YKK80 High Efficiency Building
Radiant control both outside and inside

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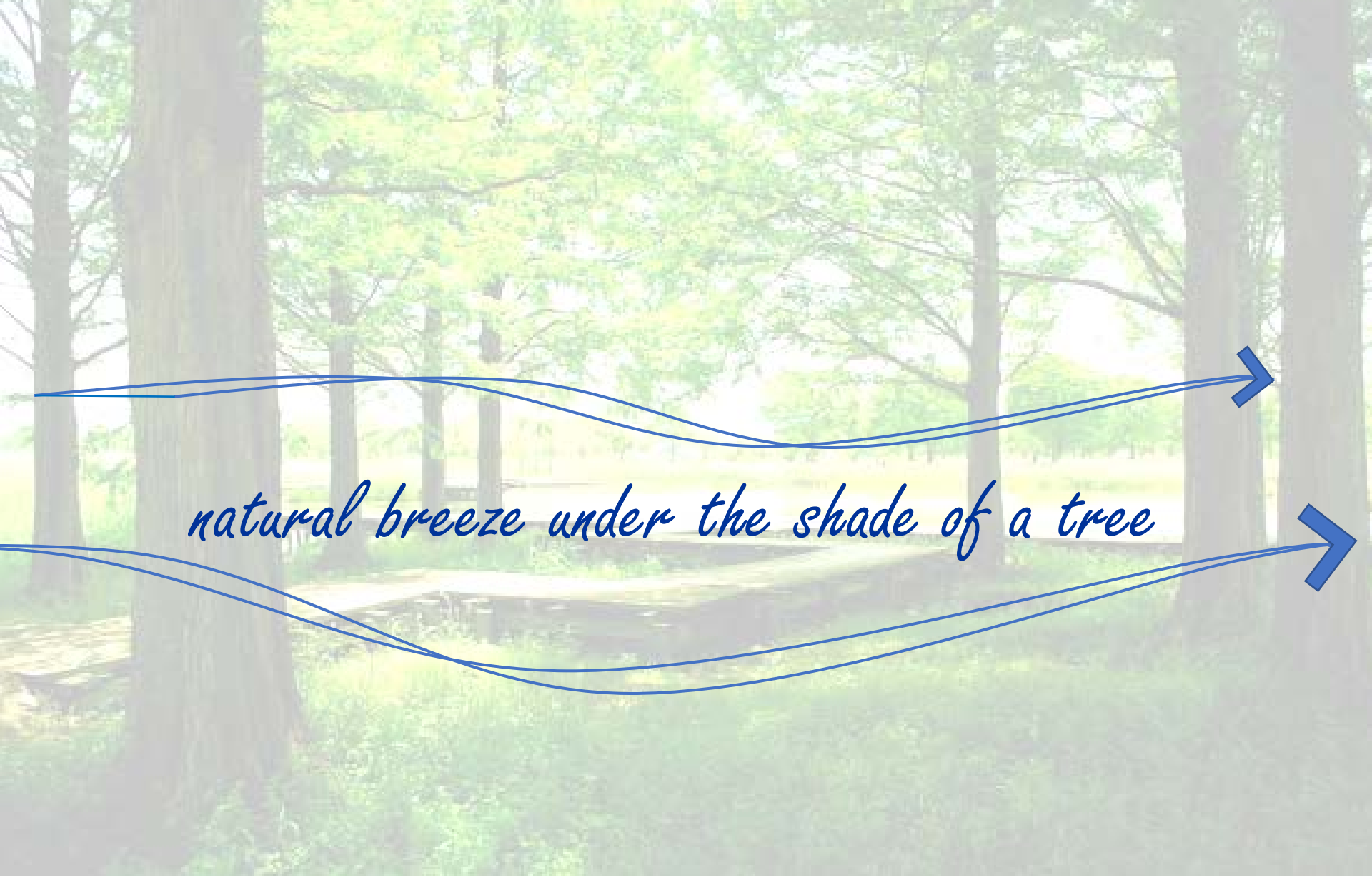
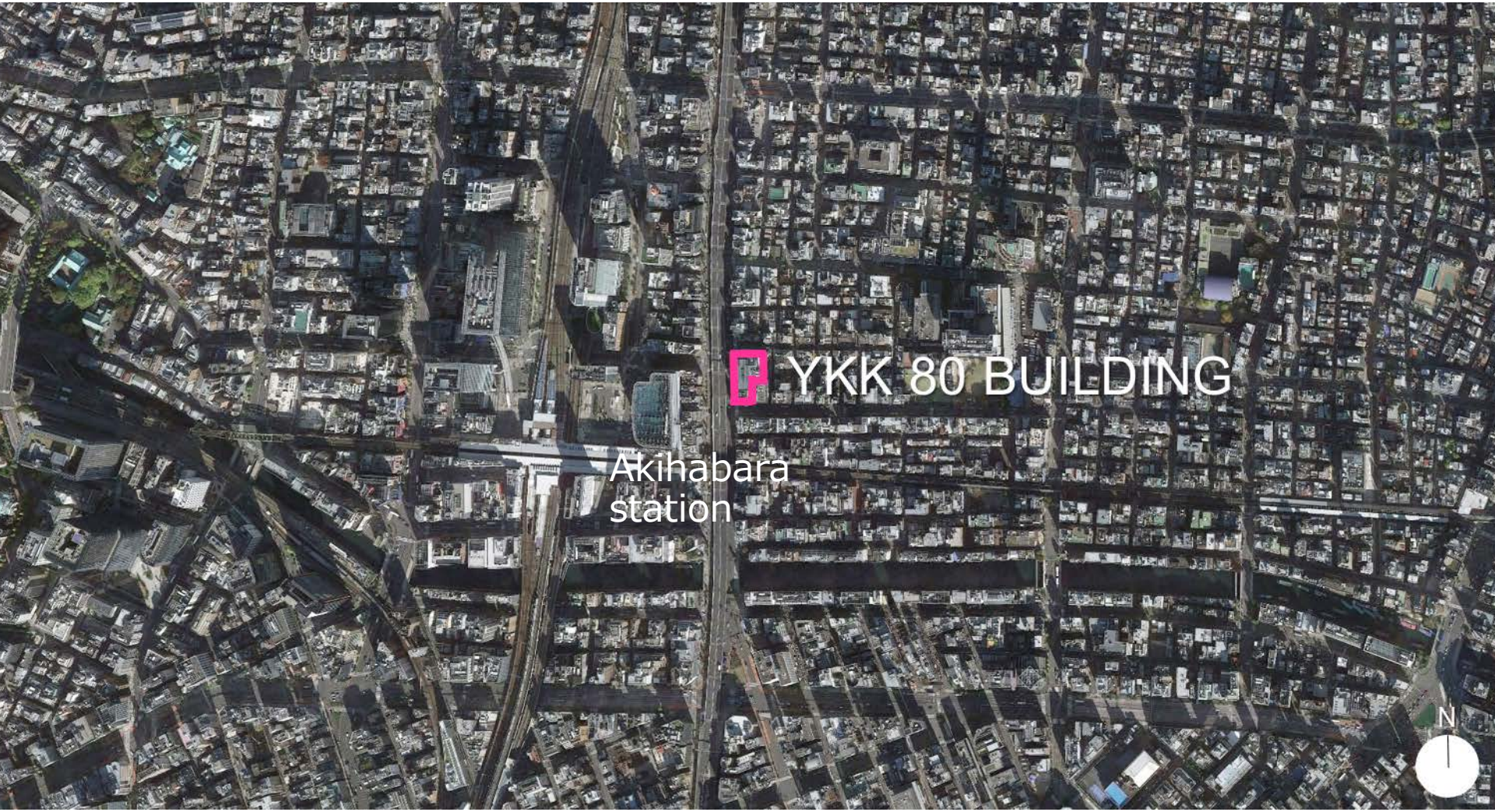
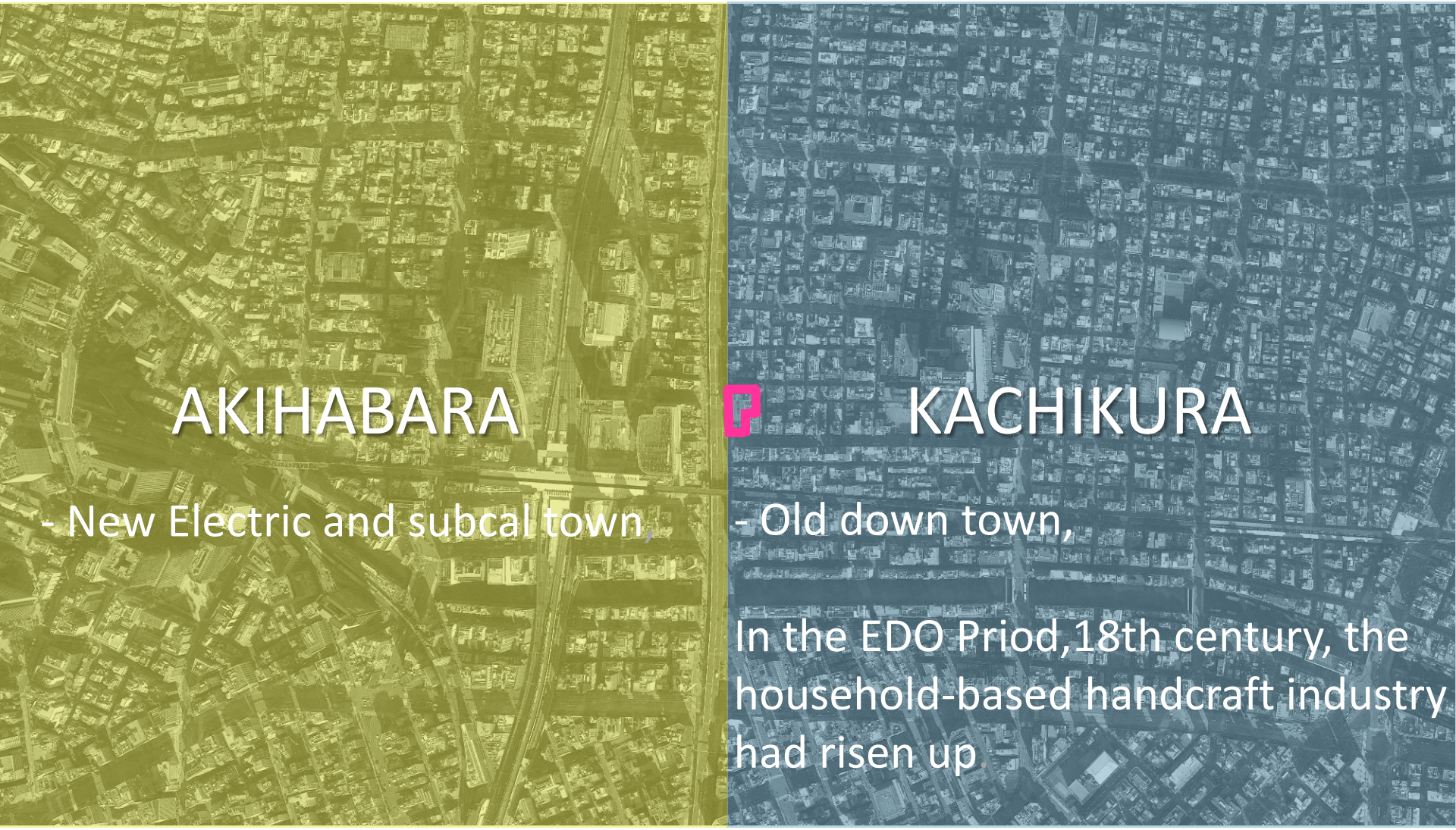

natural breeze under the shade of a tree

Location of Building - Akihabara -

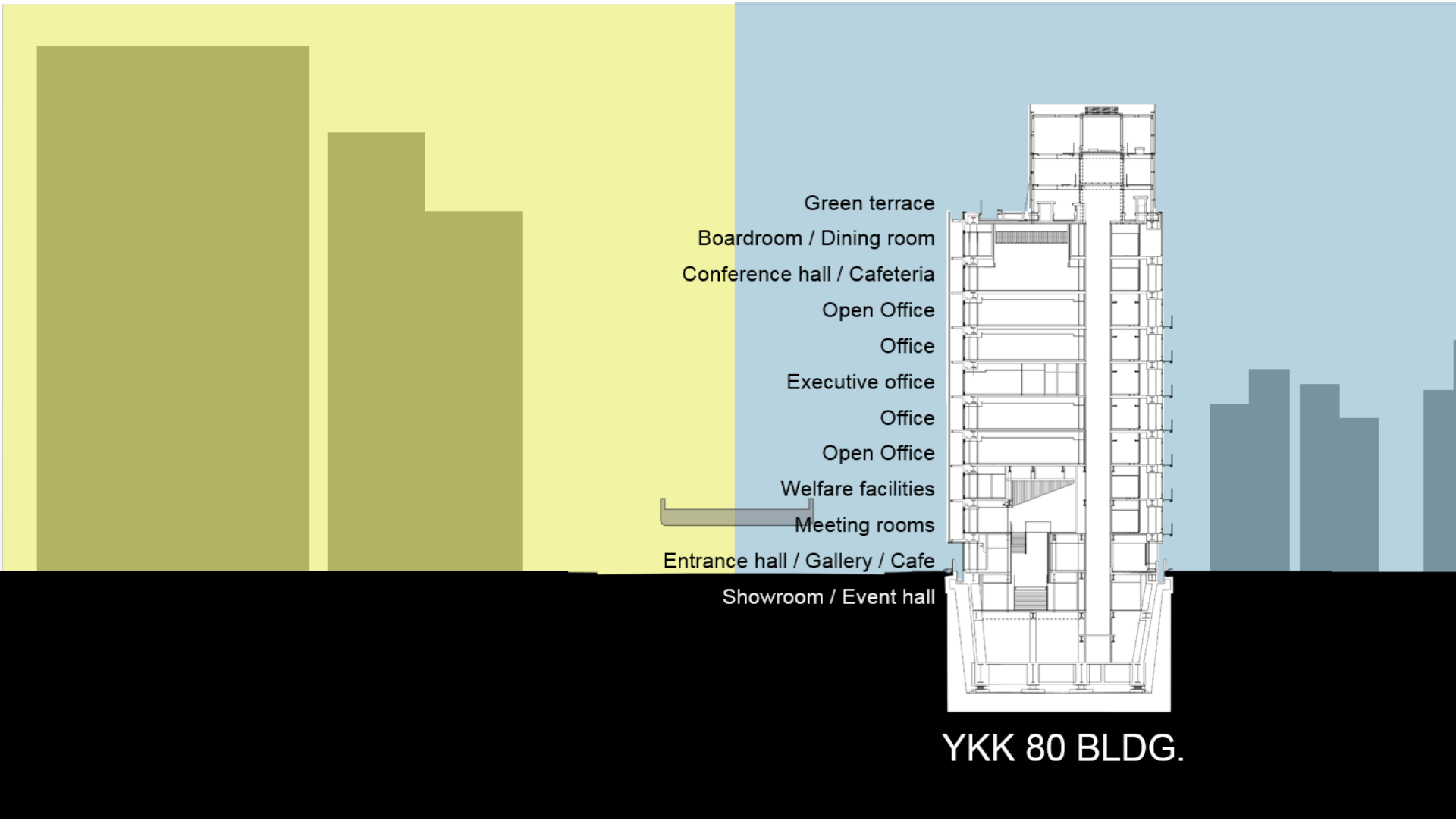


In 2015, completed in Akihabara

Locating on two distinctive districts



Confronting to Akihabara from Kachikura



The Aluminum Fabric Façade in Akihabara

©Rainer Viertböck

Outline of YKK 80 Building

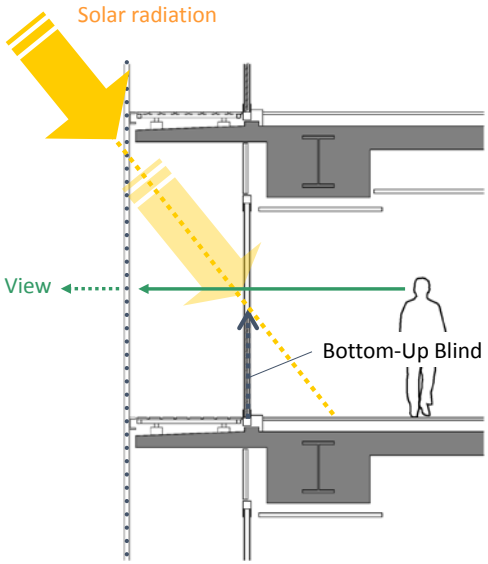
Concept

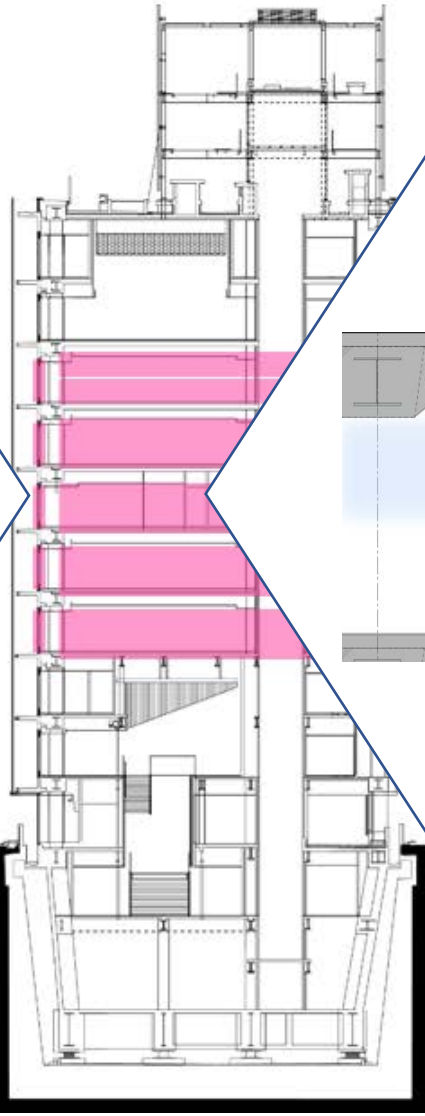
- Symbolic design as a global company.
- Functionality, safety and comfort.
- Aluminum screen façade, and radiant panel for workplace has enabled both outside and inside radiant control.

Location	Tokyo Akihabara
Total Floor Area	22,574m2 (242,985sf)
Building Height	40m regulated
# of Floor	B2F-10F
Structure	S+SRC, Seismic isolation
Completion	2015 June

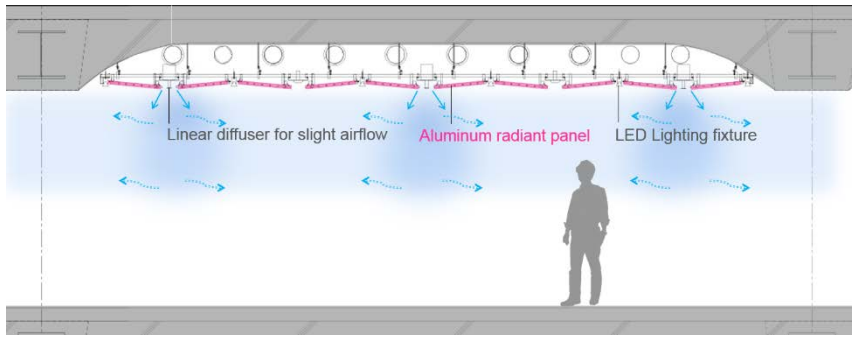
Radiant control both Outside & Inside

Outside



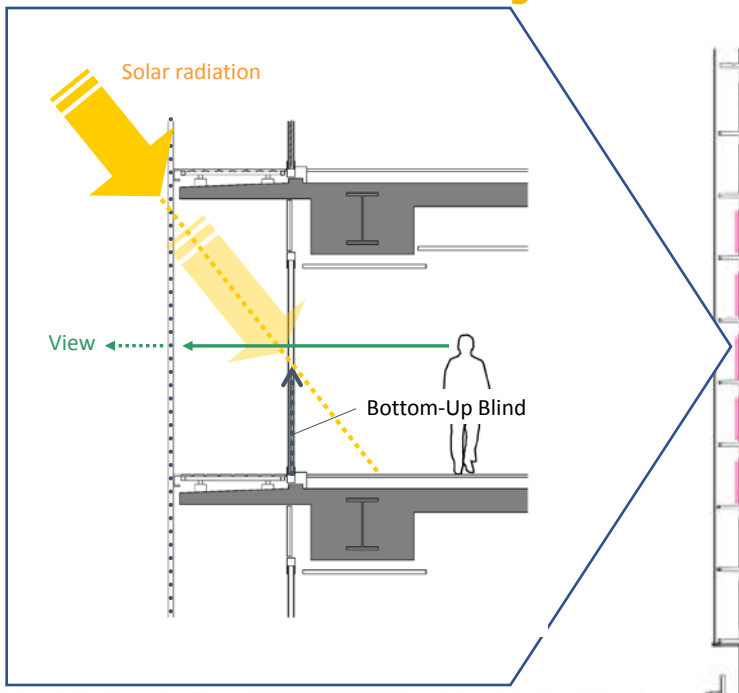


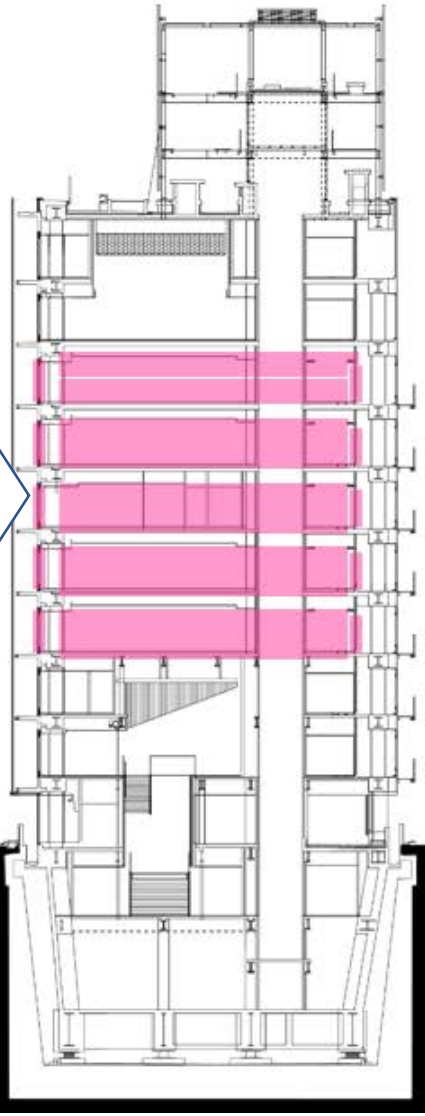
Inside



Radiant control both Outside & Inside

Outside ／ Façade

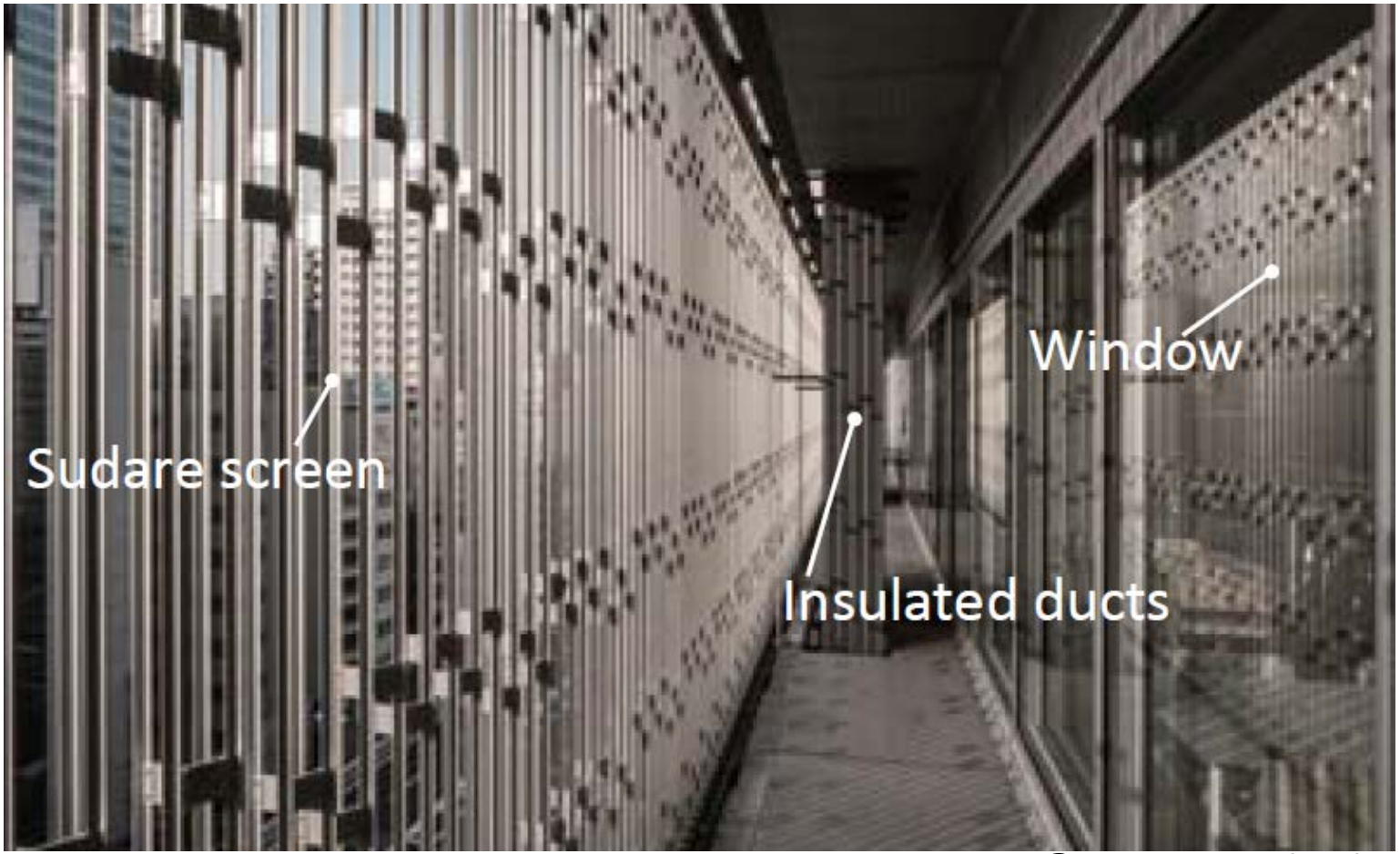




Environmental Façade “sudare”

Image of Japanese “sudare” screen

The Façade controls the radiant from outside



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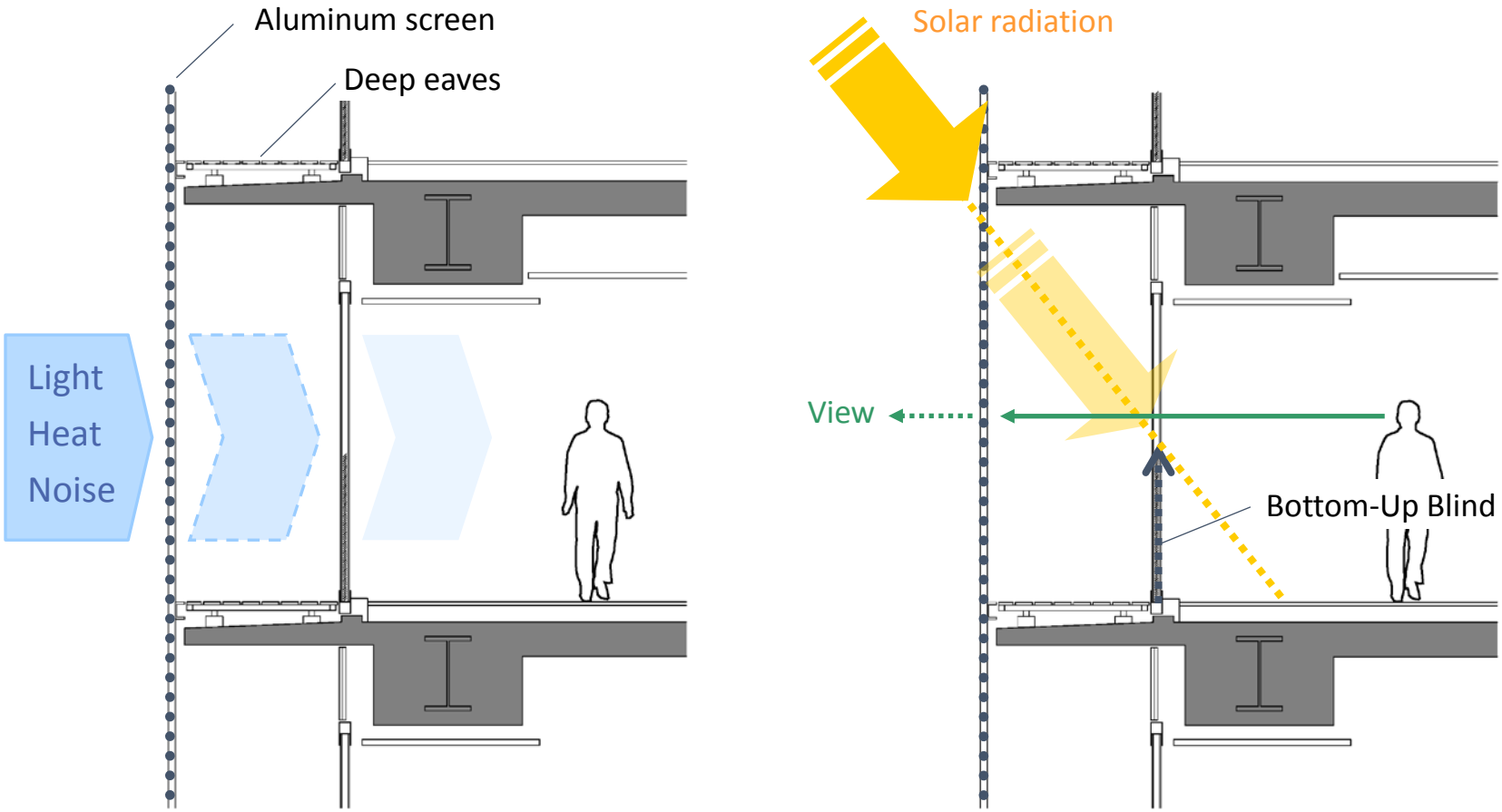
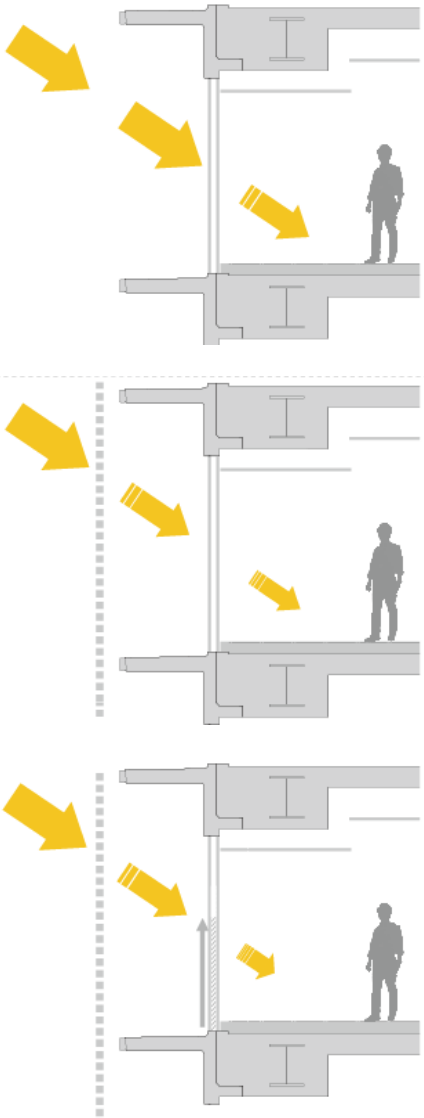
Outline of Radiant Control Façade System



- Minimizing radiation from window is crucial in radiant systems.
- Aluminum screen, deep eaves and bottom-up blind mitigates solar radiation.

SHGC diagram



Double glazed window

SHGC:
0.66 (simulation)

Sudare screen +
Double glazed window

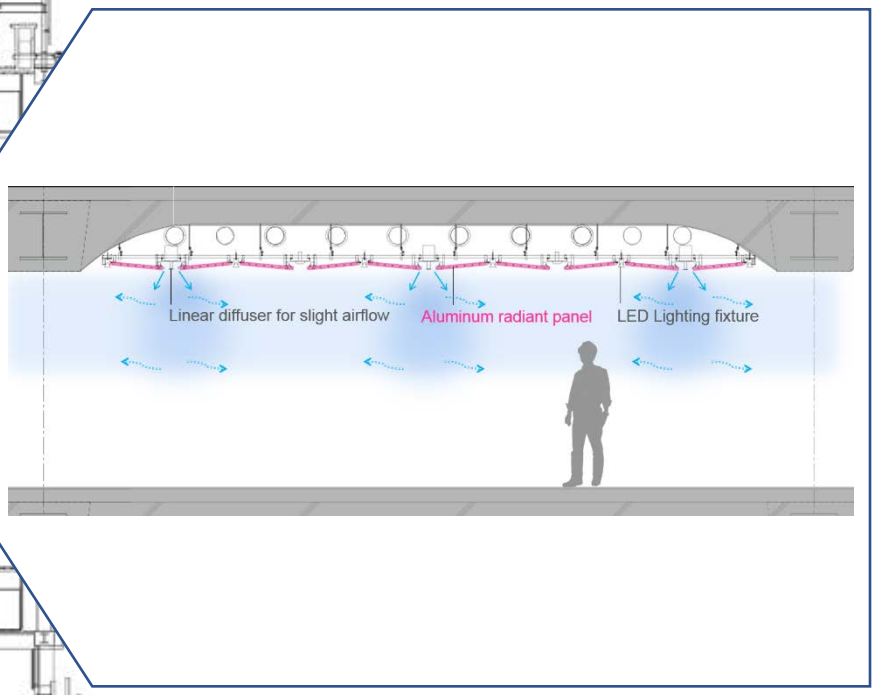
SHGC:
0.39 (simulation)
0.35 (actual measurement)

Sudare screen +
Double glazed window +
monitored climbing blinds
SHGC:
0.10 (simulation)
0.14 (actual measurement)

Radiant control both Outside & Inside

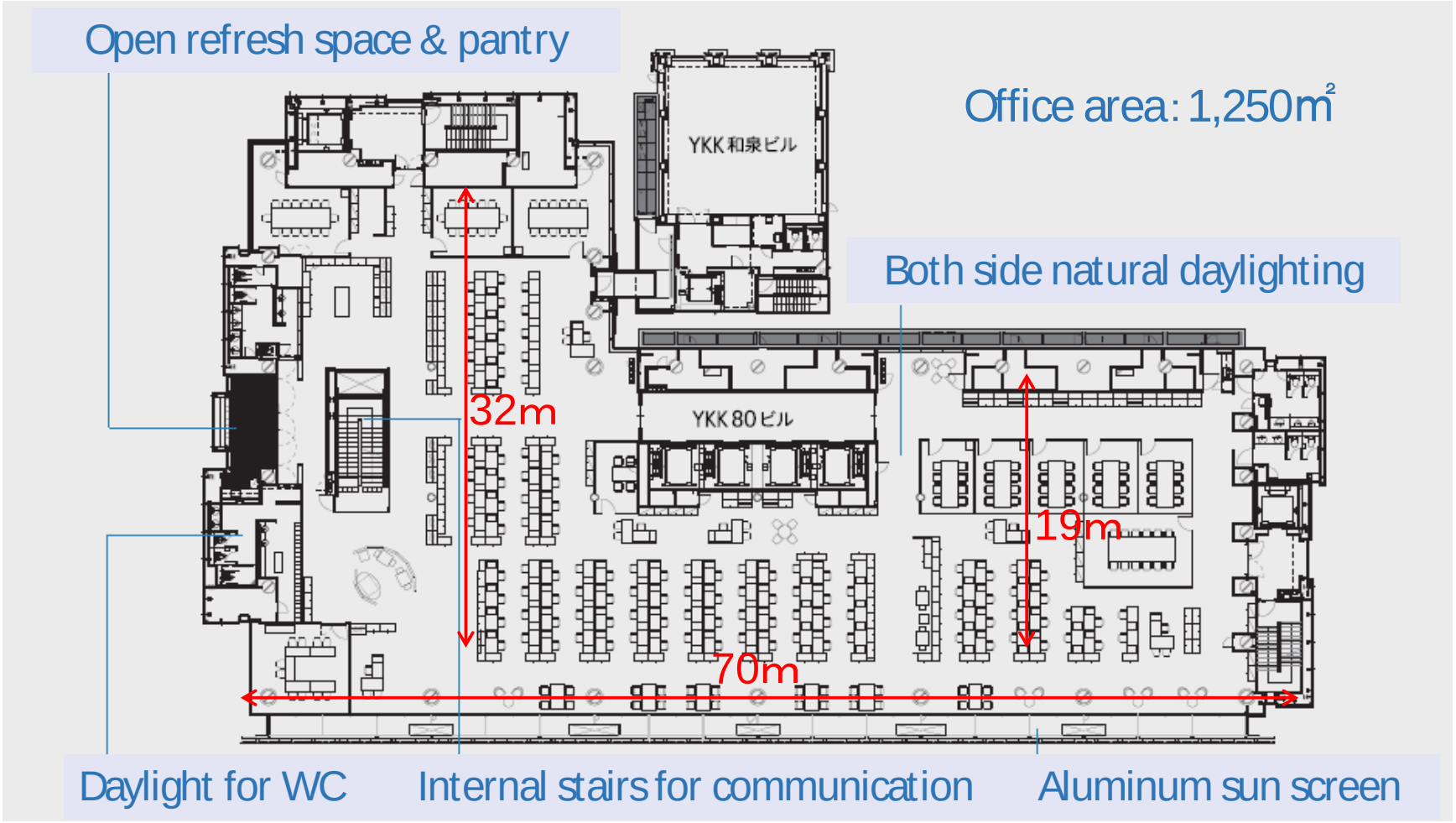
Inside

Workplace



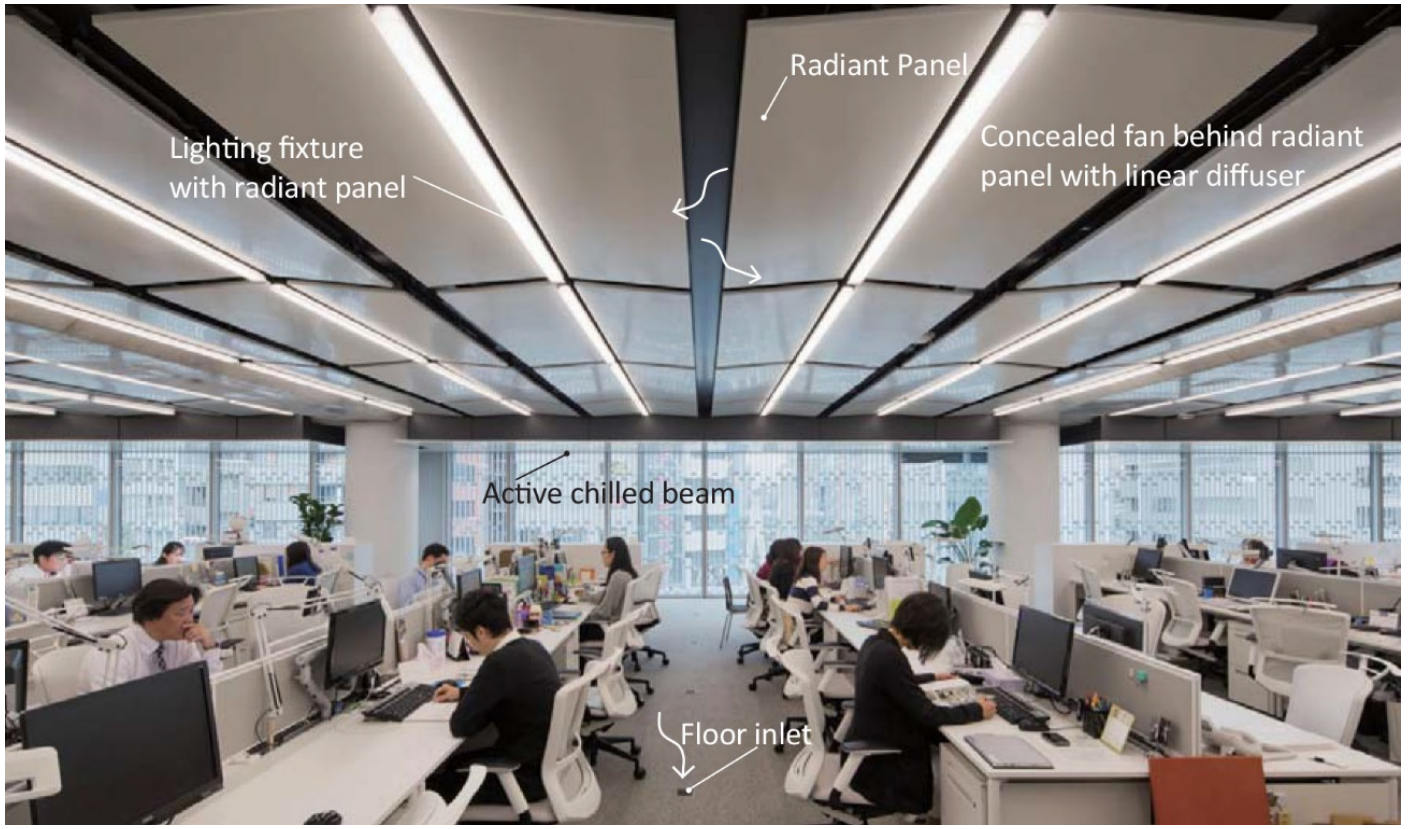
Open workplace for high quality office

West Façade is 70m length. We have Large Solar Heat Gain in summer, and in winter we have to think about cold draft in the perimeter zone.



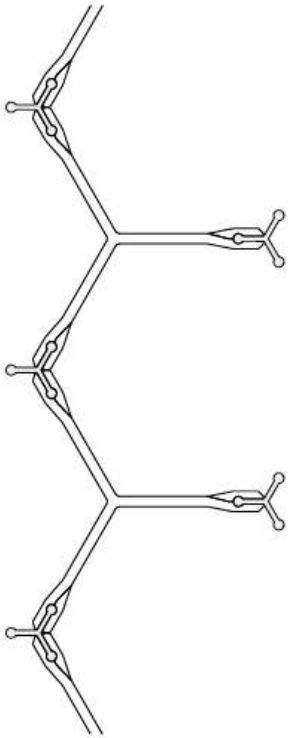
Open office space for high quality workplace

Outline of Radiant Cooling & Heating System



- Radiant panels = aluminum ceiling panels equipped with water pipes.
- Tilted panels allowing cool air to descend from the gap between panels. Fans are installed for extra airflow during the hottest season.
- Active chilled beams installed for perimeter zones.

Work place around the window-side



connection of Y bar

perimeter

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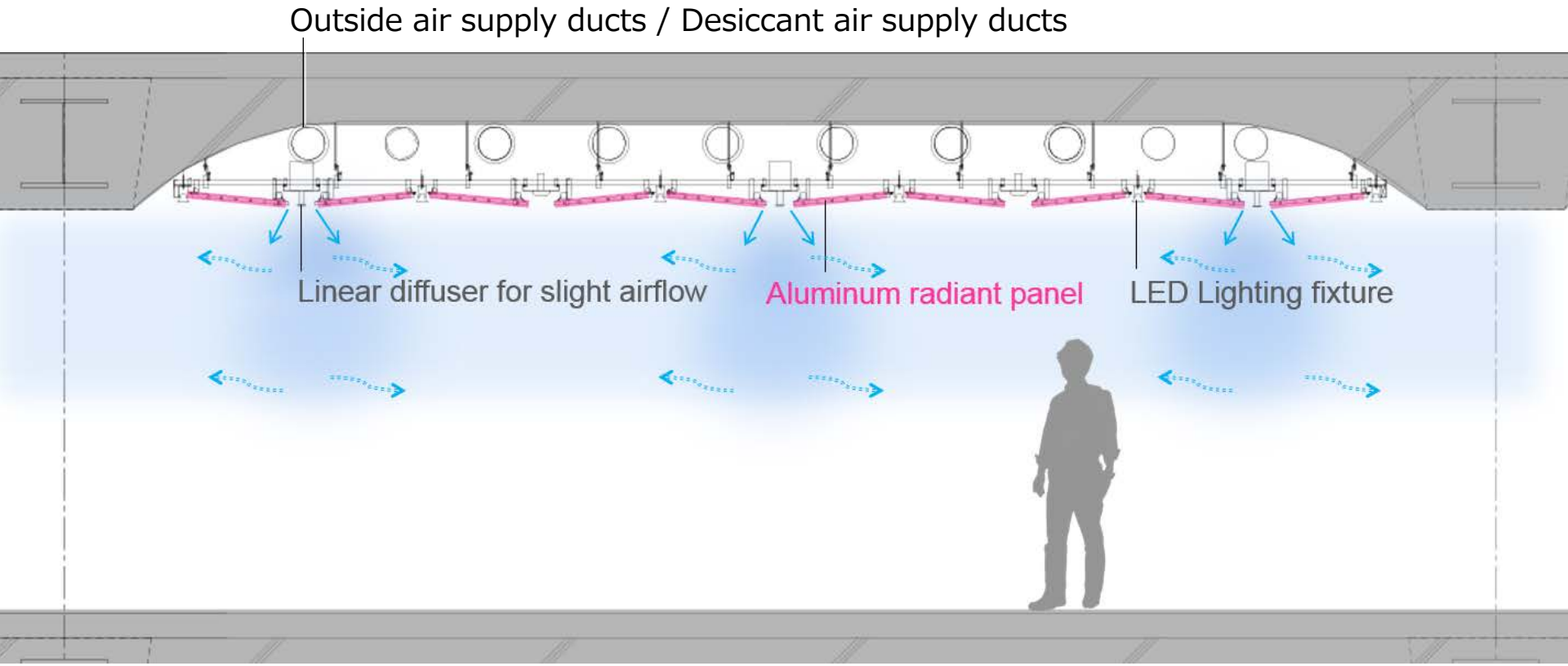
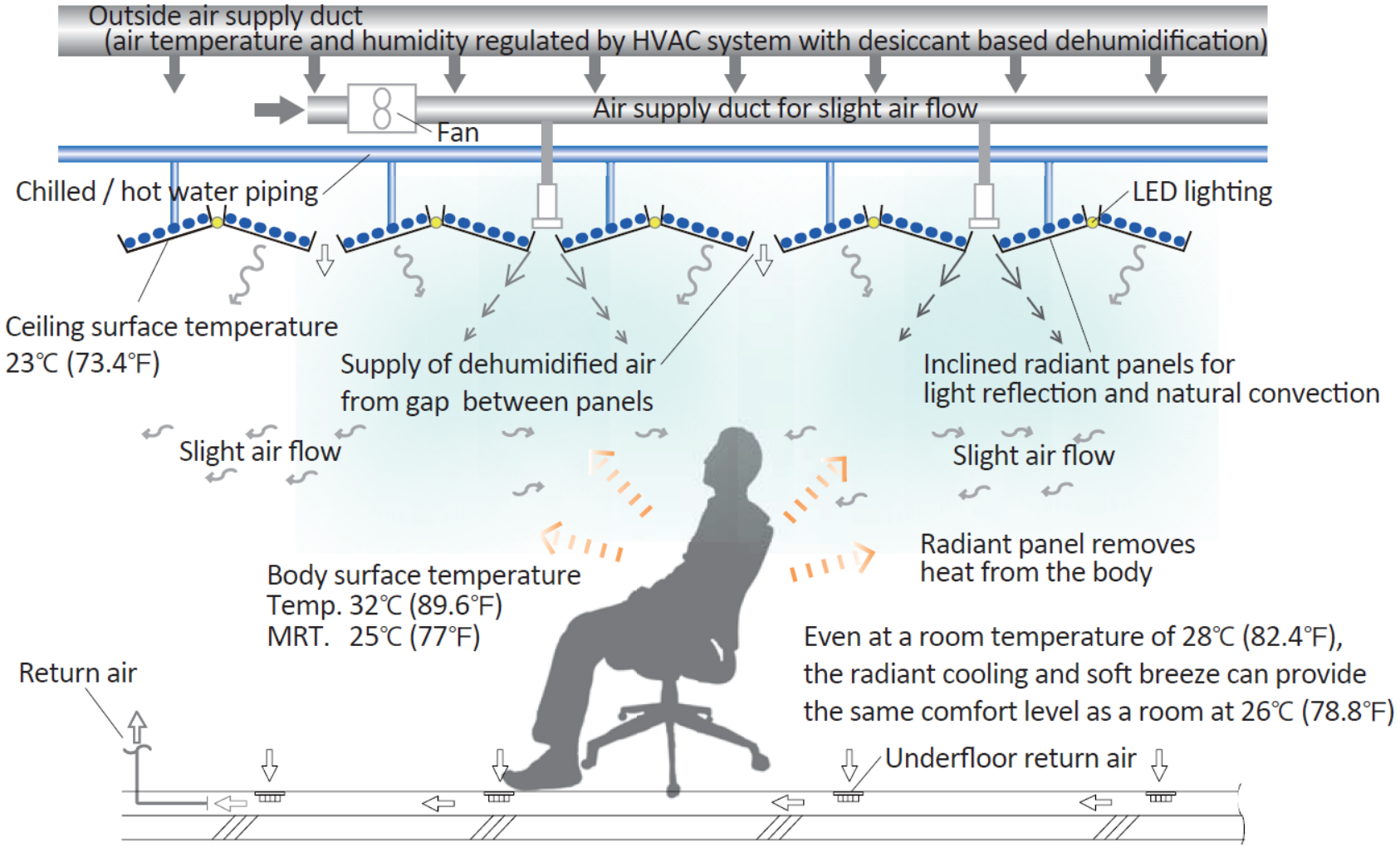
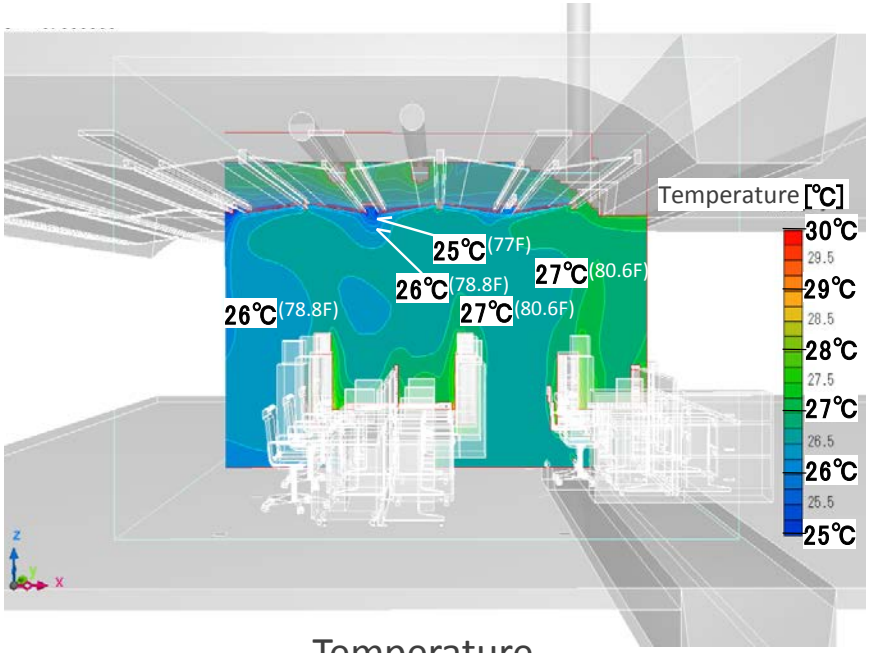
Section diagram about the radiant cooling/heating with soft breeze system



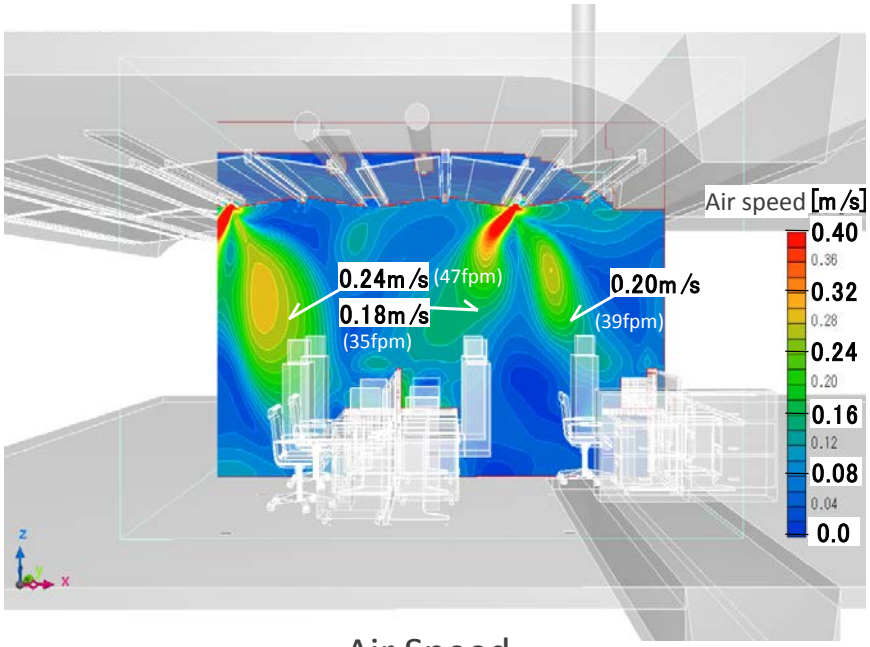
Radiant Cooling／Heating ,Desiccant Air & Soft Breeze like ‘natural breeze under the shade of a tree’



CFD Analysis Coupled with BIM



Temperature

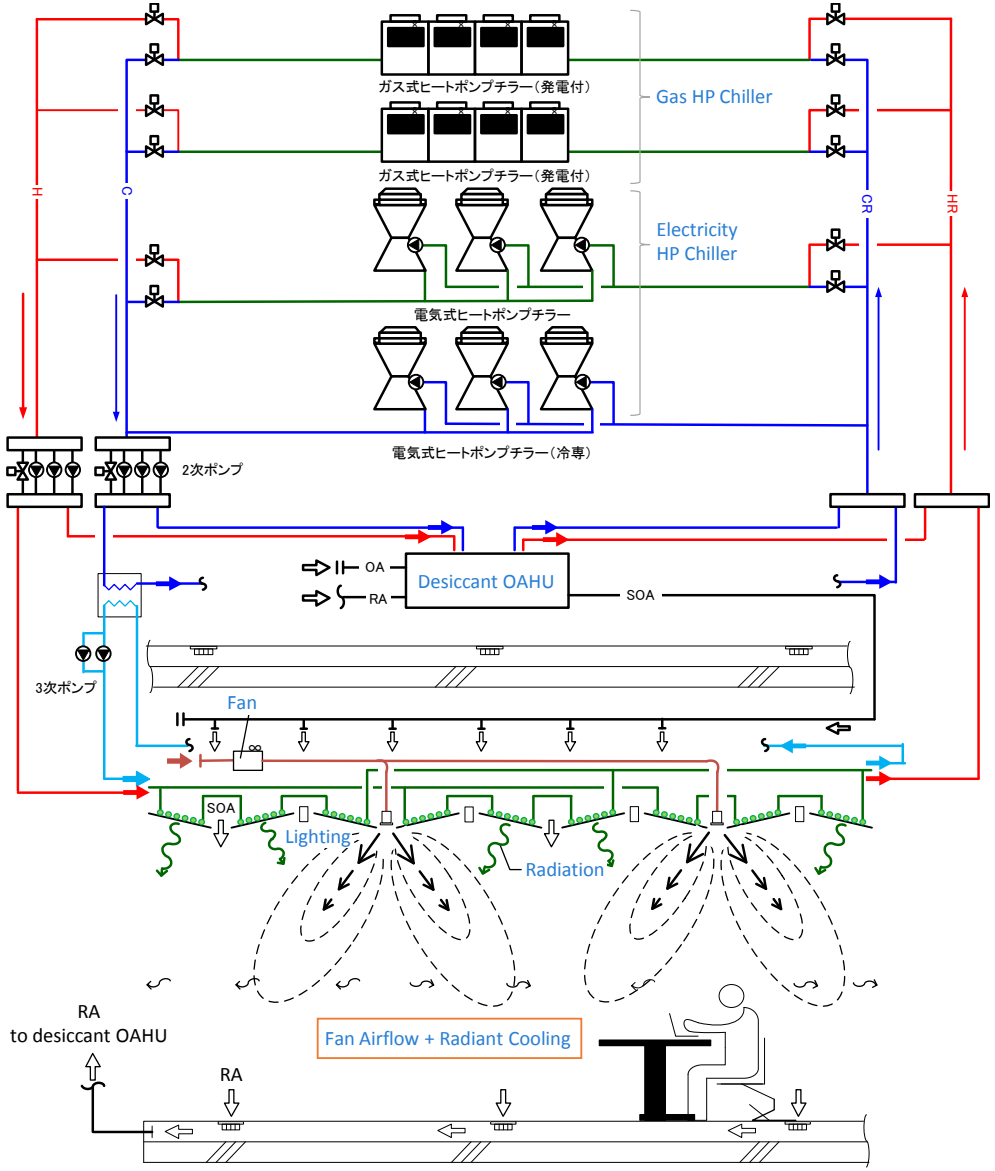


Air Speed

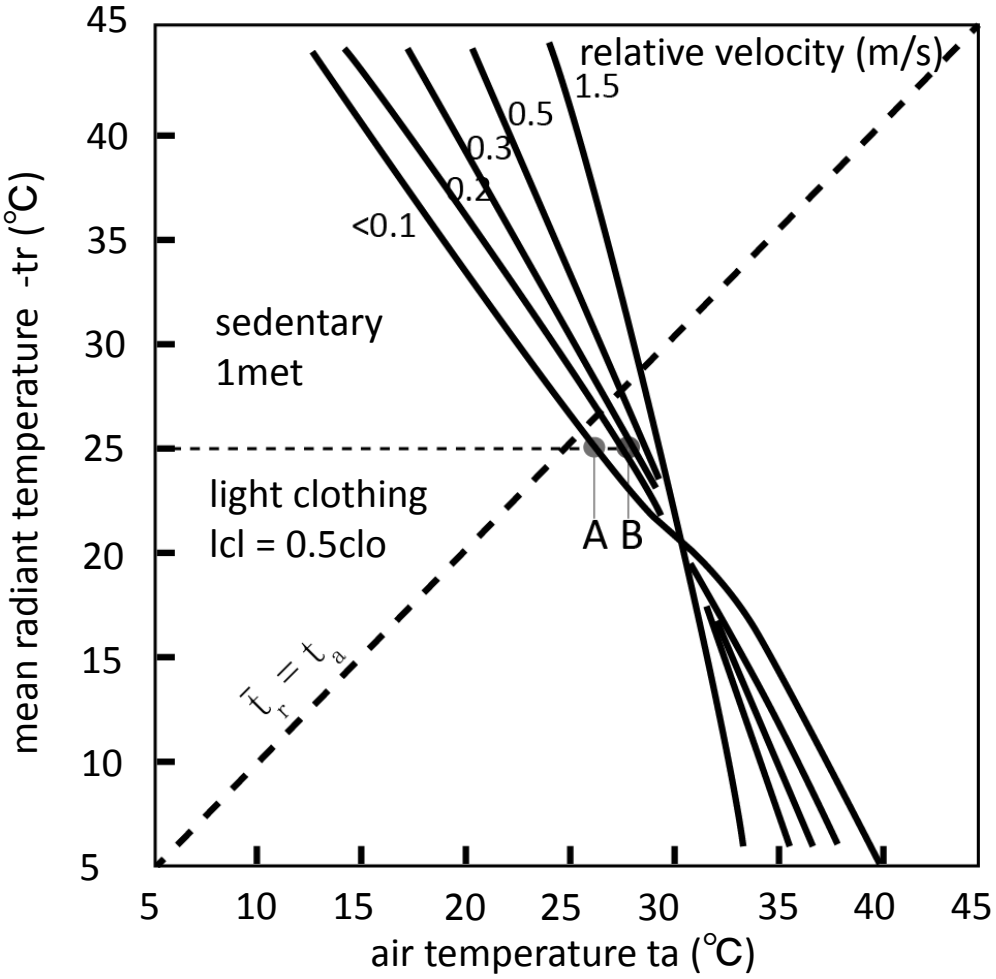
- BIM model created for space coordination were used to perform CFD analysis.
- (Upper left) Temperature: cool air (25˚C) sinking from gaps between radiant panels.
- (Upper right) Air speed: airflow (0.2m/s) created by fan.
- Uniform temperature + comfortable airflow.

Outline of HVAC System

- Heat source: electricity-driven air-cooled heat pump chiller + gas-driven heat pump chiller.
- Aims to improve system COP through higher/lower chilled/hot water temp for air conditioning.
- Dedicated desiccant AHU to treat outdoor air (latent heat).



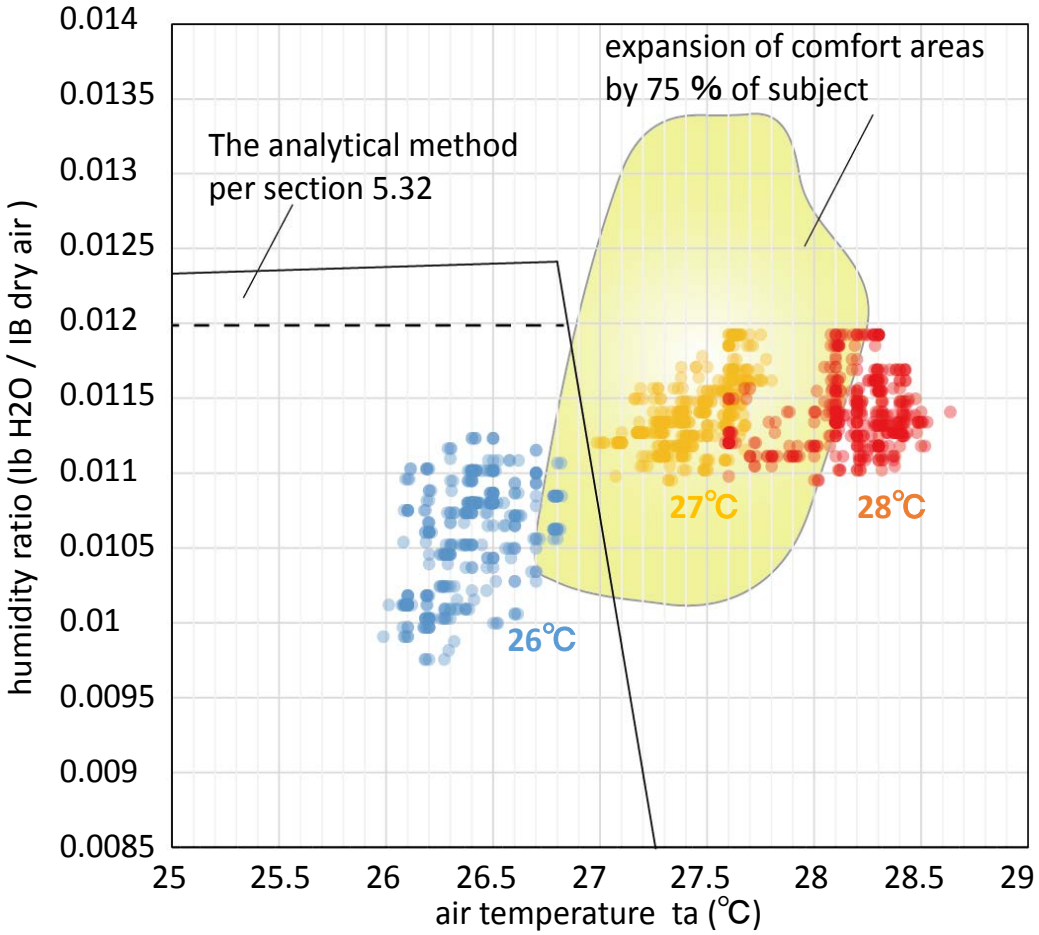
Air Temp. and MRT necessary for comfort (PMV=0)



Air Temp. and MRT necessary for comfort (PMV=0) of sedentary persons in summer clothing at 50 % RH

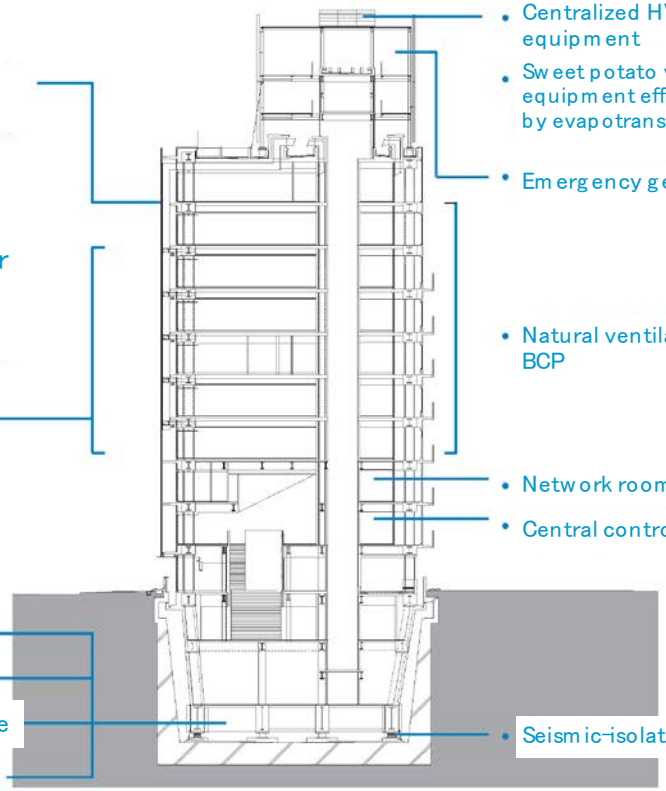
Reference: 2013 ASHRAE Handbook Fundamentals, ch9, fig15

Expansion of comfort zone



Holistic Solution toward the ecological and healthy building

60% energy reduction
- based on Many technologies installed in this building.



- High performance envelope: screen + blind sandwiched double-pane window + eave

Common
- LED lighting
- Lighting and occupancy sensor
- Water-efficient fixtures
- LEED-CS Platinum certified

- Radiant panel + desiccant OA + local fan
- Economizer + OA mist
- Task & ambient lighting
- Smart plug outlet

- Supply and drain water cistern
- Kitchen waste water reclaim system
- Well water: geothermal and water source use
- Trench cooling & heating: geothermal

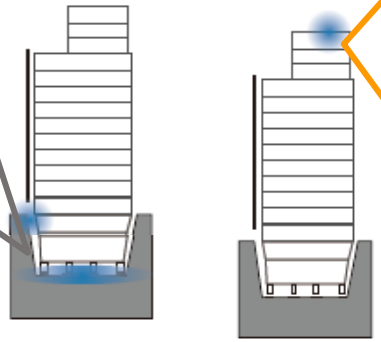
- Centralized HVAC heat source equipment
- Sweet potato vegetation for HVAC equipment efficiency improvement by evapotranspiration of leaves
- Emergency generator
- Natural ventilation window for BCP
- Network room
- Central control room
- Seismic-isolation

※Compared to ECCJenergy use intensity of office building (20,000m2, privately owned)

Other Technologies

Dry mist around the street

Seismic Isolation space for cool/heat trench

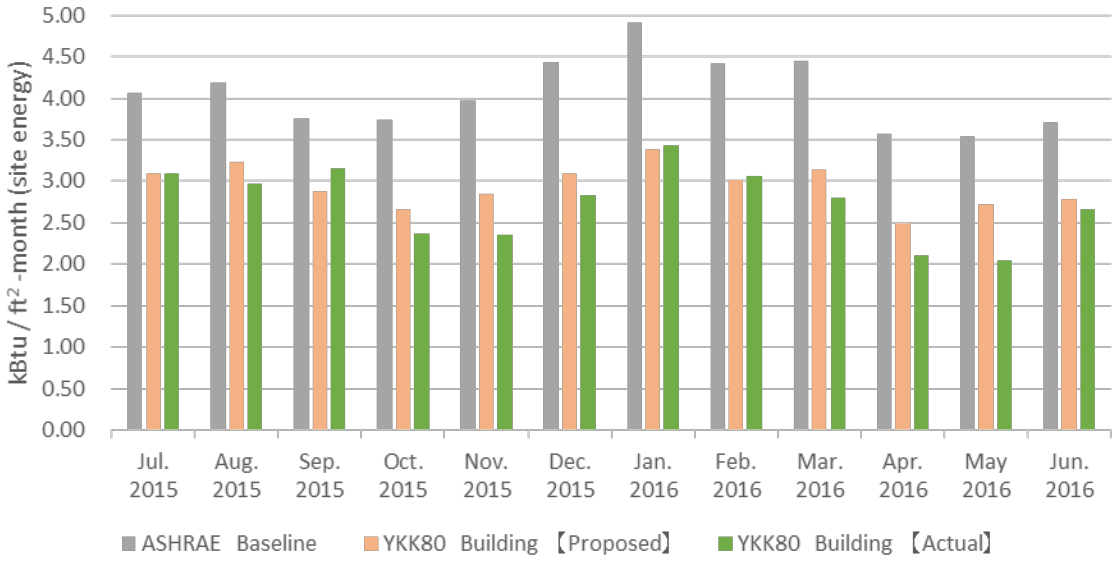


Roof top PV

Roof top greenery for efficiency of heat source

Roof top edible garden

One Year Monthly Operating Data of Building Energy Performance

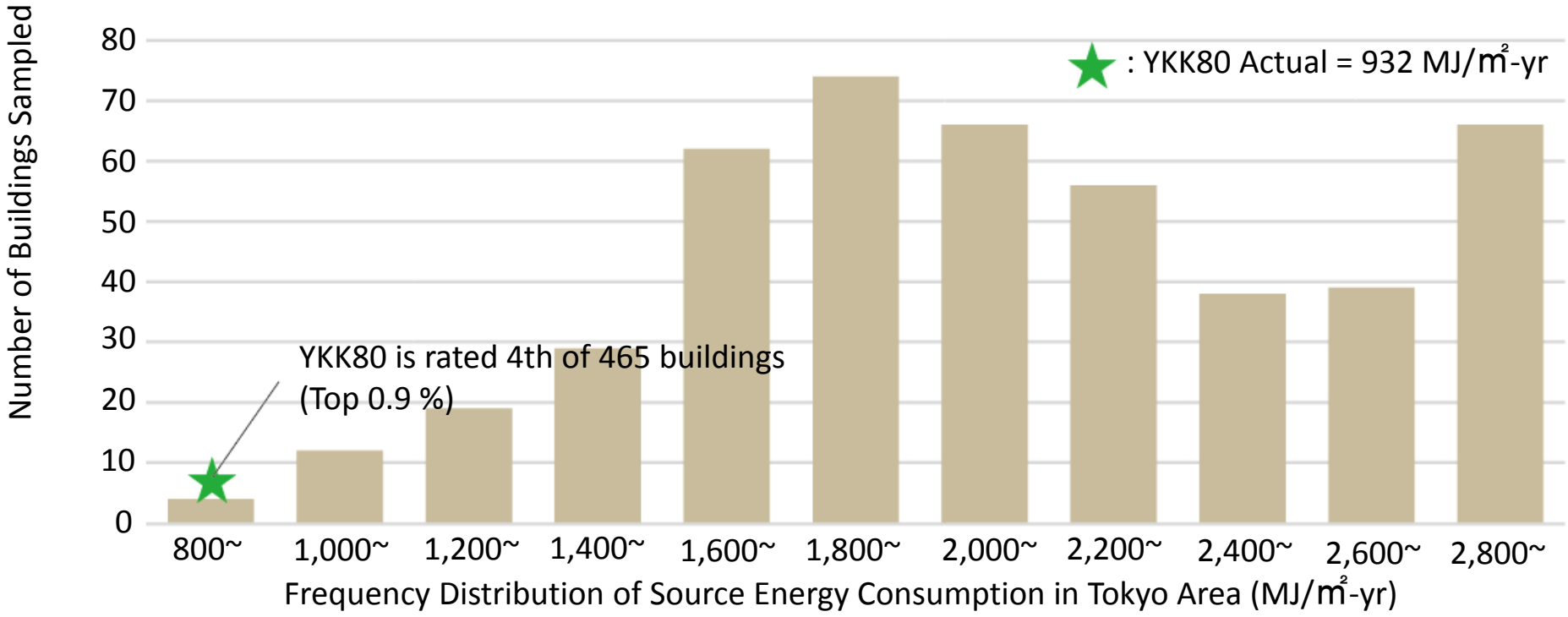


Annual Site Energy Performance

	Site	Source
ASHRAE Baseline	153.65 kWh/㎡-yr (48.71 kBtu/ft -yr)	1,371 MJ/㎡-yr (120.74 kBtu/ft -yr)
Proposed (model)	111.40 kWh/㎡-yr (35.31 kBtu/ft -yr)	1,034 MJ/㎡-yr (91.06 kBtu/ ft -yr)
Actual	103.69 kWh/㎡-yr (32.87 kBtu/ft -yr)	932 MJ/㎡-yr (82.08 kBtu/ft -yr)

※Source-Site Ratios in Tokyo Japan
Electricity:2.711 ; Natural Gas:1.005

Source energy of office buildings over 10,000㎡ in Tokyo (2009)



Thank you for your attention!