

室內空氣質素論壇

# 未來就緒 - 健築探索

What and How to Achieve in  
Future-Ready Buildings and Built Environments?

梁文傑 | MK LEUNG

董事 / 環保設計總監 | Director / Director of Sustainable Design

3 February 2024



A trusted advisor to clients and society since 1976

**47** years of history

**6** offices

**550+** trusted advisors

Projects cover

**30+** Asian cities





SK Yee Healthy Life Centre



Victoria Dockside



Ko Shan Theater New Wing



Treehouse



CIC - Zero Carbon Park



King George V School  
- Performing Arts Block



Integral



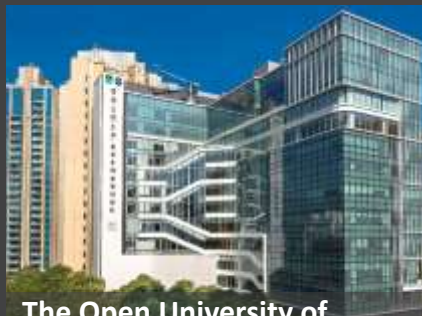
Tiu Keng Leng Sports Centre,  
Public Library and District Open  
Space



Lau Ming Wai Academic Building,  
City University of Hong Kong



Xiqu Centre



The Open University of  
Hong Kong Jockey Club  
Institute of Healthcare

# Founded Behave, RLP's research and insight partner in 2022



Analyze  
**HUMAN  
BEHAVIOUR**  
patterns

Explore  
**TRENDS &  
KNOWLEDGE**

Develop  
**NEW INSIGHTS**  
to change the  
future

Create  
**HUMAN-CENTRIC**  
design

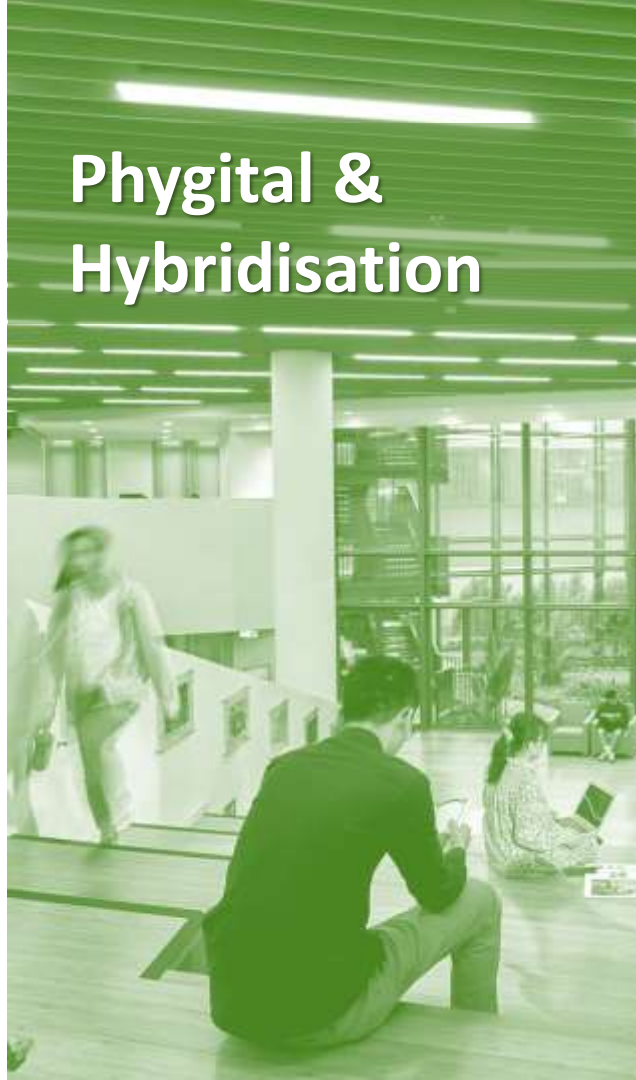
# 健築

TRENDS &  
KNOWLEDGE

# Thinking & Responsive City



# Phygital & Hybridisation



# Transparency & Trust

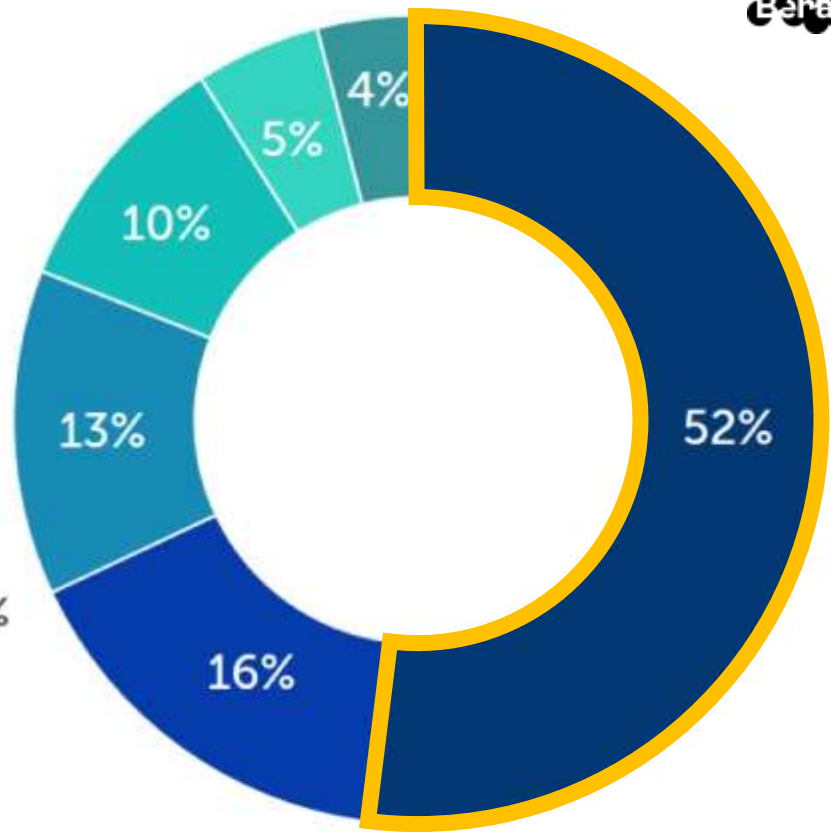


# THE WELL BUILDING STANDARD™



# SOURCES OF POOR INDOOR AIR QUALITY

- **Inadequate ventilation 52%**
- Contamination from inside building 16%
- Unknown source 13%
- Contamination from outside the building 10%
- Microbial contamination 5%
- Contamination from building fabric 4%







# DEMAND CONTROL VENTILATION

Adjust ventilation rates based on concentrations of carbon dioxide to keep levels below



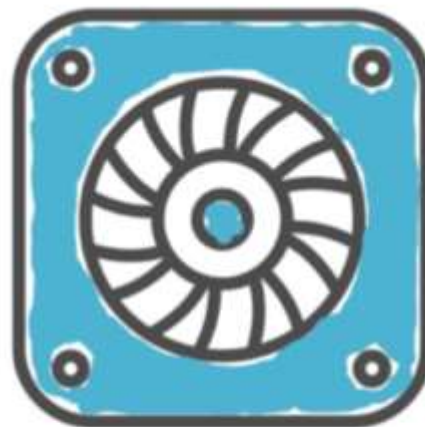
Threshold	Points
900 ppm OR 500 ppm above outdoor levels	1
750 ppm OR 350 ppm above outdoor levels	2





# AIR FILTRATION

Intent: To remove indoor and outdoor airborne contaminants through air filtration



Media filters are used in the ventilation system to filter outdoor air supplied to the space, in accordance with thresholds specified in the table below:<sup>5,6</sup>

Annual Average Outdoor PM <sub>2.5</sub> Threshold	Minimum Air Filtration Level (PM <sub>2.5</sub> removal)
23 µg/m <sup>3</sup> or less	≥80% (e.g., MERV 12 or M6)
24–39 µg/m <sup>3</sup>	≥90% (e.g., MERV 14 or F8)
40 µg/m <sup>3</sup> or greater	≥95% (e.g., MERV 16 or E10)

Evidence that the filter has been replaced according to the manufacturer's recommendation is submitted annually through the WELL digital platform.

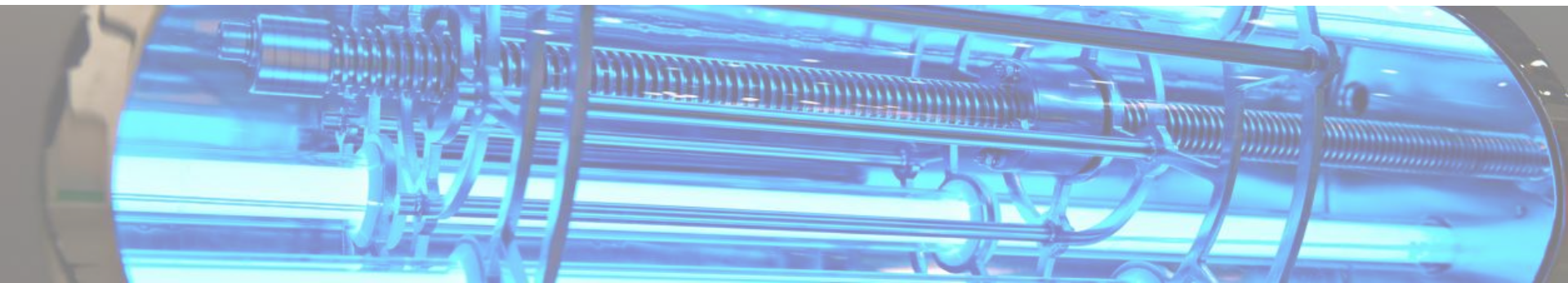


# MICROBE AND MOLD CONTROL



**Intent:** To reduce mold and bacteria growth within buildings, particularly from water damage or condensation on cooling coils

- a. All central air handling units use ultraviolet lamps to irradiate the surfaces of the cooling coils and drain pans.<sup>10</sup>
- b. All cooling coils and drain pans associated with fan coil units either:
  - 1. Are irradiated by ultraviolet lamps.
  - 2. May be opened for inspection for mold growth and cleaned, if necessary.





Particulate Matter Thresholds	Points
PM <sub>2.5</sub> : 12 µg/m <sup>3</sup> or lower. <sup>8</sup> PM <sub>10</sub> : 30 µg/m <sup>3</sup> or lower. <sup>9</sup>	1
PM <sub>2.5</sub> : 10 µg/m <sup>3</sup> or lower. <sup>9</sup> PM <sub>10</sub> : 20 µg/m <sup>3</sup> or lower. <sup>9</sup>	2



- Acetaldehyde: 140 µg/m<sup>3</sup> or lower.<sup>10</sup>
- Acrylonitrile: 5 µg/m<sup>3</sup> or lower.<sup>10</sup>
- Benzene: 3 µg/m<sup>3</sup> or lower.<sup>10</sup>
- Caprolactam: 2.2 µg/m<sup>3</sup> or lower.<sup>10</sup>
- Formaldehyde: 9 µg/m<sup>3</sup> or lower.<sup>10</sup>
- Naphthalene: 9 µg/m<sup>3</sup> or lower.<sup>10</sup>
- Toluene: 300 µg/m<sup>3</sup> or lower.<sup>10</sup>
- Carbon monoxide: 7 mg/m<sup>3</sup> [6 ppm] or lower.<sup>11</sup>
- Nitrogen dioxide: 40 µg/m<sup>3</sup> [21 ppb] or lower.<sup>11</sup>

# AIR QUALITY MONITORING AND AWARENESS



WELL IN PRACTICE

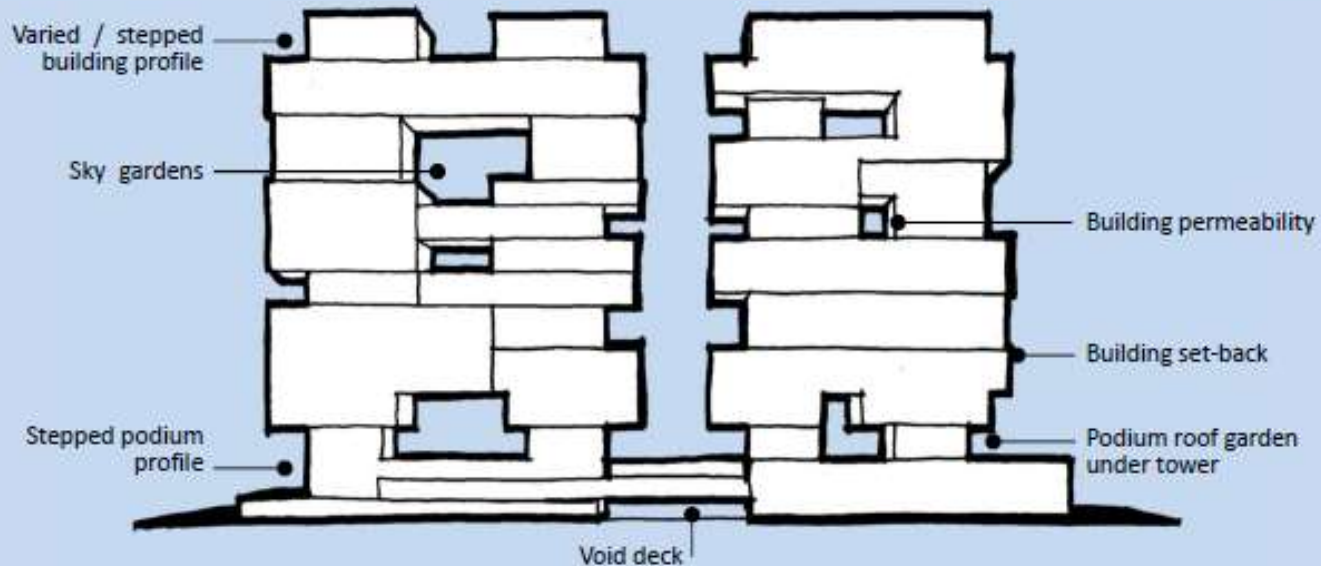
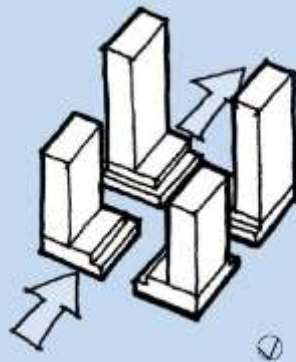
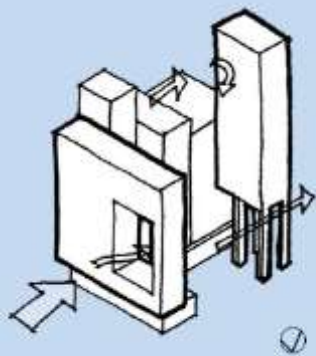
# MATERIAL TRANSPARENCY

TEKNION – DALLAS, UNITED STATES

# 健築

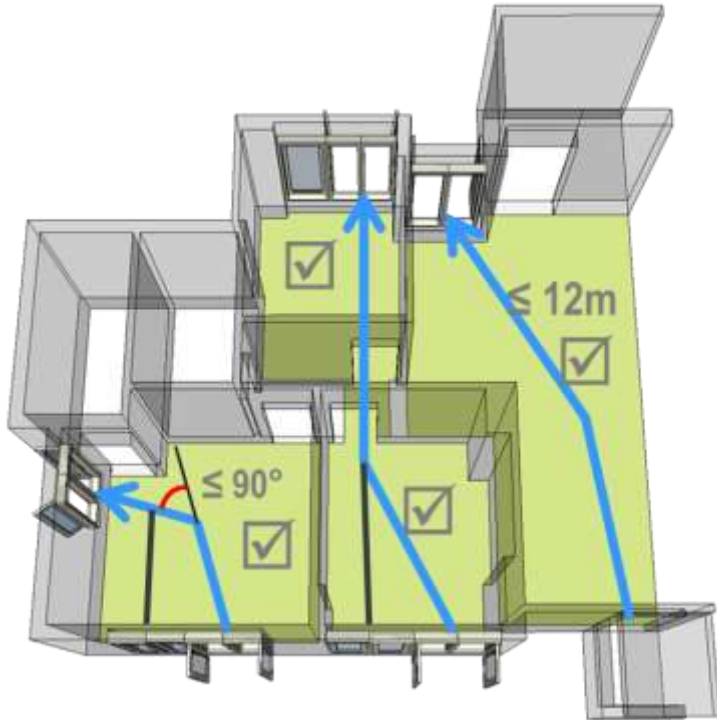
INSIGHTS &  
OPPORTUNITIES

# Permeable Built Form Towards Prevailing Winds



source: RLP's works for CUHK and HKGBC

# Fenestrations for Effective Airflow



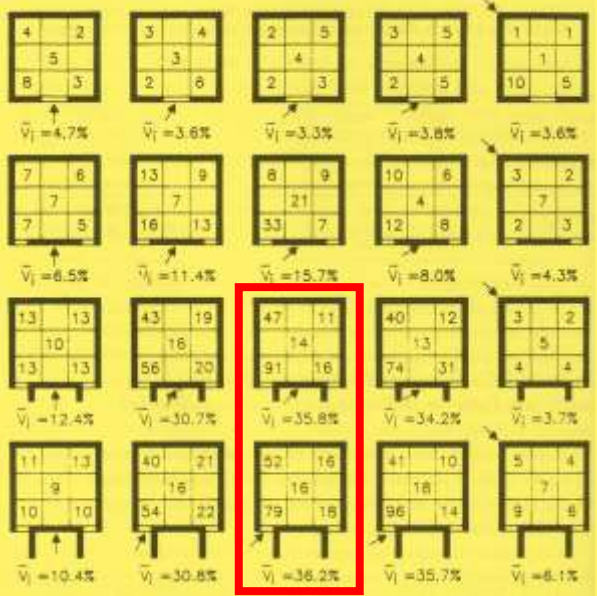
FRESH AIR

Most effective airflow at the occupied zone (between 0.5 and 1.5 m above the floor for comfort)





# External protrusions next to air inlet openings increase average indoor air speeds



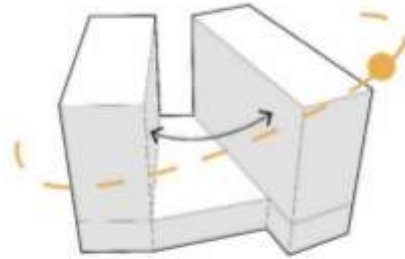
# THEi Campus, Chaiwan Building Permeability for Common Good



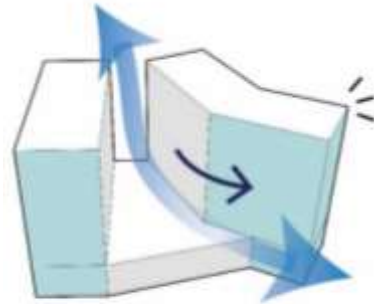
# Climate & Contexts-responsive



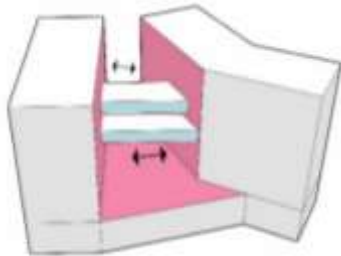
Single Mass



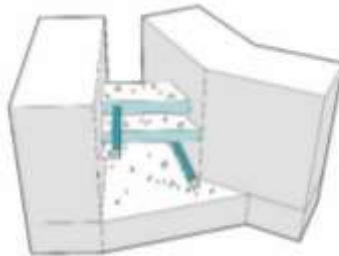
Twin Towers  
- More Light and air



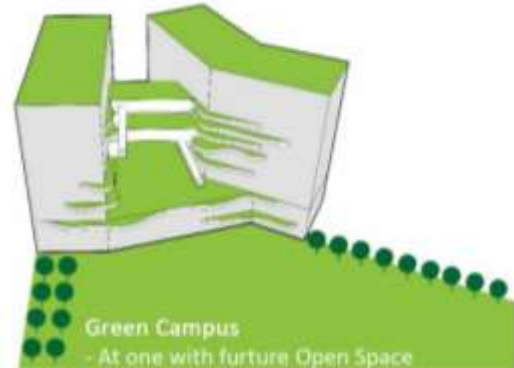
Twisting  
- Better view / permeability



Connected Towers  
- Bridges and Social Hub between



Vertical Street  
- Intermingled with Socialising spaces



Green Campus  
- At one with future Open Space

All rooms have windows facing prevailing summer winds



## Wellness measured

**Low VOC building materials** are used for interior paints and coatings, adhesives and sealants, acoustic baffles, wall panels and green carpets.

**Simulations and on-site measurement** enable we are offering **the best design** to the end-users.

**VOCs** level is  $200 \mu\text{g}/\text{m}^3$  or below  
(60% below the  $500 \mu\text{g}/\text{m}^3$  threshold)

**Formaldehyde** is less than 21.98 ppb  
(less than 27 ppb)

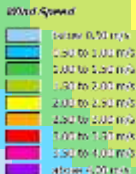
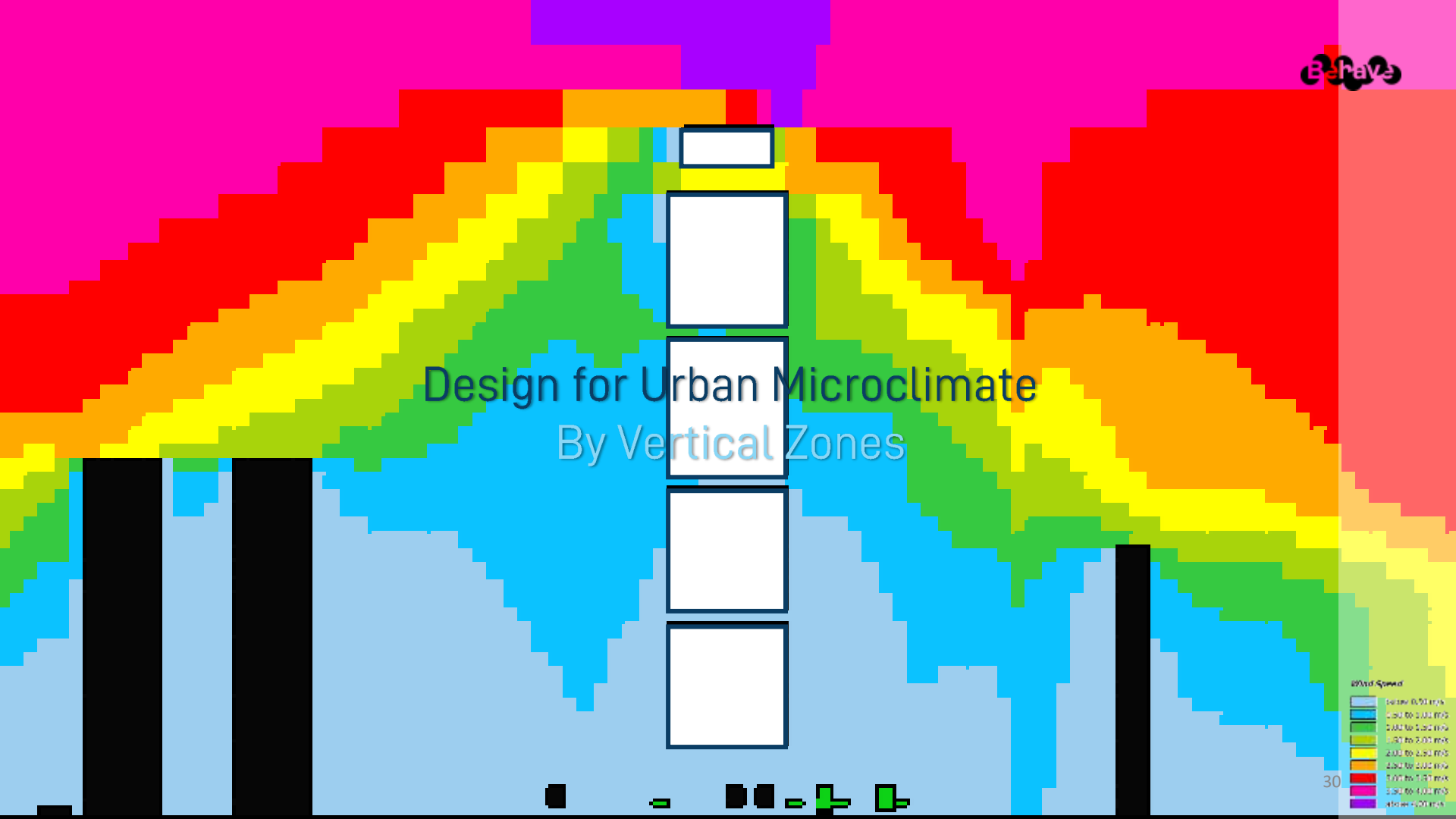
**Radon** is 0.034 Bq/L  
(77% below the 0.148 Bq/L threshold)

**Natural ventilation is optimized** by site planning, built form, orientation and high % of openable windows.

**Ventilation rates of MVAC system exceed at least 30% of ASHRAE 62.1-2017.**

T&C records demonstrated actual provisions have met design requirements.

# Design for Urban Microclimate By Vertical Zones



# TREEHOUSE

Future Category - Winner



Solar Potential  
L H

# Shared Common for Smart, Low Carbon & Green Operation



## Shared Common

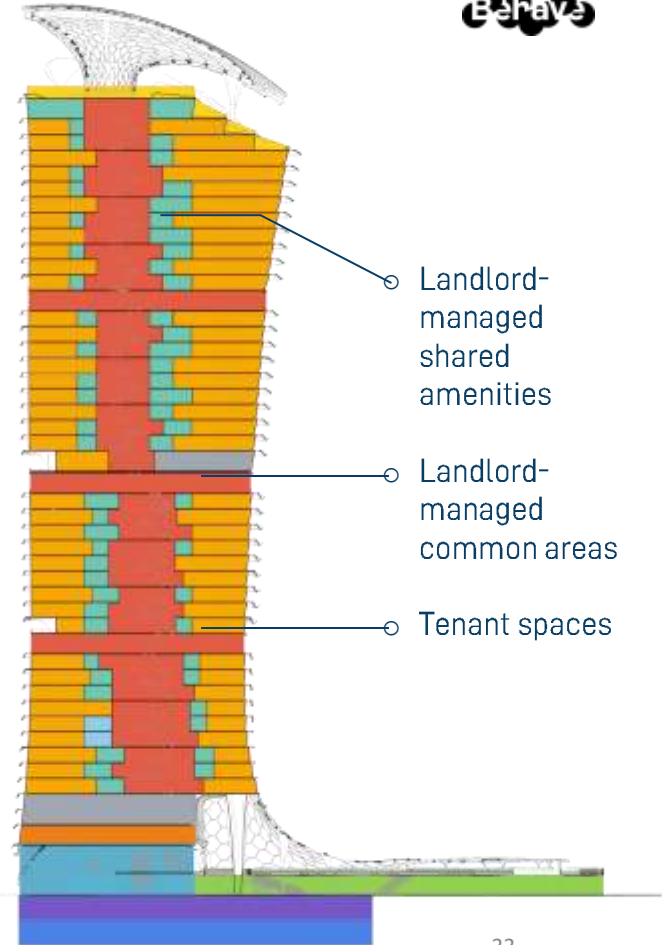
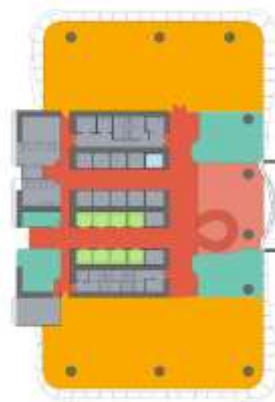
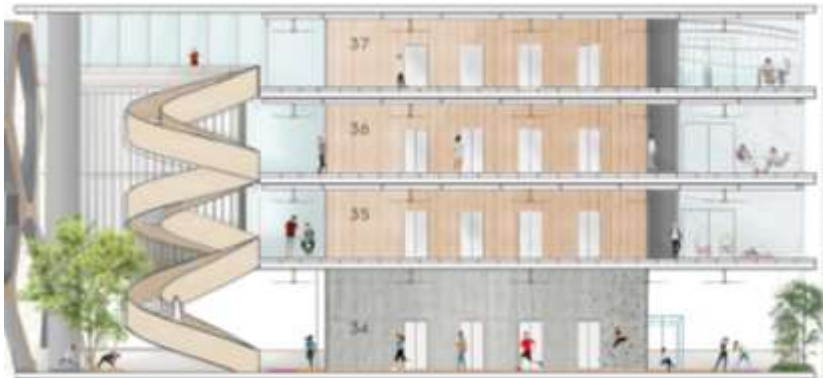
- Providing naturally ventilated spaces and shared amenities on demand



Features: Passive

## Sky Common concept (active stair + on-demand landlord- managed workplace facilities)

Each Sky Common is naturally ventilated and daylit and acts as a social hub for occupants. An aesthetically pleasing and walkable 1.5-m wide active stair is designed at the entry point to promote stair climbing. Shared spaces for social and physical activities are available on demand.



Features: Passive

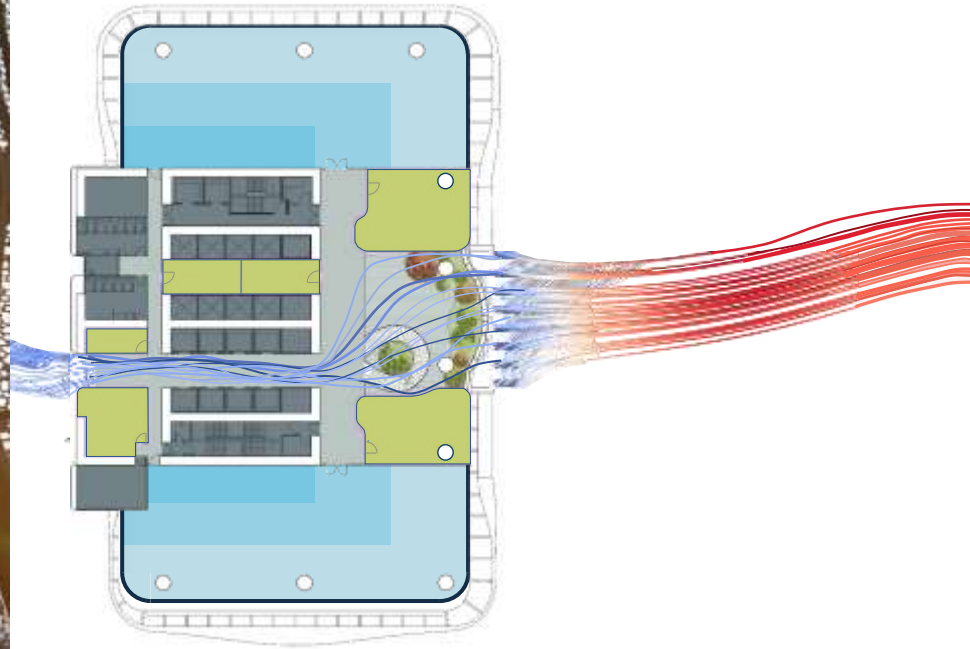


## Activity-based workplace planning for adaptive behaviour

Variety of third spaces for flexible work



# Automatic Operable Shutters to regulate natural ventilation in Shared Common

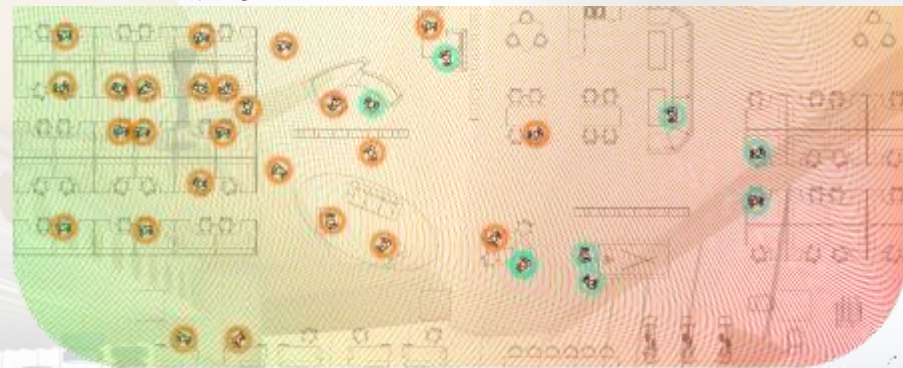


# Activity-based & Space-matching



Low ■ Perceived Temp. ■ High

Low ■ Body Temp. ■ High



Morning

Low ■ Perceived Temp. ■ High

Low ■ Body Temp. ■ High



Afternoon



ARCHITECTS | PLANNERS | INTERIOR DESIGNERS

DESIGN BETTER LIFE

BEIJING | GUANGZHOU | HONG KONG | SHANGHAI | SHENZHEN | TAIPEI

[www.rlphk.com](http://www.rlphk.com)



[rlphongkong](#) 吕元祥建筑设计





**Ronald Lu & Partners**