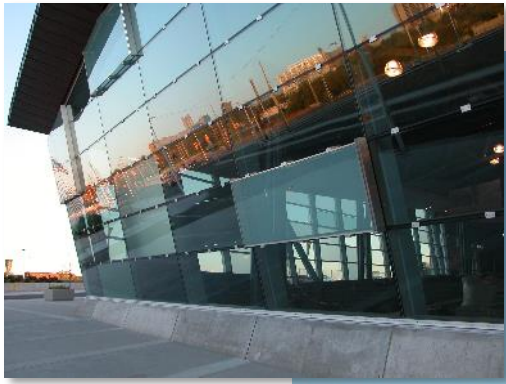
YMCA Environmental Learning Centre:

- This building illustrates the ability to install a green roof in a sloped situation





Herb garden green roof on Fairmont Hotel in Vancouver



Freshly planted green roof on Canadian War Museum (May 2005)



May 2012



Partial green roof on the Salt Lake City Library by Moshe Safdie



Boston Children's Museum: green roof panels/squares



Healing Garden, Massachusetts General Hospital, Boston

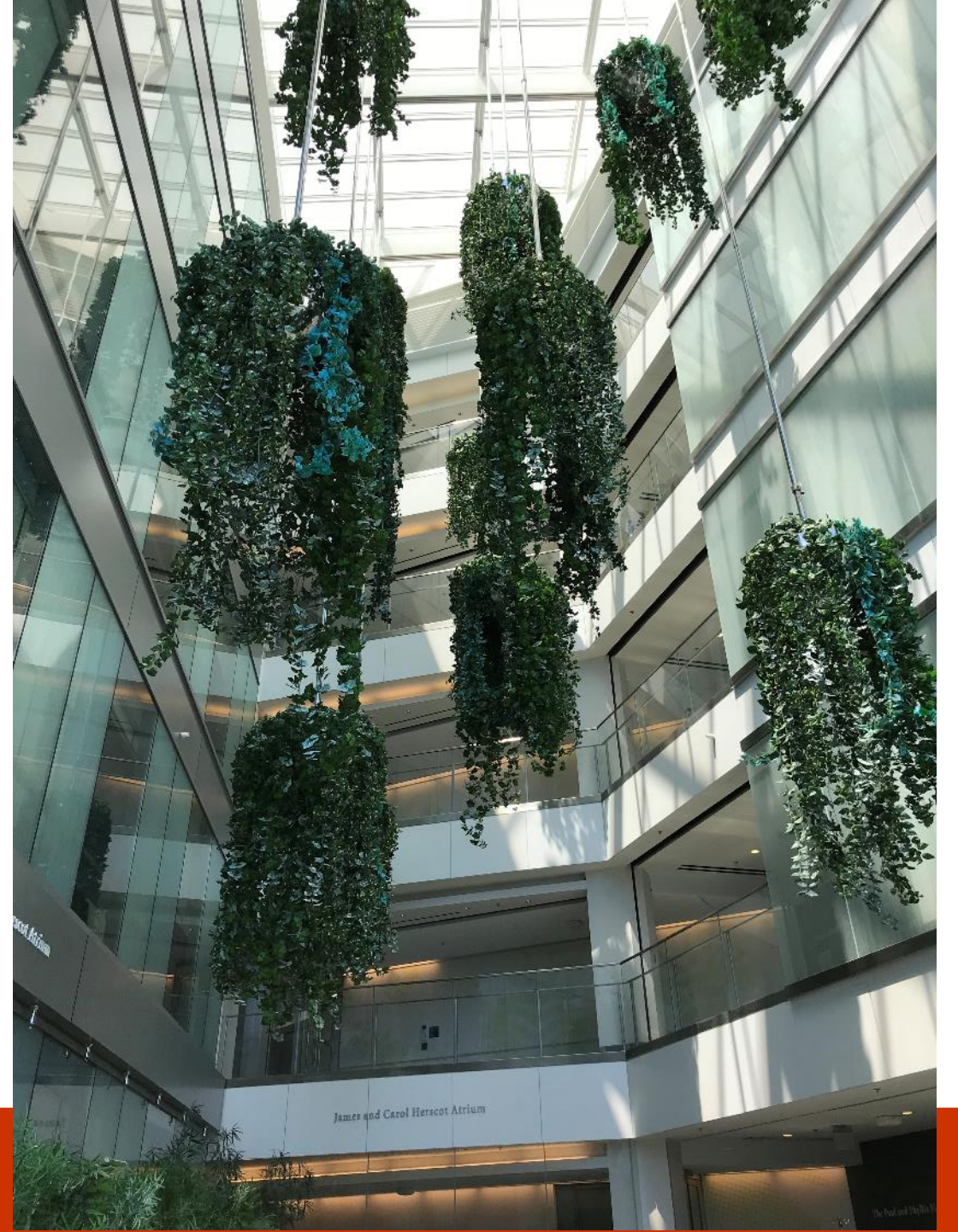
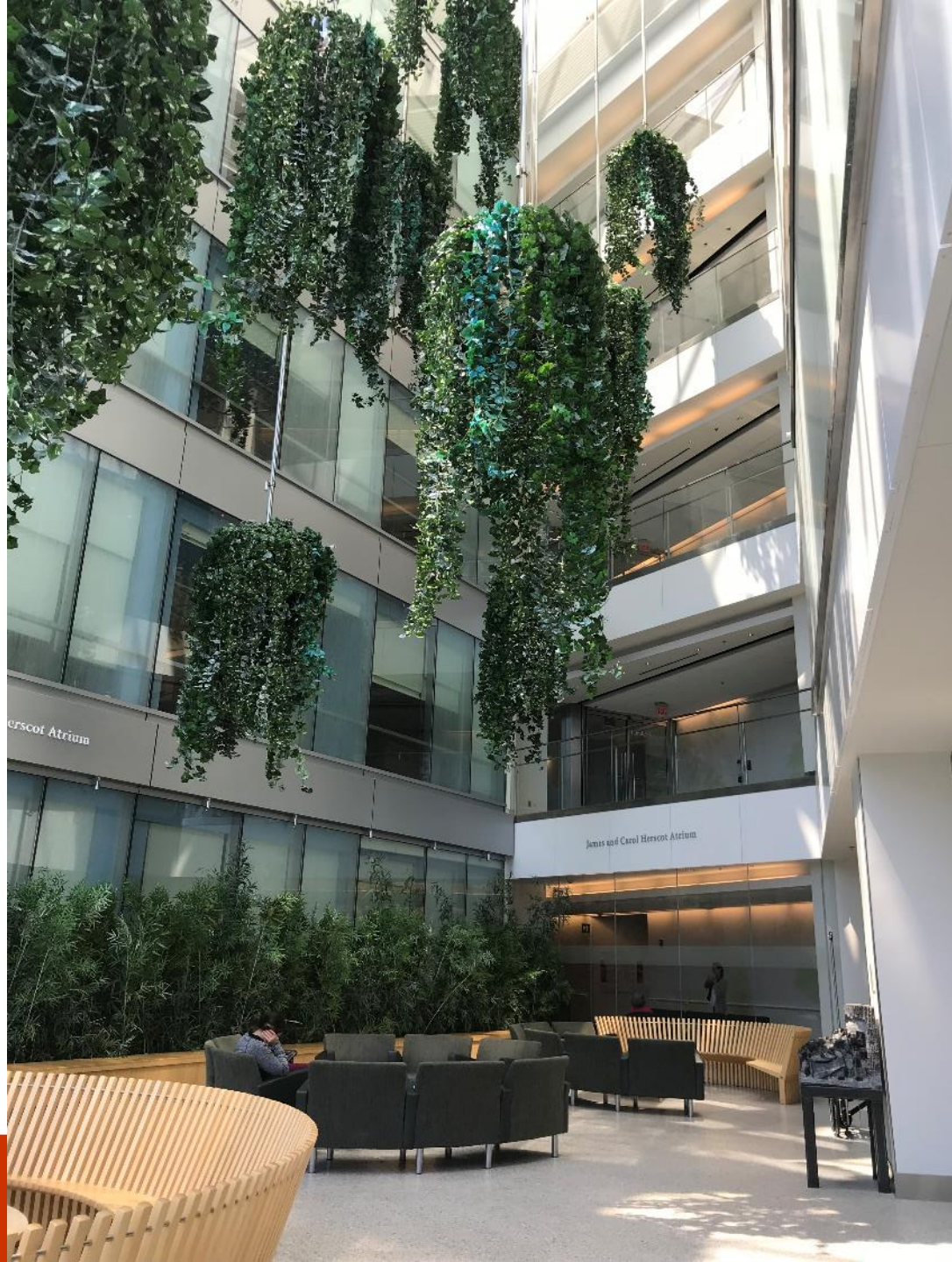






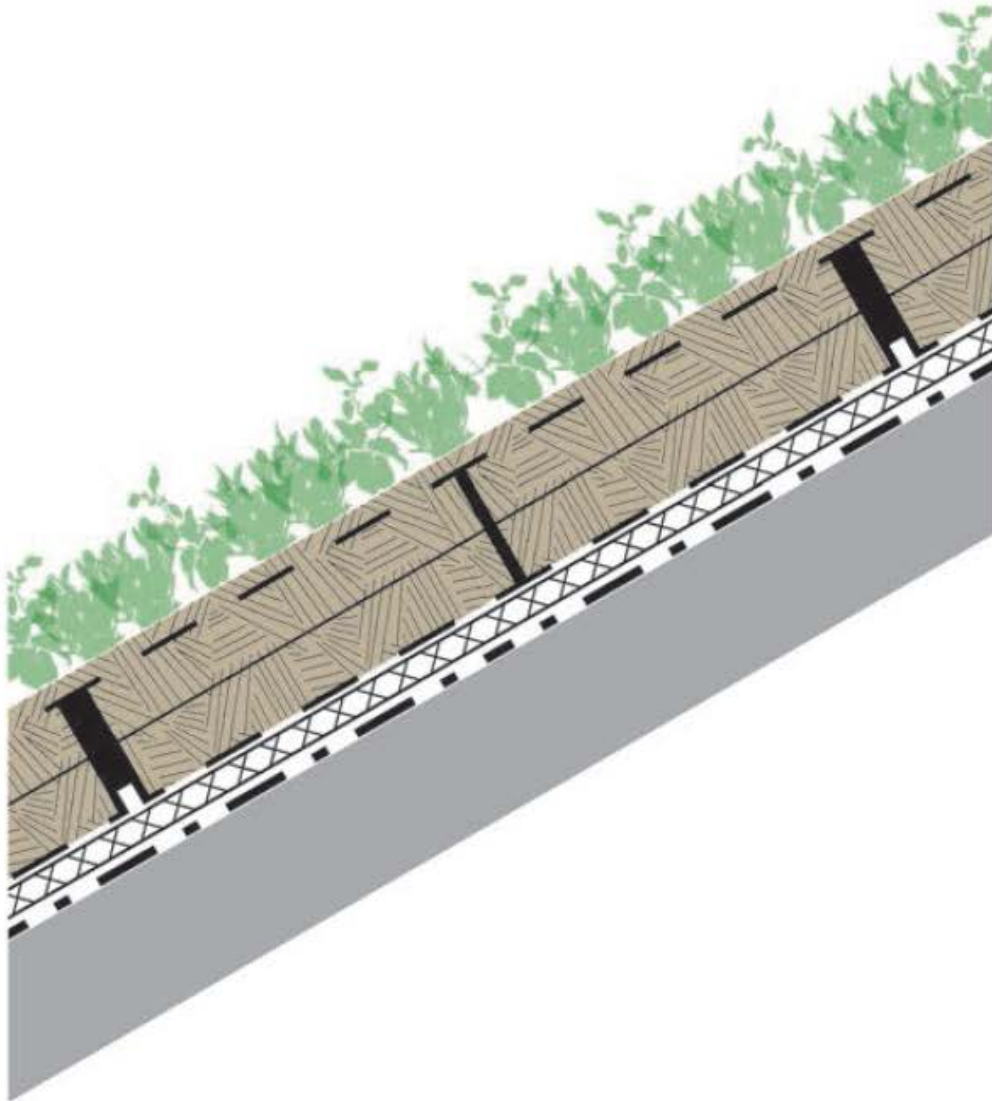








Steep Slope Assembly



Irrigation by drip lines along ridge or sprinkler

Plant layer

Substrate infill to 10 mm above grid element

HDPE cellular grid elements

Protection mat

Root resistant waterproofing membrane



Renzo Piano Science Museum, San Francisco



Operable skylights to vent heat from interior



Drainage paths for excess water



Convention Centre. Sydney, Australia



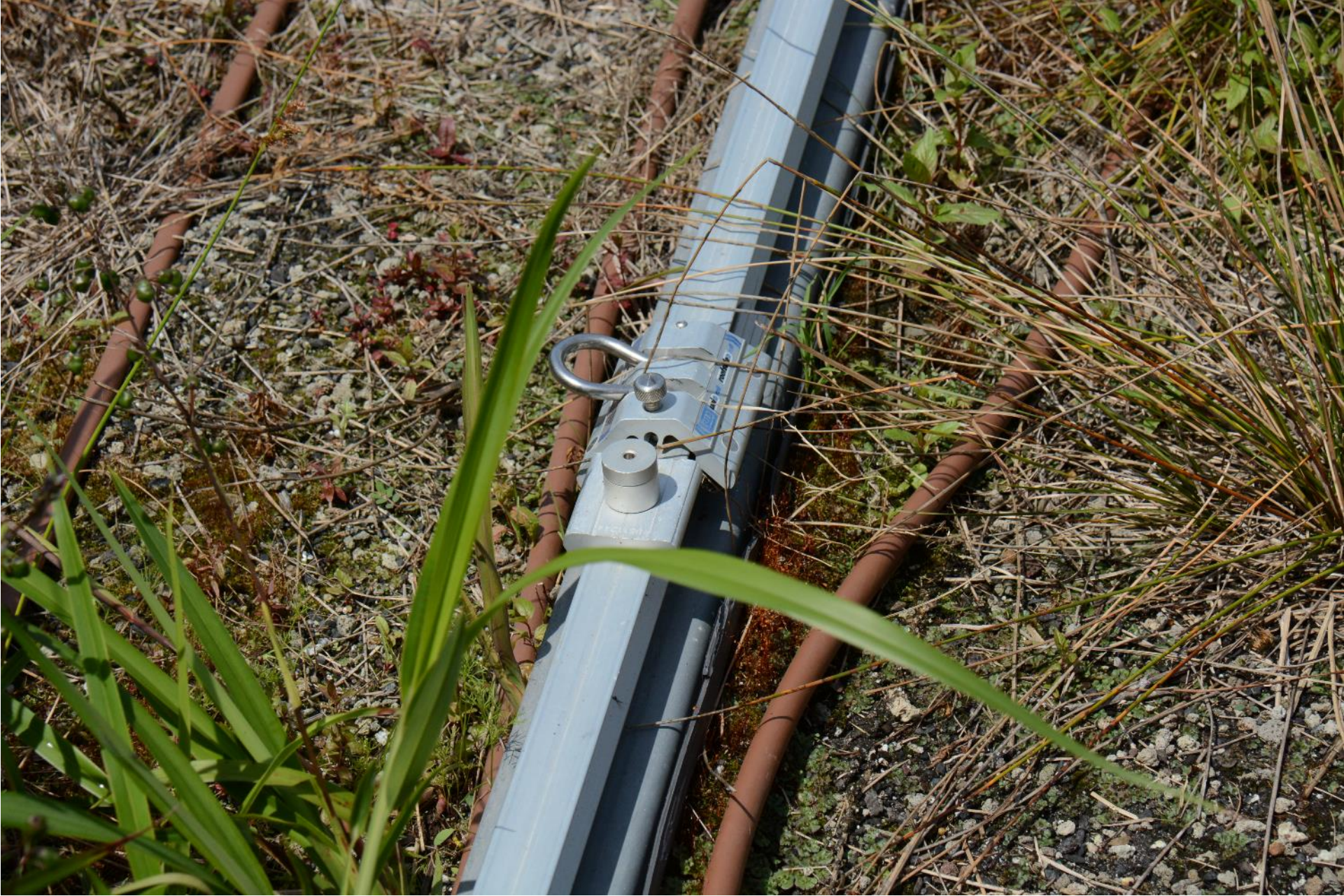












Green Roof Benefits:

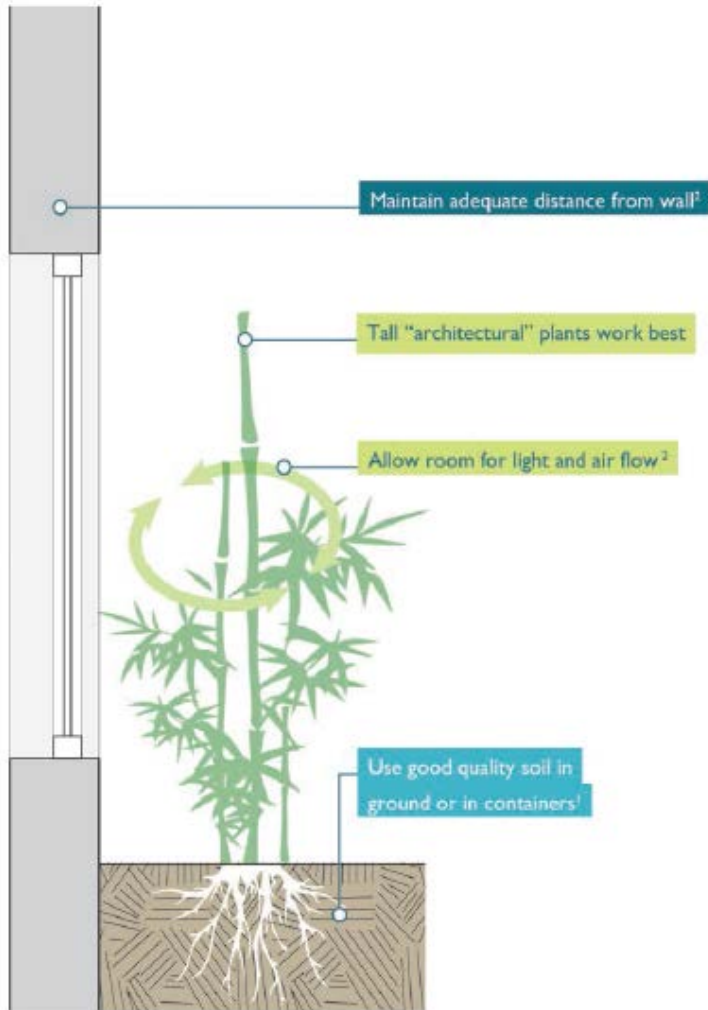
- Planting reduces *urban heat island effects*
- planting can be used to absorb rain water and decrease water that must be processed by the urban storm sewer system
- visually pleasing
- City of Toronto now has a Green Roof By-law that requires Green Roofs on new commercial buildings.

Green Roof Drawbacks:

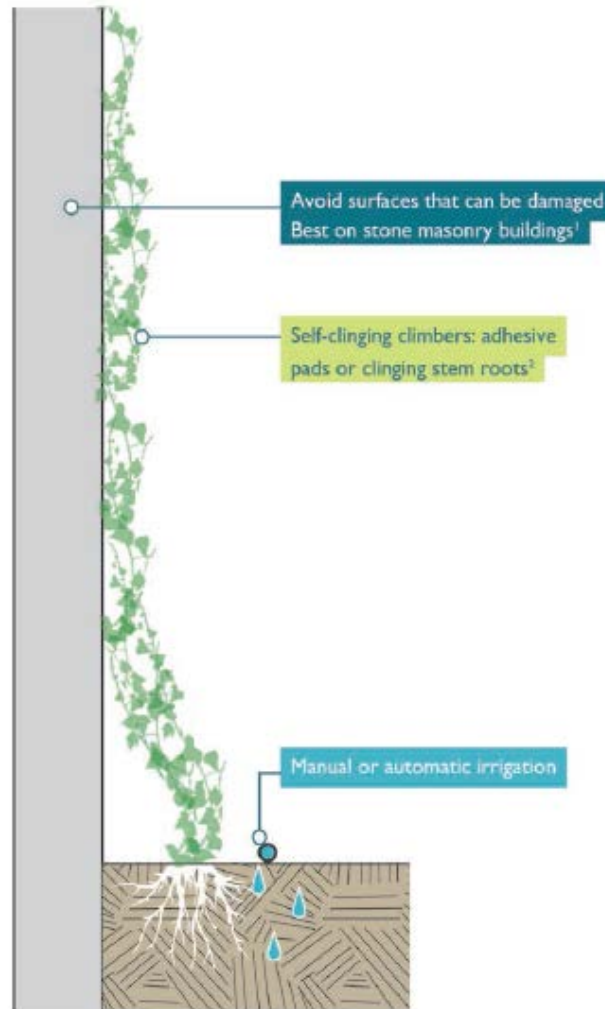
- Why not do a green roof?
- Additional first expense
- additional structure required to support roof
- plants must be hardy and not need watering (over the long term)
- watering essential during the first 2 or so years until roots become established
- Does not benefit insulation as materials are damp so conductive rather than insulative

The following images are from the thesis of Cynthia Eng: "Nature Nurtures" 2021

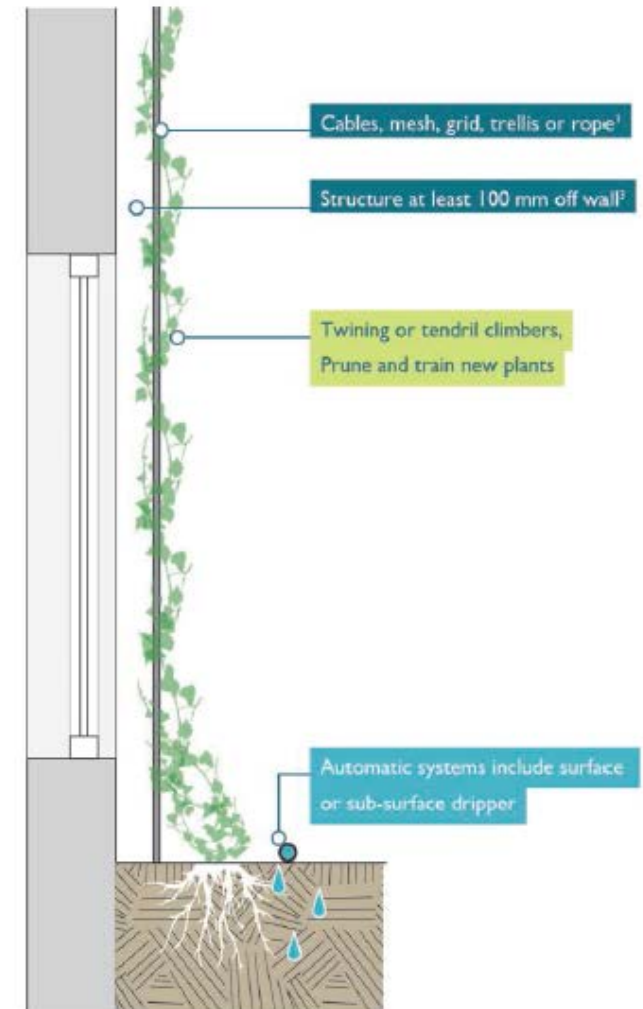
<https://uwspace.uwaterloo.ca/handle/10012/17429>



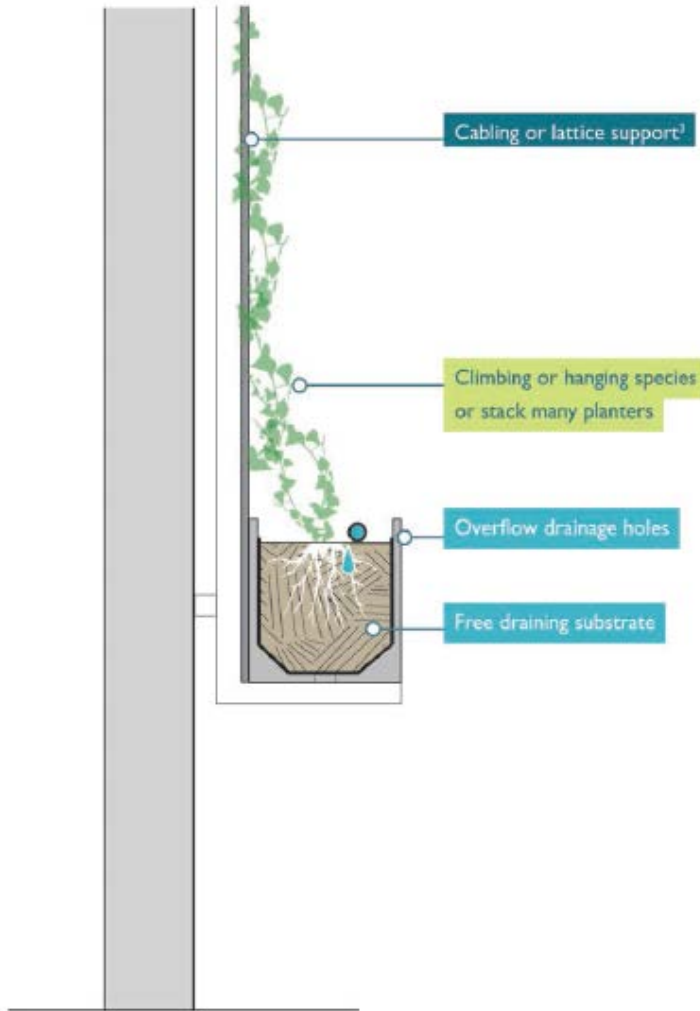
Near Wall Planting



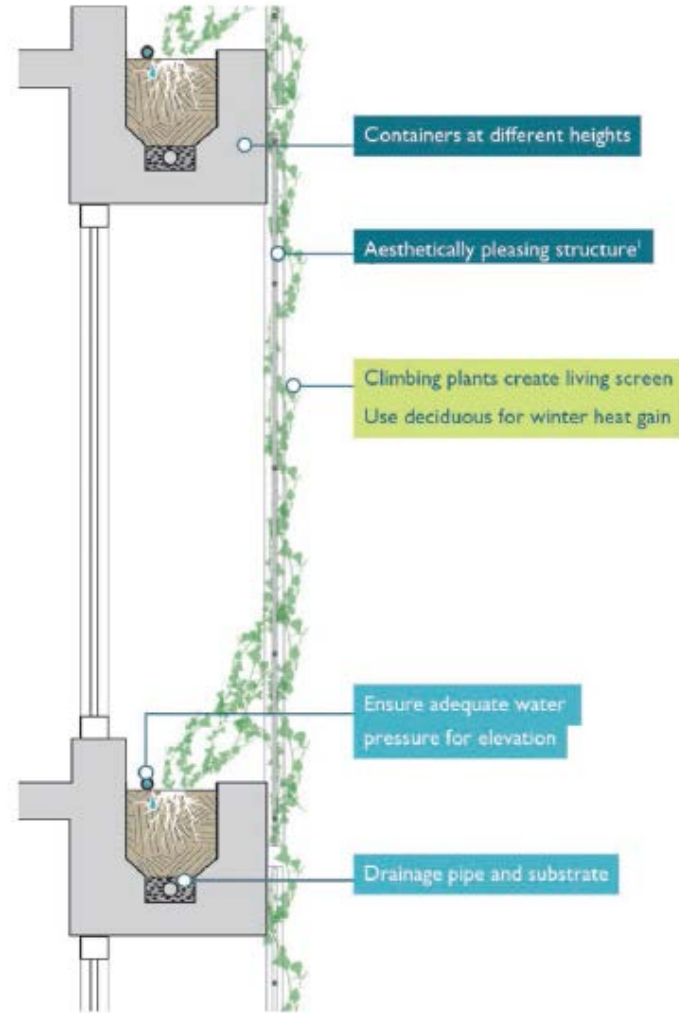
Direct Green Facade



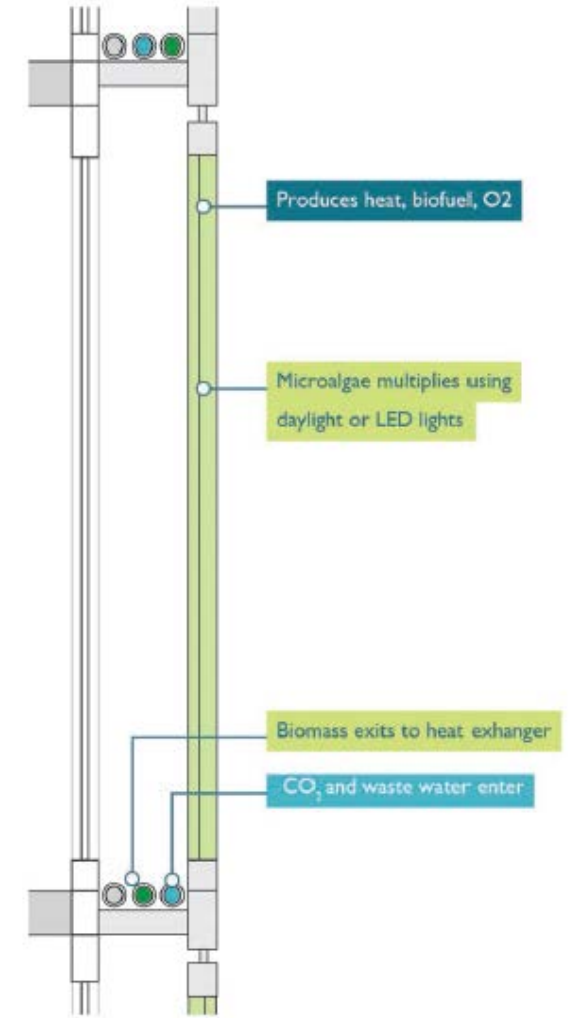
Indirect Green Facade



Raised/stacked planters



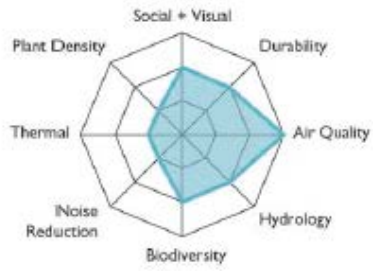
Double skin green façade



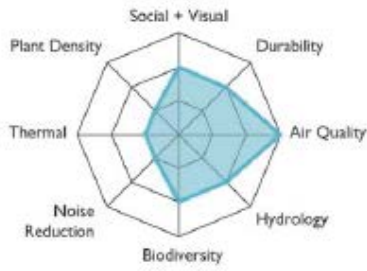
Double skin algae façade

GREEN FACADE COMPARISON

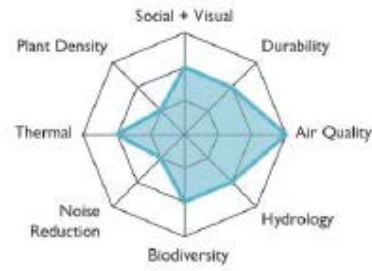
Near-Wall Planting



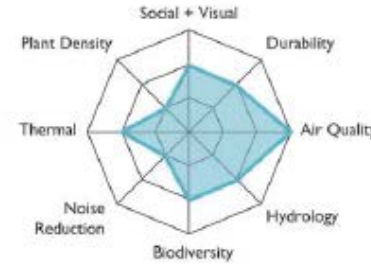
Direct Green Façade



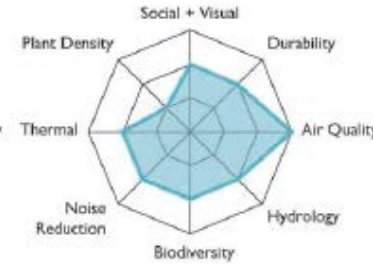
Indirect Green Façade



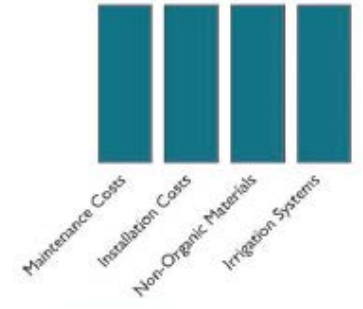
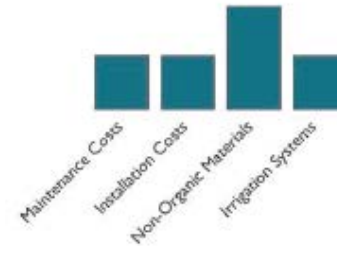
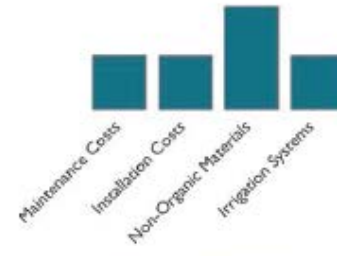
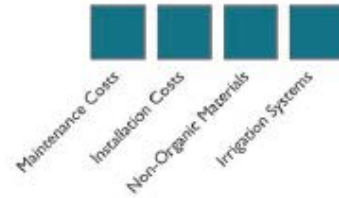
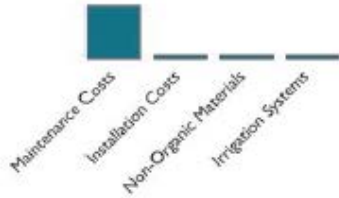
Stacked Planters

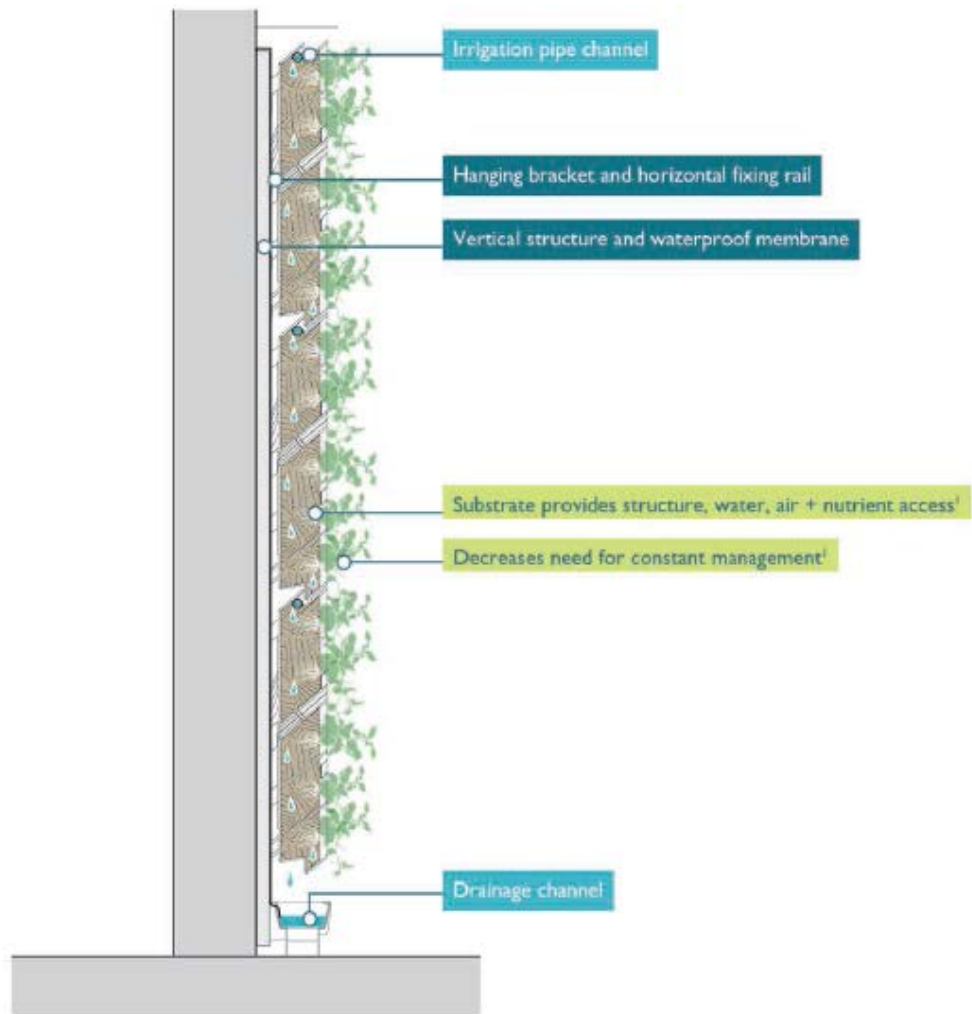


Double-Skin Green Façade

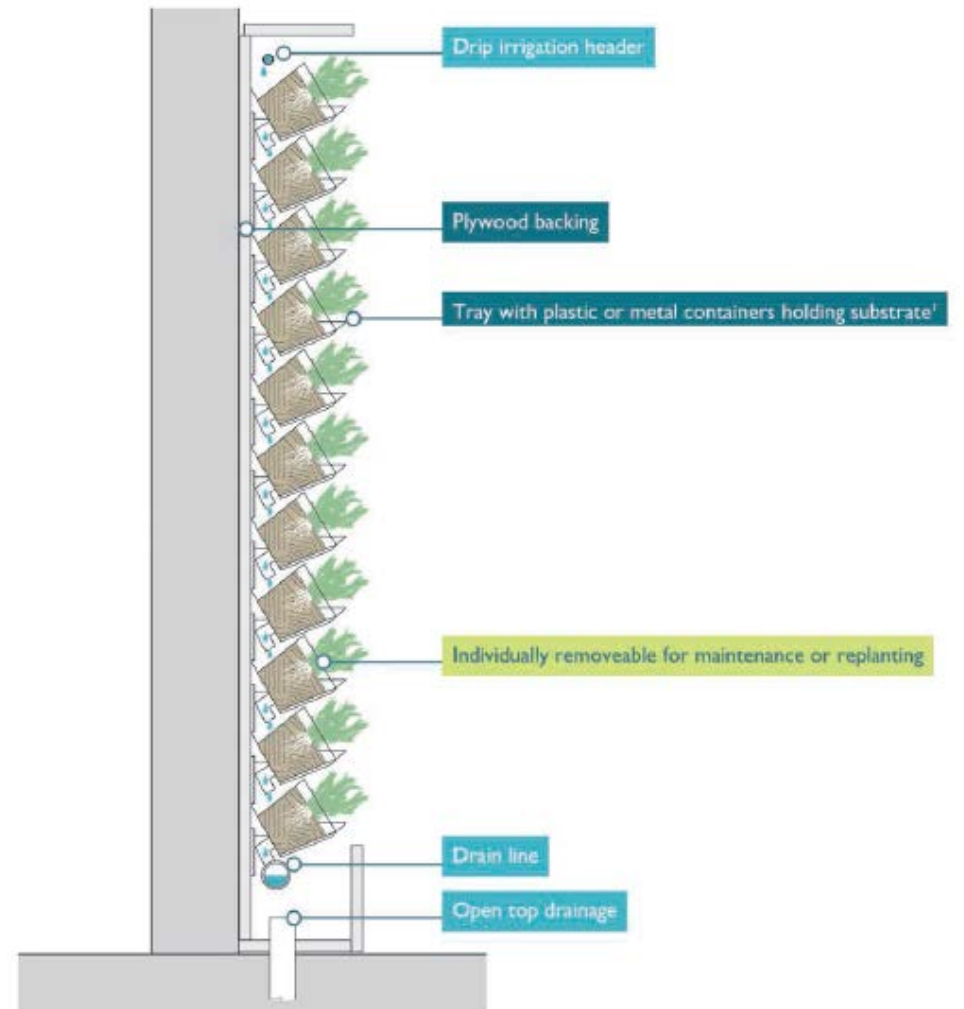


Algae Photobioreactor

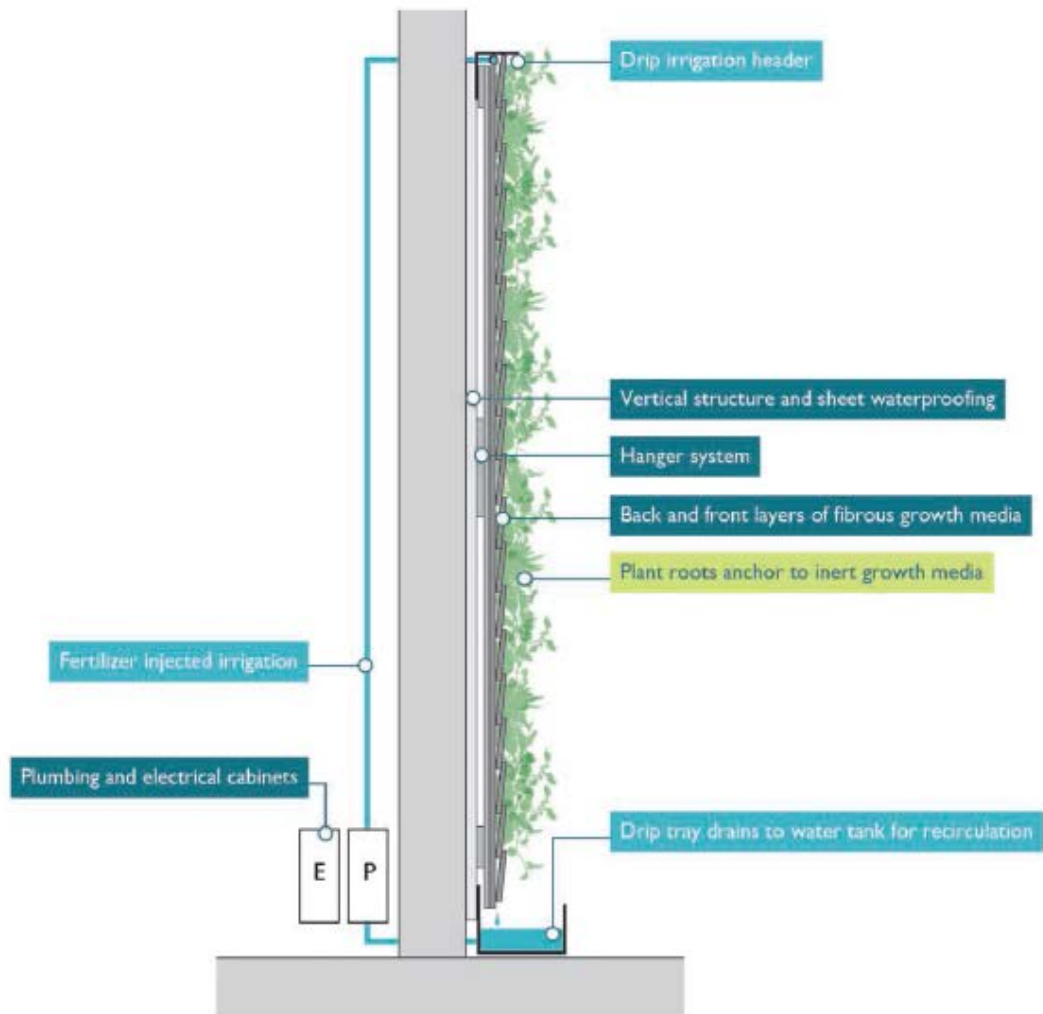




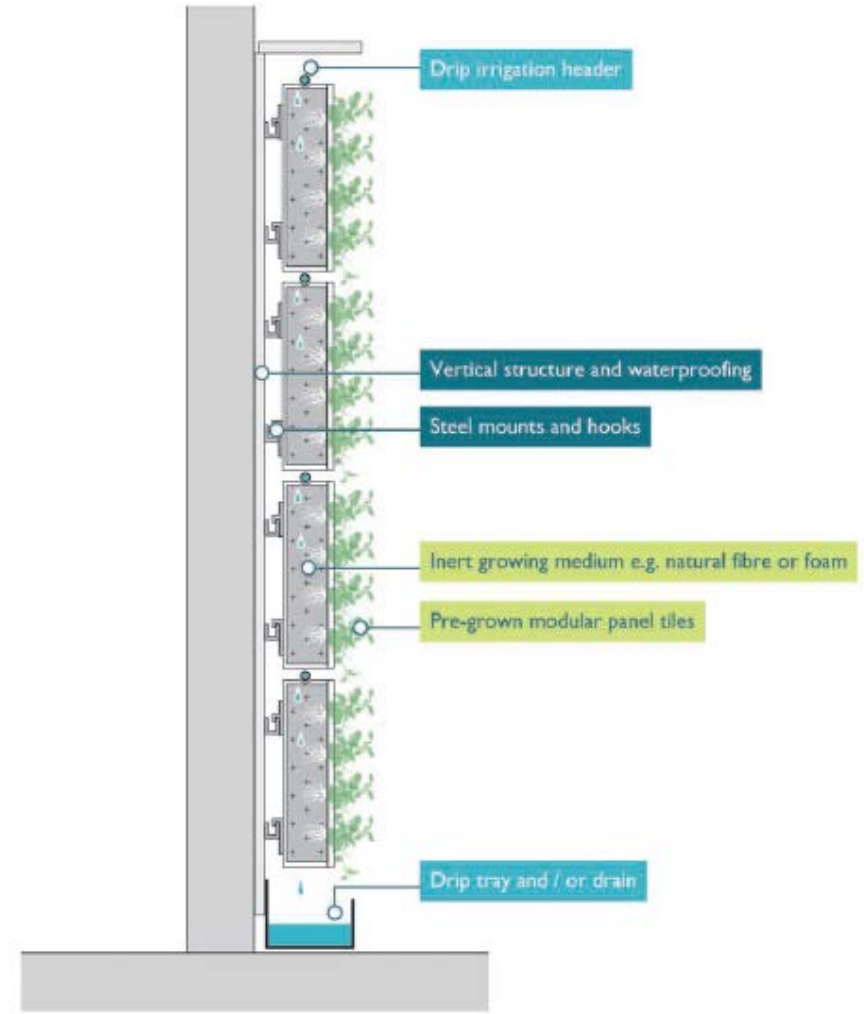
Modular substrate green wall



Tray substrate cell green wall



Continuous fabric fibre



Modular hydroponic panel



Caixa Forum, Madrid. 2007. Patrick Blanc



Miami Art Gallery. Herzog & deMeuron. Hanging Green by Patrick Blanc







Branley Museum. Ateliers Jean
Nouvel.

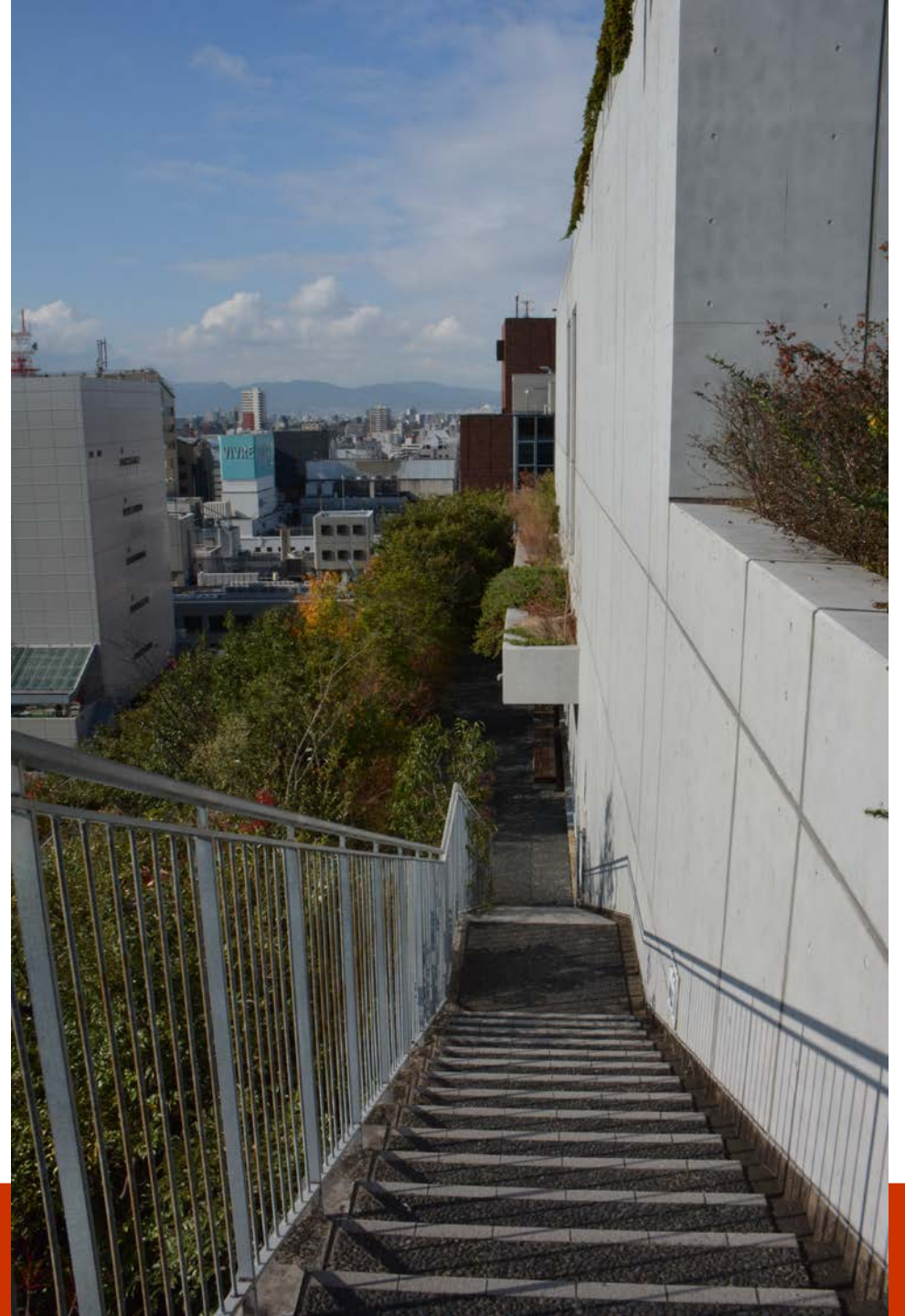
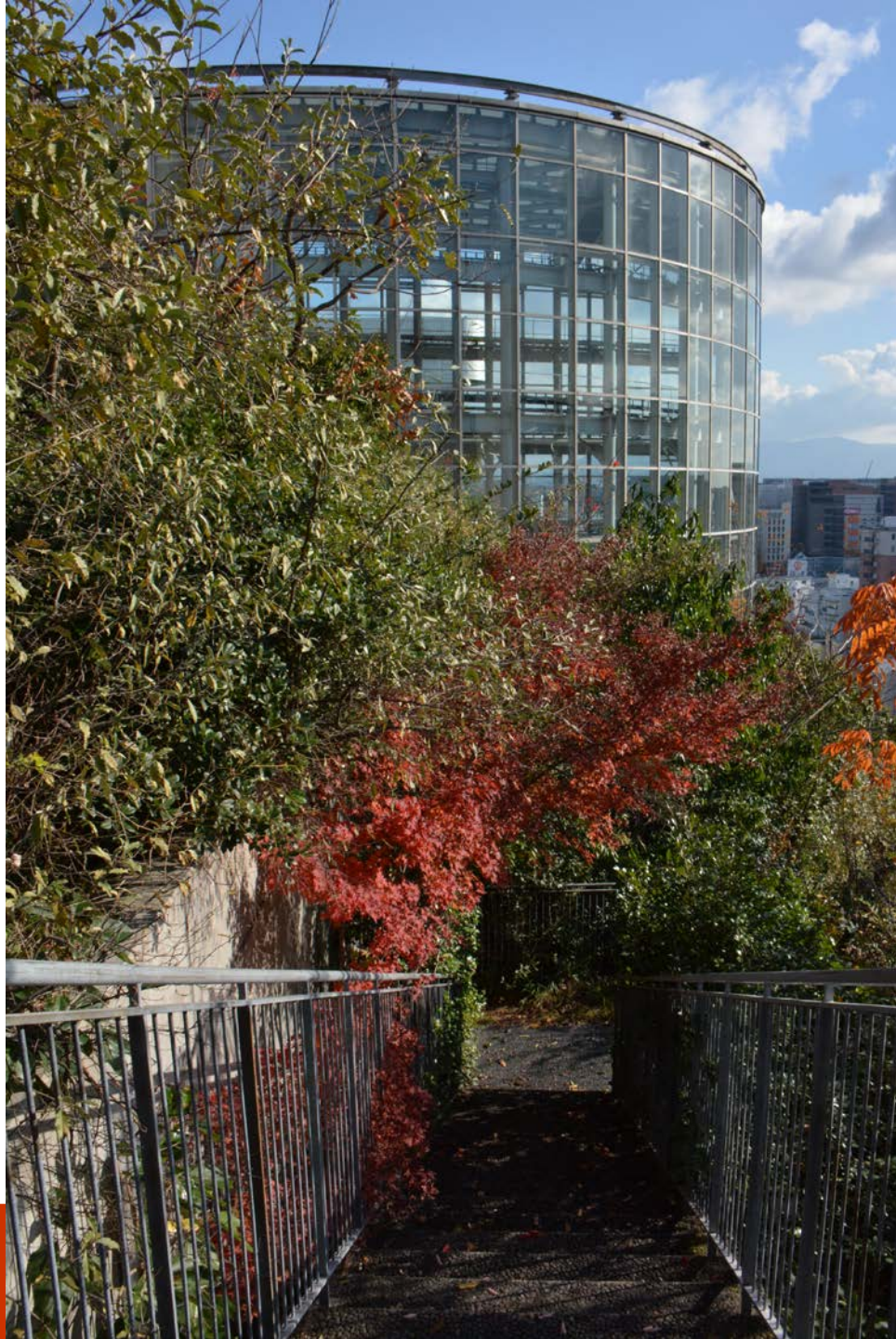






Acros, Fukuoka, Japan







One Central Park, Sydney, Australia, Ateliers Jean Nouvel







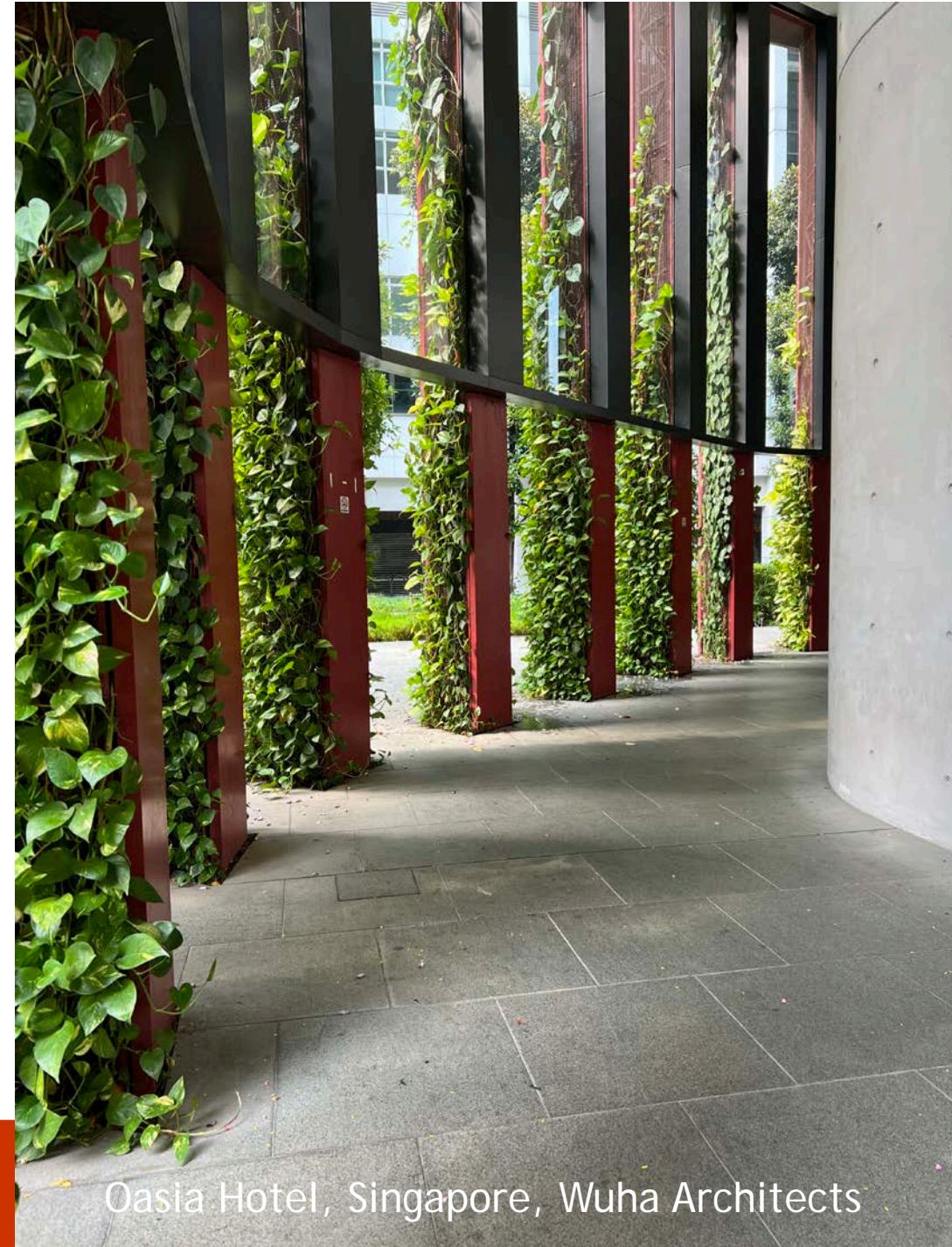
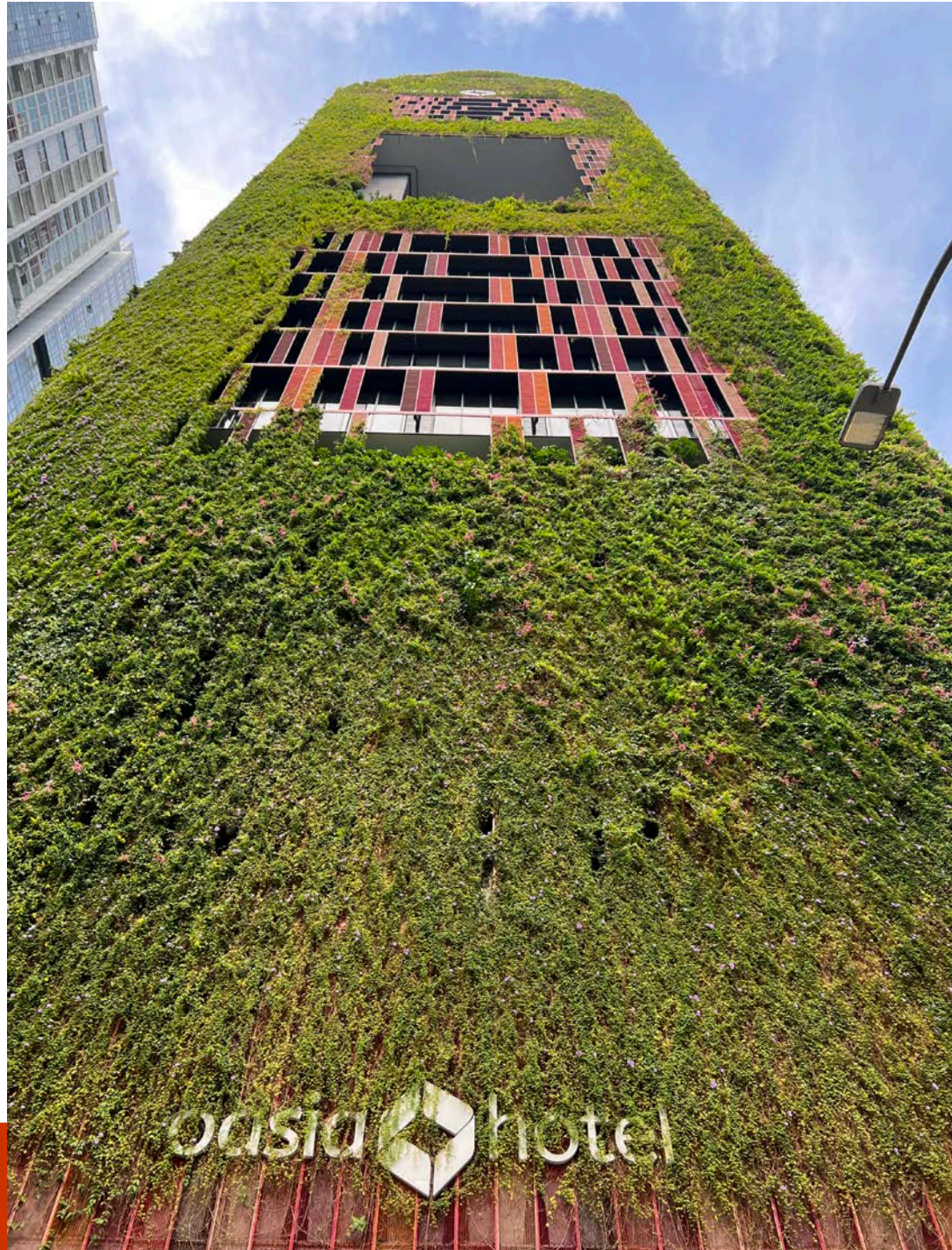




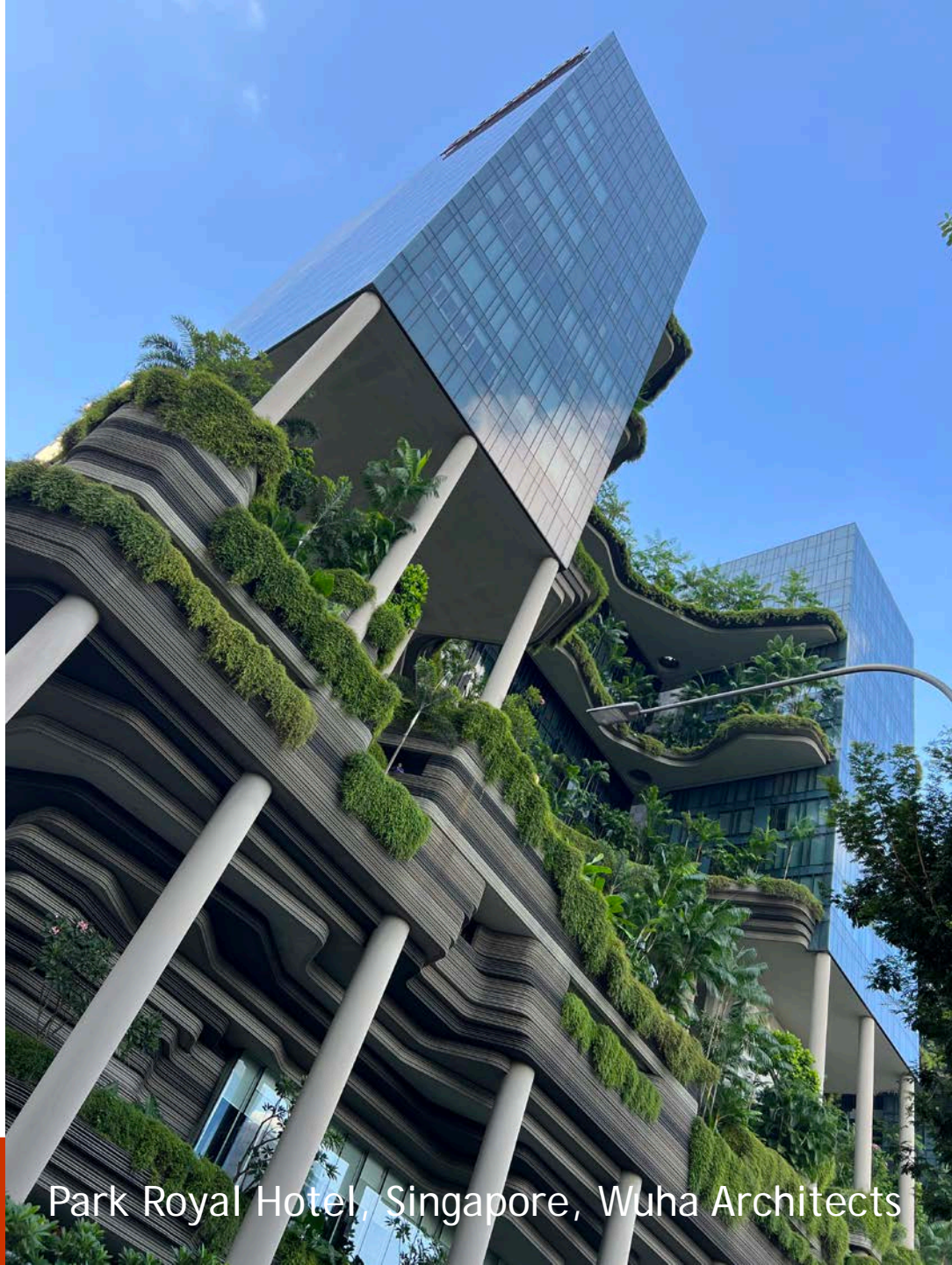
Fukuoka, Japan



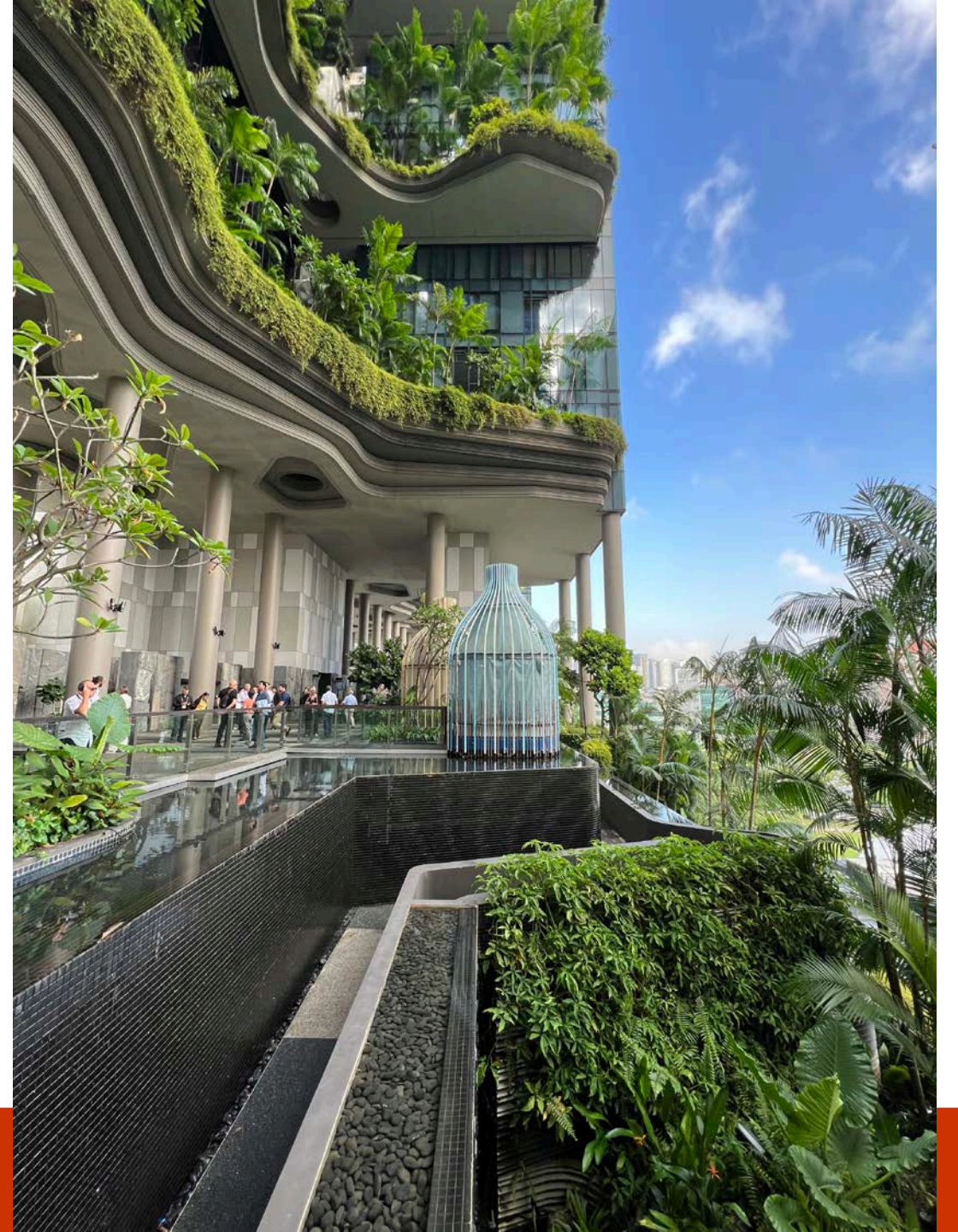




Oasia Hotel, Singapore, Wuha Architects

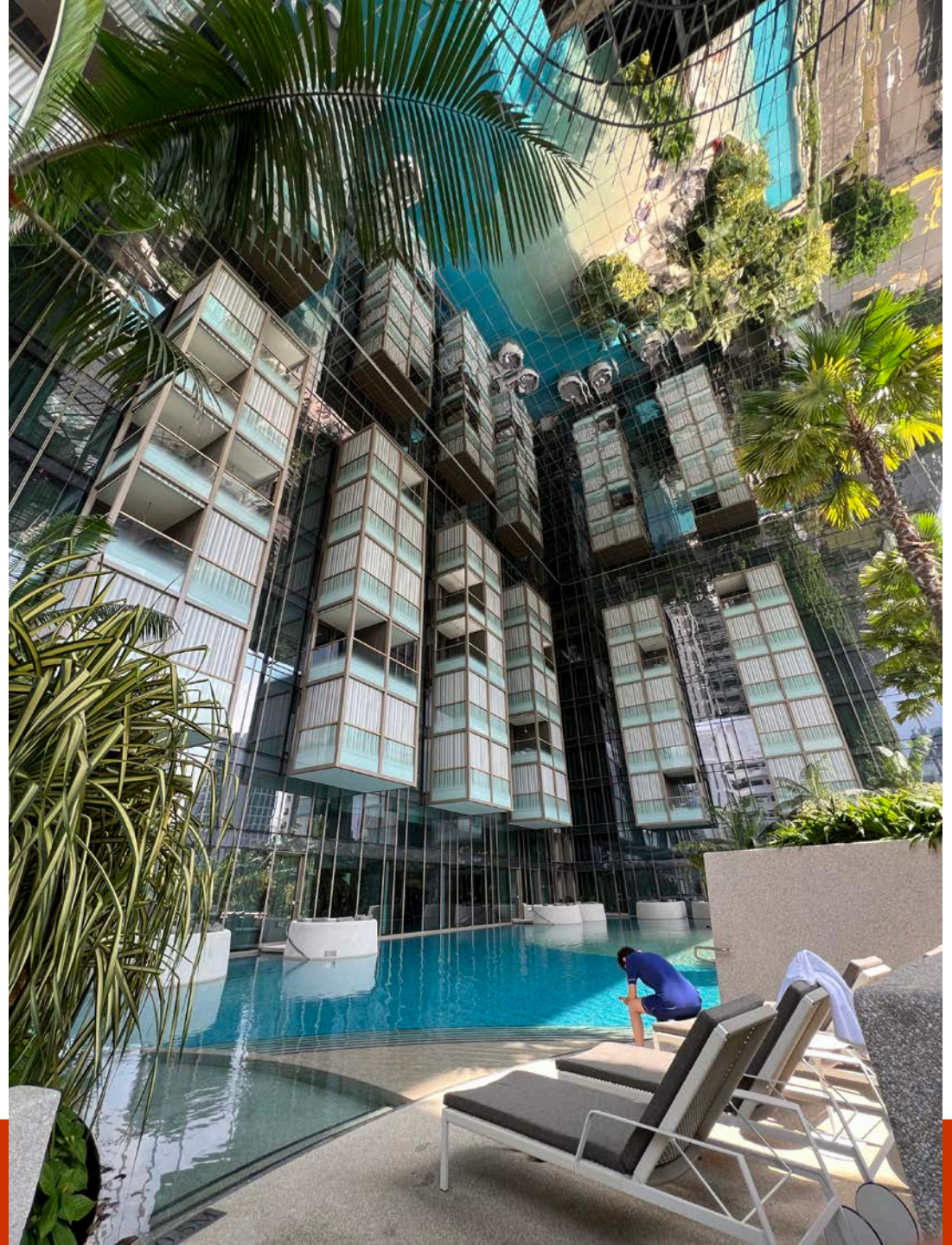


Park Royal Hotel, Singapore, Wuha Architects





Pan Pacific Hotel, Singapore, Wuha Architects



Green Wall Benefits:

- Planting reduces *urban heat island effects*
- Effective as a shading screen to keep away solar radiation
- visually pleasing
- Biophilia

Green Wall Drawbacks:

- Additional first expense
- additional structure required to support roof
- plants must be hardy and not need watering (over the long term)
- watering essential (plants never become self sufficient)
- Climate dependent (water systems will freeze in cold climates)
- Constant maintenance/access for maintenance
- Dead plants create a fire load