

I-Garden Air , Tokyo, Japan



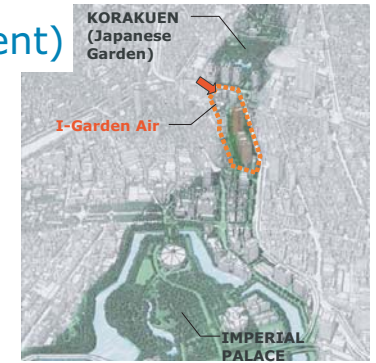
Building Type/Use Complex(offices, shops, hotel,residential)
Country Chiyoda-ku, Tokyo, Japan
Client Japan Freight Railway Company,
Architect Nikken Sekkei
-Location Chiyoda-ku, Tokyo, Japan
-Climate Warm and humid area
-Site area 41,000m²
-Total floor area 244,004m²
-Estimated population Residence 249 rooms,

Building Performance

Distance from public stop
 Within 500m from the nearest station.
Development density as ratio of density of surrounding uses
 High-densely developed.
Actual MJ/m² per year primary operating energy
 1500MJ/m² per year (NIKKEN SEKKEI Tokyo building)
Predicted or actual kg/m² per year eCO₂
 59kg-CO₂/m² per year.
Tons /m² or kg/ m² of total weight of new materials
 New materials are not used.
Actual L/m² per year of potable water consumption
 590 L/m² per year (NIKKEN SEKKEI Tokyo building)
Predicted CO₂ concentrations in ppm
 From 400ppm to 650ppm. (NIKKEN SEKKEI Tokyo building)
Capital cost and actual operating cost
 Capital cost : ¥1,080,000,000 (Landscape cost)
Percent of construction cost spent within the greater urban area
 From 110% to 120%
Other performance information
 Temperature in outdoor space is lower from 0.5 to 2.0 degree than other urban area.

Key Concept (for Cool Urban Development)

The main theme for I Garden Air was to make the new greenery of the development into an axis linking the green masses of the nearby Imperial Palace and Korakuen. The streets have a unified setback to the building walls, creating a tree-lined green corridor that extends for 300m. As a result, thermal environment on the site has been improved and air temperature reduced by from 1.0 to 2.0 degree.



Urban Design Procedure for Cool Development

1. Analysis of relationship between the topography and characteristics of climate on I-Garden Air.
2. Bio-climatic urban design
 - Green network by new greenery
 - New wind path from Tokyo bay
 - Thermal radiation environment control
3. Measurement of thermal environment in outdoor space and evaluation with CASBEE-UDE.



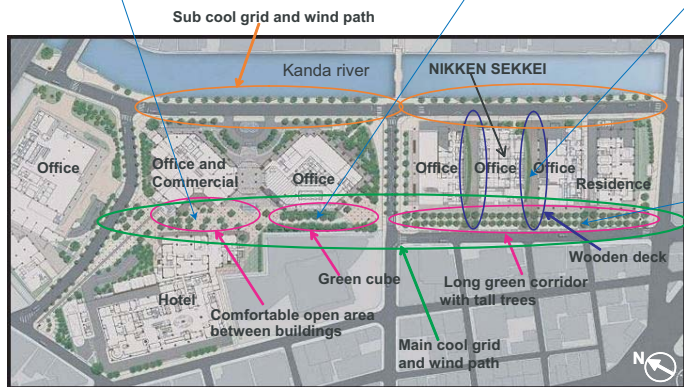
Greenery around buildings forms comfortable urban environment



Green tube by big crown improves thermal radiation environment



Long green corridor by tall tree with big crown and evaporation cooling pavement



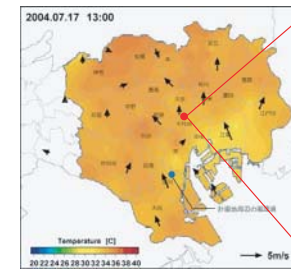
Long green corridor by tall tree with big crown forms wind path



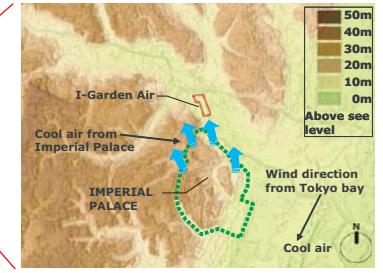
Evaporation cooling pavement

Characteristics of Development site

I-Garden Air is located nearby Imperial Palace and on the axis of main wind direction from Tokyo bay in summer. The ground level of this site is lower than other area, that facilitates the introduction of cool wind from Tokyo bay to inland.



Air temperature and Wind direction in Tokyo



Wind direction along the topography around I-Garden Air

Methodology of Bio-climatic urban design

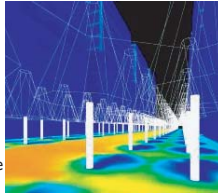
Green network & Wind path
New Long green corridor connects existing greenery and also forms cool wind path form green network.



Long green corridor by tall tree with big crown and evaporation cooling pavement

Thermal radiation control
Big tree crown, evaporation cooling pavement and wooden deck improves thermal radiation environment all day.

Evaluation by thermal simulation
The effect of greenery and pavements was evaluated by thermal simulation.



Study of surface temperature on long green corridor

Mechanism of micro climate in green tube



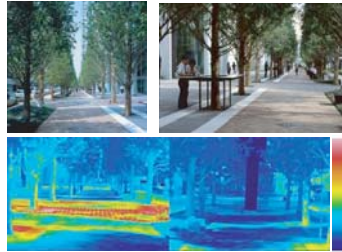
Rainwater infiltrates the underground and use for evaporation cooling

Measurement of thermal radiation environment

The thermograph shows that the surface temperature of concrete pavement under sunlight rises to 50 degree, while the surface temperature of paved area that is less long due to tall trees is at least 10 degree lower.



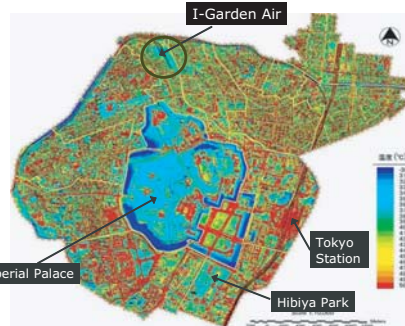
Surface Temperature around long green corridor 13:00, September, 2007



Surface Temperature in Green tunnel 13:00, September, 2007

Mitigating heat island effect by Green Corridor

This figure shows thermal Image in Tokyo's Chiyoda Ward by MSS data.
"I-garden Air" area creates cool spots and mitigates heat island effect in Tokyo.



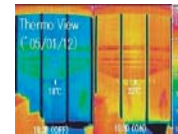
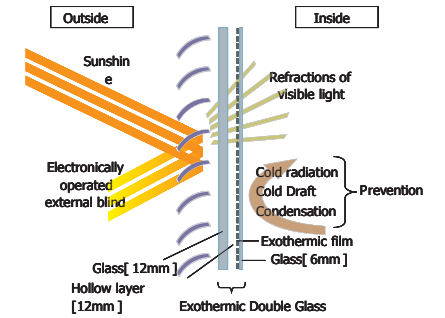
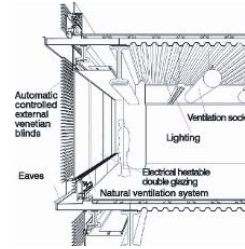
Distribution of surface temperature in August

Building Performance (NIKKEN SEKKEI Tokyo building)

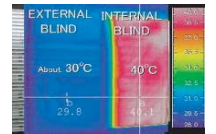
EFFECTS OF AUTOMATIC CONTROLLED EXTERNAL VENETIAN BLINDS AND ELECTRICAL HEATABLE DOUBLE GLAZING



- Multi-glazing glass, horizontal and vertical louvers for sun-shading
- Perimeterless air conditioning system
- Views, Comfortability and Energy conservation
- A variable facade



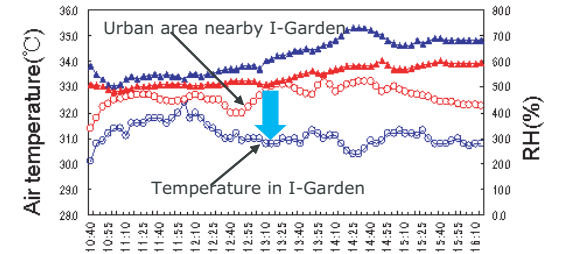
Effect of Multi-pane heating glass in winter



External blinds can shade sunlight effectively

Green corridor creates Cool spots and Wind path around I-Garden Air

As a result, the air temperature around I-Garden Air has been lower by from 1.0 to 2.0 degree than other urban area all day in summer.



Green network creates cool spots around I-Garden Air and that would be expected saving energy consumption of buildings in this area.

This area is ranked as grade "A" on CASBEE-UDE.

