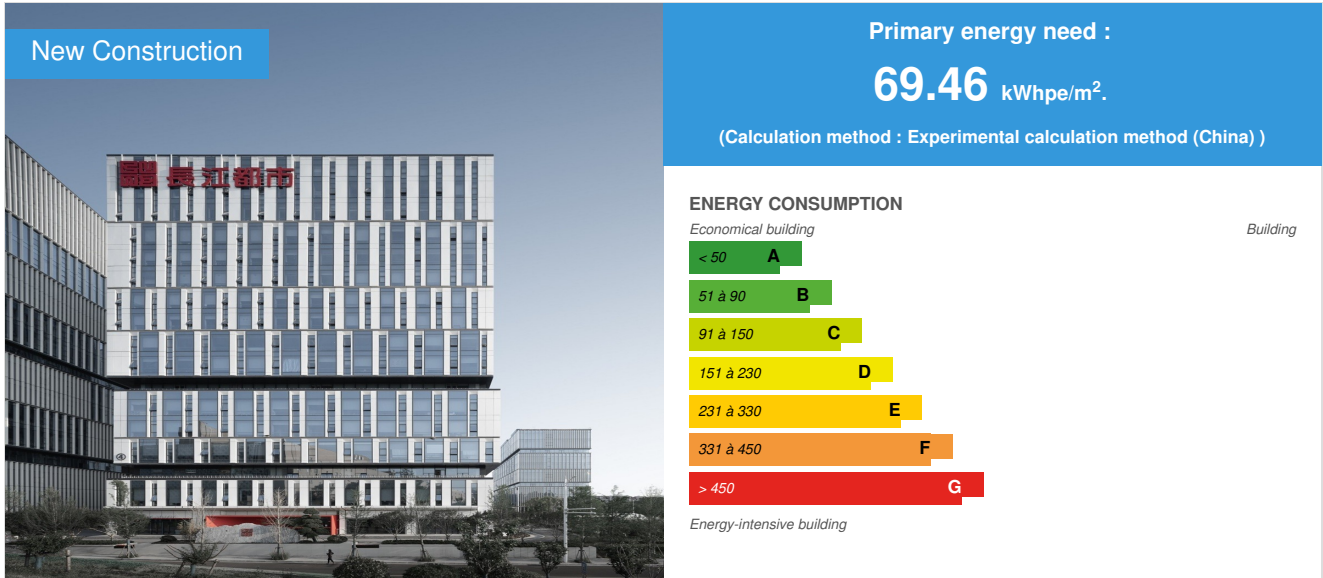


# Nanjing Yangtze River Urban Intelligent Headquarter

by / 2023-03-23 11:04:40 / China / 120 / CN



**Building Type** : High office tower > 28m  
**Construction Year** : 2021  
**Delivery year** : 2021  
**Address 1 - street** : 19 4 210022 ,  
**Climate zone** : [BWh] Subtropical dry arid

**Net Floor Area** : 24 509 m<sup>2</sup> Useful area (it)  
**Construction/refurbishment cost** : 62 500 000 ¥  
**Number of Work station** : 958 Work station  
**Cost/m2** : 2550.08 ¥/ m<sup>2</sup>

**Certifications :**



## General information

The project is a self-owned office building with 16 floors. It is a low-carbon and smart-operated modern office as well as a experimental platform of green & healthy design and sustainable operation.

The building is constructed by the office park and hand over to Nanjing Yangtze River Urban Architectural Design CO., LTD (The owner) for decoration. During construction, the owner proposed an optimized layout and structural system, from frame-core structure to frame-buckling-restrained bracing (BRB) structure. Meanwhile, the core tube is relocated from the central to the north. The optimization provides more flexibility on the layout, increasing space utilization efficiency by 5.3%. Also it reduces concrete of 1177.24m<sup>3</sup> and steel of 125.25 tons, equivalent to 1789 tons of CO2 emissions.

Considering surrounding obstructions, the offices with highest day-lighting demand are located on the east and south side, while conference rooms with second-highest demand are located on the west side. Noise sources, such as AC units and elevators, are placed on the north side away from offices, using stairways and

corridors as acoustic barriers. In addition, it uses open plan layout which is more beneficial for natural ventilation comparing to central core layout. During transitional seasons, the doors of AC units platform on the north will be allowed to open on the purpose of promoting ventilation. All above strategies improve natural ventilation and lighting performances and reduce noises, which is an implementation of passive and low-carbon design.

The building is the first office building with scale application of assembled decoration and skeleton-infill construction in Jiangsu Province. 80% of the walls use lightweight steel keel partitions and modular wall panels with decorative finishes. 75% of the floors adopt an elevated floor system. Pipelines are separated from the structure in 80% areas. Construction period reduces by 30% by using standardized components. The building saves more than 1400m<sup>3</sup> of cement mortar by using dry construction compared to wet construction, equivalent to 421 tons of CO<sub>2</sub> emissions. Moreover, the owner commits to an environmental-friendly decoration with no natural stone or timber materials.

The project emphasizes human-centered design, creating a healthy and comfortable environment for all users. It encourages healthy lifestyles and achieves a dynamic balance between energy conservation, environment protection, health and comfort through a series of technologies, such as haze-removing outside air systems, online monitoring of air and water quality, segregated water supply, light tubes, multi-level vertical greening, ergonomic furniture, smart dining facilities (including nutrient analysis), and maternal and child care.

## Data reliability

3rd part certified

## BIM approach

The project use BIM through the entire process including design phase, construction phase and operation phase. The digital BIM model is considered to be the digital assets, and are delivered at the same time of the actual building. An independent component coding system and model association logic were established during this process. These efforts turn to be a self-developed intelligent operation platform with copyright. Relying on IOT and 3D engine, real-time operation and maintenance data and virtual simulation can be interconnected, allowing the value of BIM as a digital asset to continue and achieving the full process of digital twin applications.

In addition, the platform also connects to human resource management system, improving the effectiveness of personnel organization and space assets management. Meanwhile, it can record and analyze indoor environmental quality and energy consumption for further analysis.

## Photo credit

Nanjing Yangtze River Urban Architectural Design Co., Ltd.

## Stakeholders

### Contractor

Name :

### Construction Manager

Name :

### Stakeholders

Function : Designer

<http://www.nanjing-design.cn>

The stakeholder is the owner, also as the design and consulting party. It provides interior design, green building consulting, healthy building consulting and smart building consisting services of the project. The owner is responsible for daily operation

## Allocation of works contracts

Macro packages

## If you had to do it again?

The project implemented a significant number of new technologies, which brought unexpected management demands. However, the intelligent operation platform and sensors throughout the buildings collect all kinds of maintenance data, allowing for secondary software development with no need of additional equipment. This strategy promotes continuous iteration and upgrading of building operation and maintenance management. The following functions have been added as of today.

1. Energy audit report module. This module provides monthly and annual energy consumption analysis and is able to establish energy consumption limits.
2. IBuilding carbon emissions module. It provides real-time display of operation-stage carbon emissions and will generate warning signals while carbon emissions excess limit.
3. Wanglong robot platform. The robot provides delivery and guiding services.
4. Photovoltaic and direct current (DC) laboratory.

The intelligent operation platform is self-developed with copyright, based on BIM models, graphics engines, and IOT technologies. It integrates 27 subsystems, 2469 devices, and more than 10,000 data points and enables interconnection between people, equipment, and the building itself. The platform enhances capabilities of sustainability and efficient building management.

## Building users opinion

The project conducts satisfaction survey annually. Due to last survey on June 10, 2022, the overall satisfaction of indoor environment is 95.36%, thermal comfort satisfaction is 87.71%, air quality satisfaction is 89.08%, lighting environment satisfaction is 95.08%, sound environment satisfaction is 92.36%, and indoor facilities satisfaction was 95.91%.

## Energy

### Energy consumption

**Primary energy need** : 69,46 kWhpe/m<sup>2</sup>.

**Calculation method** : Experimental calculation method (China)

**Final Energy** : 58,65 kWhfe/m<sup>2</sup>.

**More information** :

1. The project adopts a integrated ventilation strategy consisting of natural ventilation, outside air system, and adjustable ceiling fans. By providing multiple ventilation choices, it is able to main thermal comfort in different seasons and also reduce operating time of HVAC, thereby saving energy consumption. In 2022, the integrated ventilation strategy saves 39 days that potentially needs HVAC. Ceiling fans has 6 adjustable speed ranges and can operate in both forward rotation and reverse rotation. Forward rotation is for cooling purposes, whole reverse rotation mode is for ventilation purposes.

2. High-efficient VRF system

IPLV (C) of the HVAC units is between 8.3 and 9.51, which doubles the standard limit (4.0).

3. Dual management - IBMS and property inspection

Customize operation schedules for different equipment in the building, including public area lighting, signage lights, display screens, outdoor lighting, elevators, water heaters, air conditioning, etc. The IBMS system is able to open and shut down the equipment automatically according to the control schedule. Taking HVAC as an example, IBMS close HVAC at 21:00 and 24:00 everyday. However, occupants can manually turn on when working overtime. Property management personnel will take patrol inspection after 24:00.

By dual management, the project can save 30000 kWh every month comparing before.

### Envelope performance

**Envelope U-Value** : 0,40 W.m<sup>-2</sup>.K<sup>-1</sup>

**More information** :

Envelop is designed in accordance with the Energy Efficiency Design Standard for Public Buildings (GB 50189-2015), with an energy efficiency rate of 65%. The following optimization measures are taken.

1. Minimize window to wall ratio on south facade and install vertical fixed sunshades to reduce indoor HVAC loads.

2. 3F and 8F adopt concave design which forms a 1m-width overhanging shading.

3. Use high-performance glass curtain walls.

**Building Compactness Coefficient** : 0,33

**Indicator** : GB/T 7106-2008

**Air Tightness Value** : 6,00

### Real final energy consumption

**Real final energy consumption/m<sup>2</sup>** : 58,65 kWhfe/m<sup>2</sup>.

**Year of the real energy consumption** : 2 022

## Renewables & systems

### Systems

**Heating system** :

- Others

**Hot water system** :

- Gas boiler
- Solar Thermal

**Cooling system** :

- VRF Syst. (Variable refrigerant Volume)

#### Ventilation system :

- Natural ventilation
- Single flow

#### Renewable systems :

- Solar photovoltaic
- Solar Thermal

#### Renewable energy production : 0,60

#### Solutions enhancing nature free gains :

1. The project is located in the southeast corner of the entire site, within the upwind zone during transition seasons. Core tube is placed on the north side which has the least favorable ventilation and natural lighting. All regularly-occupied spaces are located on the east, west and south side, adopting an open plan layout. The windward is significantly increased by shifting the core tube to the north, which promotes natural ventilation. The doors of AC units platform on the north will be allowed to open during transition seasons creating a north-south airflow that expands the area of ventilation comfort.
2. During winter, the buildings on the north perform as the first windbreak. The core and equipment rooms perform as the second windbreak. This design reduces cold air infiltration and is able to reduce energy consumption for air conditioning during the winter season.
3. The project adopts an integrated ventilation strategy consisting of natural ventilation, outside air system, and adjustable ceiling fans. It helps to reduce operating time of HVAC, thereby saving energy consumption.
  - ☞ Natural ventilation. All regularly-occupied spaces have operable windows. Total operable ratio is 10.29% of the curtain wall. 96.48% of the spaces achieve an air exchange rate of more than 2 times per hour.
  - ☞ Outside air system. It will automatically turn on when air quality exceeds threshold.
  - ☞ Adjustable ceiling fans. The fan has 6 adjustable speed ranges and can operate in both forward rotation and reverse rotation. Forward rotation is for cooling purposes, while reverse rotation mode is for ventilation purposes.
4. Considering surrounding obstructions, the offices with highest day-lighting demand are located on the east and south side, while conference rooms with second-highest demand are located on the west side. The design enhances day-lighting while reducing lighting energy consumption.
5. Based on variety consideration, the project uses variable refrigerant flow (VRF) multi-split air conditioners that provide the most flexibility. Cooling zones are well determined and all air conditioning terminals can be controlled separately.

## Smart Building

#### BMS :

The project uses a self-developed intelligent operation platform with copyright. The IBMS system connects all 2469 devices in the building and has the following functions.

1. The IBMS has spatial floor visual display and system topology diagram display.
  - ☞ The spatial floor visual display shows real-time operating status by floor plan.
  - ☞ The system topology diagram display shows operating status by different subsystems.
2. The IBMS has data analysis and predictive maintenance capabilities.
  - ☞ The system is able to analyze equipment uptime, staff attendance rate, space utilization rate, equipment failure rate, work order processing status.
  - ☞ The system incorporates environmental and use time conditions to configure maintenance rules. It generates predictive maintenance notice when necessary.
3. The IBMS is able to reduce energy conservation through linkage control.
  - ☞ The system connects access control data to operating equipment. For example, lighting and HVAC will be automatically turned off when there is no one in the room.
4. The IBMS consists of building energy management system.
  - ☞ The system is able to analyze energy consumption by day, month, season and year and generate analysis reports. The management sets energy limits based on past data.
  - ☞ VRF system is able to diagnose operation anomalies and provide energy-saving advises.

## Environment

### Biodiversity approach

1. Use more than 30 species of native plants. Vertical greening on the 3F and 8F. Multi-level indoor green system "Indoor vertical greening-station greening-green corner", greatly improve the office microclimate and draw the distance between the city and nature.

#### 2. Sponge city

Combining with the expropriated green space to create a walking style sunken green space, achieving a functional rainwater landscape design.

#### Mitigation actions on soil and biodiversity :

The project adheres to the concept of respecting nature and prioritizing conservation. The project team transplanted 16 trees that are over 20 years old from original location when moving in. All trees have survived and are thriving well under the care of a dedicated greening team.

### Urban environment

1. There are 3 bus stops and 1 subway station providing 24 routes within 500-meter radius of the project. Additional, direct pedestrian pathways connects the bus stops and the entrance of the site.
2. The project provides employee cafeteria, exhibition hall of prefabricated decoration, coffee bar, fitness center, multi-purpose hall and retail beside office uses. Also, there are restaurants, KTV in the office park.

3. The project provides both short-term and long-term bicycle parking spaces. Short-term parking spaces are located near the entrance of the building. Most of the vehicle parking spaces are underground. 10% charging stations are equipped for both bicycles and vehicles.

4. The project promotes nationwide fitness lifestyle by set up multiple outdoor sports areas. The areas are free to the public.

## Land plot area

Land plot area : 40 266,40 m<sup>2</sup>

## Green space

Green space : 40 266,40

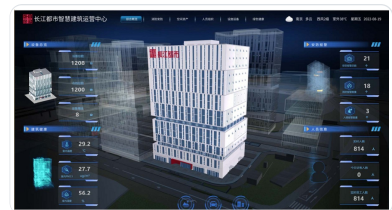
## Products

### Product

Intelligent building operation platform with copyright.

#### Product category :

Self developed platform for daily operation and maintenance management, helping to achieve digital twinning.



Intelligent delivery robot

#### Product category :

Used for visitor guidance, and food/parcel delivery.



DC laboratory (including 8 types of photovoltaic and energy storage equipment)

#### Product category :

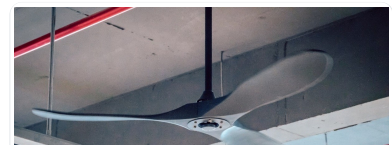
8 different forms of photovoltaic panels are installed on the roof. Power generated are used in DC refrigerators, DC lamps and DC air conditioners.



Multi-functional natural ventilation ceiling fan

#### Product category :

The fan has 6 adjustable speed ranges and can operate in both forward rotation and reverse rotation. Forward rotation is for cooling purposes, whole reverse rotation mode is for ventilation purposes.



## Costs

### Construction and exploitation costs

Total cost of the building : 62 500 000 ¥

### Energy bill

Forecasted energy bill/year : 1 627 900,00 ¥

Real energy cost/m<sup>2</sup> : 66.42

Real energy cost/Work station : 1699.27

### Circular economy strategy

#### Quantified targets for reuse? :

1. Reusable structural materials. Total of 130 buckling-restrained bracing (BRB).
2. Reusable furniture. Management, green building, and BIM department and small meeting rooms all use existing furniture from previous working location.
3. Reusable prefabrication wall. 80% of the walls use lightweight steel keel partitions and modular wall panels with decorative finishes. These walls can be disassembled and used in other projects.

### Reuse : same function or different function

#### For each batch : Reused Materials / Products / Equipments :

1. Buckling-restrained bracing (BRB).

BRB used in the project has 6 types. The buckling load capacity ranges from 1000 to 3000 kN.

2. Existing furniture

Eco-friendly particle board.

3. Prefabrication wall.

Light gauge steel stud gypsum board.

#### Reused materials rate :

The category of reusable and recyclable materials includes reinforced steel, glass curtain walls, gypsum products, mineral wool boards, light gauge steel studs, BRB and raised access floors

Recyclable material ratio is 9.85%. The total weight of construction materials is 18898.75 tons, and the weight of recyclable materials is 1862.40 tons.

Reusable material ratio is 0.39%. The weight of reusable materials is 75.22 tons.

### Environmental assessment

#### Impacts avoided : water, waste, CO2 :

The building implements waste sorting, promoting the classification and disposal of household and office waste. Dedicated waste bins for different types of waste are installed on each standard floor for centralized collection and removal.

1. Kitchen waste.

Paper towel-specific waste bins are set at the kitchen utensil recycling area to separate them from food waste, making it easier for disposal.

2. Office paper waste.

Follow company's requirements of office paper waste, ensuring that office waste paper and old newspapers are collected and recycled in a centralized and unified manner.

3. Hazardous waste.

Enhance disposal of toxic and hazardous office waste. It is strictly forbidden to abandon hazardous waste in office.

### Economic assessment

#### Purchasing process for reused materials :

1. Buckling-restrained bracing (BRB).

BRB is used in the structure, which improves seismic performance.

2. Furniture

Management, green building, and BIM department and small meeting rooms all use existing furniture from previous working location.

3. Reusable prefabrication wall.

The walls are prefabricated in the factory and can be disassembled and used in other projects.

### Social economy

#### Social economy and professional integration :

The headquarter is a low-carbon and smart-operated modern office as well as a experimental platform of green & healthy design and sustainable operation. No natural stone or timber materials are used in the project decoration phase.

The company has issued the "Green design, green lifestyle and green development" low-carbon action white-paper, encouraging green office practices and low-carbon lifestyles to create a positive atmosphere of energy conservation, environmental protection and cost savings.

Using the headquarters building as practice, the owner makes active solutions of green and low-carbon buildings. By using environmental-friendly methods and operating models that connect everything and operate with intelligence online, the project is becoming an innovative demonstration base of green, low-carbon and smart building.

## Circular design

### Eco-design :

1. The building is constructed by the office park and hand over to Nanjing Yangtze River Urban Architectural Design CO., LTD (The owner) for decoration. During construction, the owner proposed an optimized layout and structural system, from frame-core structure to frame-buckling-restrained bracing (BRB) structure. Meanwhile, the core tube is relocated from the central to the north. The optimization provides more flexibility on the layout, increasing space utilization efficiency by 5.3%.
2. 80% of the walls use lightweight steel keel partitions and modular wall panels with decorative finishes. 75% of the floors adopt an elevated floor system. Pipelines are separated from the structure in 80% areas.

### Sustainable supply :

1. The building is the first office building with scale application of assembled decoration and skeleton-infill construction in Jiangsu Province. Construction period reduces by 30% by using standardized components. Pipelines are separated from the structure in 80% areas. By ensuring that all components and parts are reversible, detachable, and replaceable, the efficiency of material usage throughout its entire lifespan is improved.
2. The switch from frame-core structure to frame-buckling-restrained bracing (BRB) structure saves concrete of 1177.24m<sup>3</sup> and steel of 125.25 tons, equivalent to 1789 tons of CO<sub>2</sub> emissions. Also, it saves 1.0122 million yuan.

## Health and comfort

### Water management

Consumption from water network : 16 486,00 m<sup>3</sup>

Consumption of harvested rainwater : 3 383,30 m<sup>3</sup>

Water Self Sufficiency Index : 0.17

Water Consumption/m<sup>2</sup> : 0.67

Water Consumption/Work station : 17.21

The project provides potable water to all users within a radius of 50 meters. It uses separate pipe systems in order to supply water for different qualities. The pipes of potable water system are stainless steel lined composite steel pipe with clearly visible pipeline identification to prevent incorrect connections. Potable water fountains use a multi-layer filtration system, including sediment filter, activated carbon filter and reverse osmosis membrane to remove suspended solids, particles, organic matter, and heavy metals. Pre-filters are installed on main water supply pipeline before water fountains that will extend service life of the machine and reduce filter replacement frequency. Water fountains are placed at least 15 meters away from restrooms to reduce the risk of secondary contamination caused by bacteria.

In addition, the project established a potable water quality records system through dual management of IBMS and administrative supervision, including following measures.

1. Hire a third-party professional organization to clean domestic water tanks in May and November every year. Testes are performed after cleaning to ensure water quality. Since September 2021, the tank has been cleaned four times with good water quality.
2. Replace pre-filters installed main water supply pipeline every six months to effectively filter out large particles such as sediment, rust, suspended solids, and colloidal impurities. Pre-filters extend service life of the water fountains and reduce multi-layer filter replacement frequency of the machine.
3. Establish water quality records for every water fountains in the building. Management team conducts water quality inspections using TDS as indicator to determine whether the filters need to be replaced on a monthly basis. The water quality records are posted on each water fountain that can be seen by all users.
4. Install two sets of online water quality monitoring devices on the ground floor and top floor, monitoring residual chlorine, turbidity, pH, and conductivity on a daily basis. IBMS system collects monitoring data and will generate warning signals and when thresholds are met.

### Indoor Air quality

1. The project intends to control indoor pollutant emissions from the beginning. The owner commits to an environmental-friendly decoration with no natural stone or timber materials. Prefabricated decoration and skeleton-infill system (dry construction) is been used in the decoration phase. 80% of the walls use lightweight steel keel partitions and modular wall panels with decorative finishes. 75% of the floors adopt an elevated floor system. Pipelines are separated from the structure in 80% areas. The prefabricated decoration and no ceiling design in open plan offices significantly reduces indoor pollution sources.

2. Particulate matters are controlled by haze-removing outside air systems. Over 99% of PM<sub>2.5</sub> shall be removed. In addition, the building has an air quality monitoring system which consists of 93 integrated air quality sensors covering all major functional spaces. The monitored parameters include temperature, humidity, PM<sub>2.5</sub>, PM<sub>10</sub>, CO<sub>2</sub>, and TVOC. Monitoring data are displayed at the entrance on first floor and elevator halls on each floor. The project creates and indoor air quality index (IAQI) through multi-parameter coupling strategy. It is much easier for occupants and visitors to recognize air quality in the building by using only one parameter (IAQI). Also, air quality data is stores in IBMS system, and is capable of providing weekly, monthly and yearly analysis reports. When air quality meets the thresholds, outside air system will automatically turn on. In 2022, the annual average concentration of PM<sub>2.5</sub> is 16.31 µg/m<sup>3</sup>.

### Comfort

#### Health & comfort :

1. The project adopts a integrated ventilation strategy consisting of natural ventilation, outside air system, and adjustable ceiling fans. By providing multiple ventilation choices, it is able to main thermal comfort in different seasons and also reduce operating time of HVAC, thereby saving energy consumption. In 2022,

the integrated ventilation strategy saves 39 days that potentially needs HVAC.

- Natural ventilation. All regularly-occupied spaces have operable windows. Total operable ratio is 10.29% of the curtain wall. 96.48% of the spaces achieve an air exchange rate of more than 2 times per hour.
- Outside air system. It will automatically turn on when air quality exceeds threshold. OA system is the primary choice to cool the whole building in transitional seasons.
- Adjustable ceiling fans. The fan has 6 adjustable speed ranges and can operate in both forward rotation and reverse rotation. Forward rotation is for cooling purposes, whole reverse rotation mode is for ventilation purposes.

2. The core tube is placed on the north side that provides more flexibility on the open plan layout. All regularly-occupied spaces are location on the east, west and south side, adopting an open plan layout. The windward is significantly increased by shifting the core tube to the north, which promotes natural ventilation. The doors of AC units platform on the north will be allowed to open during transition seasons creating a north-south airflow that expands the area of ventilation comfort. 73.77% of regularly occupied spaces achieve first level thermal comfort (APMV range of -0.5 to 0.5) under natural ventilation conditions in transitional seasons.

3. Use four-way multi-split indoor units as air conditioning terminals. Carefully considerations are taken when install terminals to avoid direct airflow to people. Third-party test shows that the temperature ranges from 25.4 to 26.0°C, relative humidity ranges from 50.4% to 62.4% and airflow speed around people is below 0.15 m/s during typical summer conditions. CBE Thermal Comfort Tool indicates that the PMV ranges from -0.02 to 0.29, achieving first level thermal comfort under HVAC conditions.

#### Acoustic comfort :

1. The major outdoor noise source is the highway on the west. The owner determines the locate the building on the southeast corner of the entire office park with an over 150m distance from the highway. Building along the street form as a natural sound barrier. The noise level around the project building is approximately 54dB (daytime and 44dB (nighttime)), while the noise level by roadside is 73dB (daytime and 62 dB (nighttime)). Thus, selection of the project site brings a benefit of 18 dB reduction of outdoor noise.

2. The major outdoor noise sources are HVAC units and elevators on each floor. They are all placed on the north side away from offices, using stairways and corridors as acoustic barriers. Third-party tests indicate daytime noise level is approximately 33dB in standard offices providing a quiet working environment.

3. Typical conference rooms install an intelligent, non-intrusive sound reinforcement conference system. It uses the whole-plane sound generation and resonance method by installing four array microphones and flat-panel sound modules in the ceiling. There is no need to set up additional microphones in the conference room. Moreover, several strategies such as dynamic noise cancellation, adaptive feedback suppression and network echo cancellation are employed to enhance speech clarity.

#### Visual comfort :

1. Considering surrounding obstructions, the offices with highest day-lighting demand are located on the east and south side, while conference rooms with second-highest demand are located on the west side. 81.86% of all regularly occupied spaces achieve a daylight factor above 3.3%.

2. Top floor of the building is a shared reading and communication area. It is equipped with intelligent modular skylight windows, which are controlled by a smart shading system to obtain sun shading in summer, natural ventilation in spring and autumn, and harvest sunlight in winter. This design not only provides a bright reading space but also allows the building to breathe within the seasons. In addition, 6 sets of light guide tubes are installed in the most frequently used staircase reference room. It has been proven that no artificial lighting is necessary during daytime.

3. 91% of regularly occupied spaces have direct outside views except a few chat rooms. There are public green spaces, water features, sculptures, sports fields, and other blue-green spaces within the view. By connecting to natural environments, it helps to alleviate fatigue caused by intense concentration during work, allowing the brain to rest and recover fully.

4. For artificial lighting, the project uses the highest anti-blue light level RG0 lamps. Color temperature is under 4000K, control color rendering index (CRI) is above 80. All lamps are equipped with light shades to prevent direct eye exposure and glare from computer screens. With the combined effect of lighting and daylight, the project achieves more than 250lx EML in 75% of all regularly spaces in circadian lighting design.

#### Ergonomic design :

The occupants of the project are designers of an architectural design institute, who experience high work intensity and long periods of sitting that may lead to health issues such as cervical spondylosis and lumbar muscle strain. Therefore, the project encourages multi-posture working by providing adjustable tables and desks to alleviate sitting fatigue. Meanwhile, dual monitors and adjustable stands for computers are provided to all employees by self-application. As of today, more than 50% employees are using dual monitors and adjustable stands.

Furthermore, the chair of standard workstation are ergonomically designed, which be used for both sitting and sleeping. They can be adjusted in both angle and height, and also serve as nap beds.

## Quality of life and services

1. The project fully embraces the concept of "all-staff fitness". There are six sports options (aerobics, anaerobic exercise, yoga, table tennis, badminton, and ping pong) within the building. Also, the office park provides basketball courts, tennis courts, football fields, outside fitness areas and a walking trail. Diverse sport needs are fulfilled. The fitness center in the building provides privacy-protected shower rooms. Shower heads use thermostatic faucets to prevent cold shocks and scalding, and their height can be adjusted freely.

2. After optimization of the plan layout, stairways are visible before the elevators. The operation and management departments are located on the intermediate floors. These design promote the use of stairs instead of elevators. In addition, stairs are equipped with slogans that encourage the use of stairs. All employees are encouraged to taking the stairs for going up 3 floors and going down 4 floors.

3. The project implements a multi-level greening system including "vertical greening, workstation greening, and green corners", based on the concept of biophilic design. There are three vertical green walls on 1st, 9th, and 10th floors. Recessed corridors on 3rd and 8th floors are planted. Corners are all designed to be green corners. Every desk has more than one green plant. This creates a breathable and healthy office for employees, significantly improving the microclimate of the office and bridging the gap between the urban and natural environment.

4. The project encourage employees to participate decorating the building. After moving in, it holds a voting event for "Most Beautiful Office" and "Top Ten Workstations".

5. Employee cafeteria separates the food preparation area and dish cleaning area which reduces the risk of cross contamination to ensure food safety. Smart



dining system based on facial recognition technology is using for checkout, greatly reducing queuing time. At the same time, has nutrition content display function, which can automatically generate the nutrition composition of each meal. The menu changes based on sales data and nutritional composition data. Furthermore, healthy recommendation are provided on working Apps (Dingding).

6. Over 30 sleeping cabins with bedding, music, and charging facilities are provided for employees. Also there are baby care rooms for working mothers.

7. Professional sports coaches are hired to help employees. Various sports games are held on a yearly basis including basketball matches, table tennis matches, badminton matches, dragon boat matches and so on. On Youth Day, Women's Day and Children's Day theme activities or health lectures are also held to create a good cultural atmosphere and enrich the spare time life of employees.

## Carbon

### General infos

#### 1. Passive design - natural ventilation

CFD analysis of the middle core tube shows that only offices on the east and north side may obtain enough natural ventilation, as 25.3% of all spaces.

After moving the core tube to the north side, ventilation path expands from 7.7m to 13.5m. Nearly 87% of all spaces shall have good natural ventilation. The optimization can reduce HVAC usage time of 39 days, equivalent to 8.72 tons of CO2 emissions.

#### 2. Passive design - shading system

3rd and 8th floors adopts a concave design, forming a staggered volume relationship similar to the "drawer" style, providing shading. Based on the temperature monitoring data, these floors can reduce HVAC usage time of 28 days, equivalent to 6.52 tons of CO2 emissions.

#### 3. Structural system carbon reduction

The owner proposed an optimized layout and structural system, from frame-core structure to frame-buckling-restrained bracing (BRB) structure. it reduces concrete of 1177.24m<sup>3</sup> and steel of 125.25 tons, equivalent to 1789 tons of CO2 emissions.

#### 4. Prefabricated decoration

Saving more than 1400m<sup>3</sup> of cement mortar, equivalent to 421 tons of CO2 emissions.

#### 5. Dual management- IBMS and property inspection

Customize operation schedules for different equipment in the building, saving 258.78 tons of CO2 emissions.

#### 6. Renewable energy

PV generates 13286 kwh per year, equivalent to 186.93 tons of CO2 emissions (20 years of use time).

### Carbon sink

#### 1. Renewable energy

PV generates 13286 kwh per year, equivalent to 186.93 tons of CO2 emissions (20 years of use time).

#### 2. Carbon sink of plants, estimated as 0.39 tCO2.

### GHG emissions

GHG in use : 41,64 KgCO<sub>2</sub>/m<sup>2</sup>/

Methodology used :

Standard for building carbon emission calculation GB/T 51366-2019

GHG before use : 400,40 KgCO<sub>2</sub> /m<sup>2</sup>

Building lifetime : 50,00

, ie xx in use years : 9.62

GHG Cradle to Grave : 2 525,13 KgCO<sub>2</sub> /m<sup>2</sup>

## Contest

### Reasons for participating in the competition(s)

“ ”

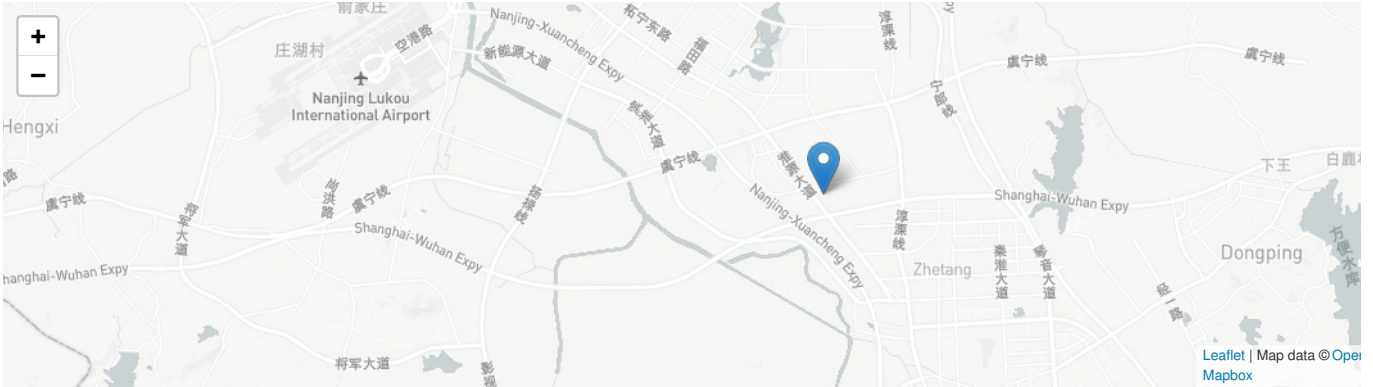
2650 /

### Building candidate in the category





Users' Choice



Date Export : 20230804211430