



让我们共同打造气候中和的未来
Building a climate-neutral future together

Sino-Swiss Cooperation on Zero Emissions Building

Zero Emissions Building Demonstration Project Report

Gongchen Community Centre

Fangshan District, Beijing

ENGLISH VERSION



JULY 2024



中华人民共和国
住房和城乡建设部



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Building a climate-neutral future together

This report has been produced within the framework Sino-Swiss Zero Emissions Building Project; an international collaboration funded by the Swiss Agency for Development and Cooperation in partnership with the Chinese Ministry of Housing and Urban-Rural Development.

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The Sino-Swiss Zero Emissions Building Project is an international collaboration funded by the Swiss Agency for Development Cooperation in partnership with the Chinese Ministry of Housing and Urban-Rural Development. The project aims to reduce greenhouse gas emissions and enable carbon neutral development of the building sector in China by sharing Swiss know-how on sustainable and zero emission building.

Implementation partners:

Intep Integrated Planning
Skat Consulting
China Academy of Building Research

WeChat:



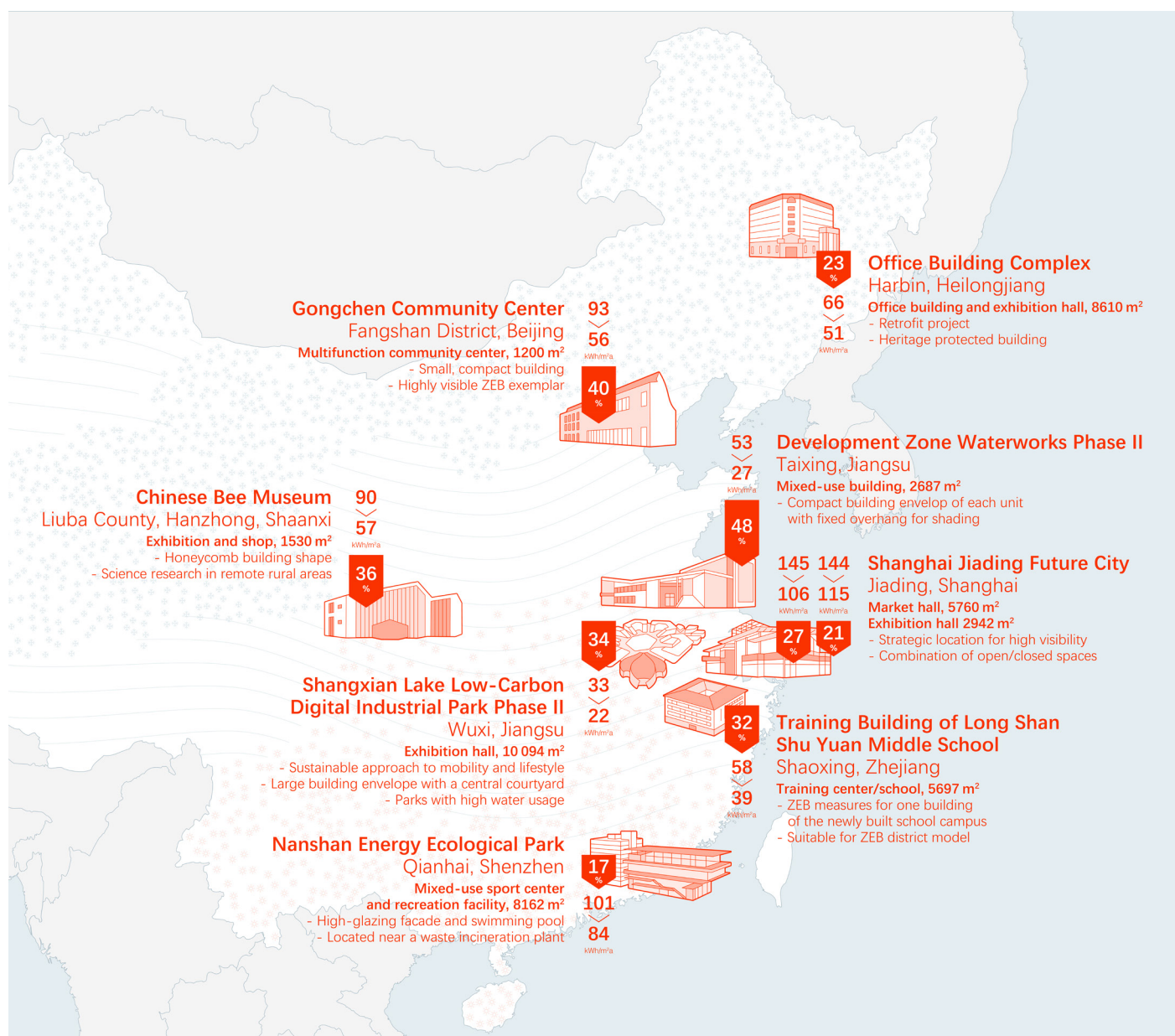
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Cover image. Gongchen Community Centre, Beijing. Image courtesy SUP Atelier.

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Map. Zero Emissions Building demonstration projects. Eight projects distributed across China's four climate zones. Image by EBP.



1. Sino-Swiss Cooperation on Zero Emissions Building

To jointly address global climate change and to strengthen cooperation between China and Switzerland in the field of emissions reduction in the construction industry, the Ministry of Housing and Urban-Rural Development of the People's Republic of China and the Swiss Federal Ministry of Foreign Affairs signed a Memorandum of Understanding (MoU) on 24 November 2020. The Memorandum focuses on fostering international cooperation in the field of building energy efficiency. Within the framework of this MoU, the Swiss Agency for Development and Cooperation (SDC) initiated and funded the Sino-Swiss Zero Emission Building (ZEB) Project. The project aims to support China in formulating the technical standard for zero carbon buildings and long-term roadmaps for reducing carbon emissions in the construction industry. Switzerland contributes by sharing know-how, showcasing demonstration projects of zero emission buildings in four different climate zones, and carrying out various forms of capacity building activities to promote the carbon-neutral development of China's construction industry.

Project Objectives

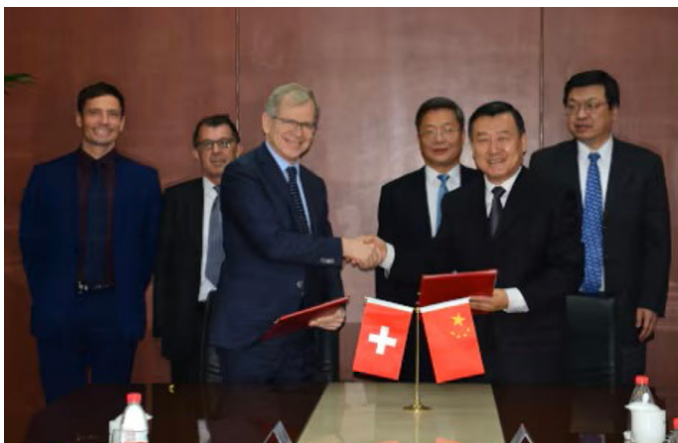
- Upgrading existing building energy efficiency standards to zero carbon technical standards
- Implementing demonstration projects (DP) in four typical climate zones to test the new ZEB standards and finding potential for optimization
- ZEB capacity building and knowledge dissemination

Project duration

March 2021 – November 2025

Project impact on climate protection

Reduce CO2 emissions in China's building sector.



Ambassador Bernardino Regazzoni and Vice Minister Ni Hong, sign the project agreement. Image: Swiss Embassy in Beijing

Demonstration projects

The ZEB Project supported Demonstration Projects intended to serve as case studies to guide and educate further projects in achieving the ZEB standard.

Following a call for suitable projects, selection of demonstration projects in each of China's four climate zones followed a consistent process including.

Collection of applications for potential demonstration projects by an official call

- Evaluation based on selection criteria by Chinese and Swiss experts:
 - Political commitment, funding commitment, possibility of intervention, potential for affordability and replicability, visibility and accessibility, diversity
 - CO2 emissions reduction potential and other environmental benefits (40%), number of beneficiaries (20%), light-house potential (20%), incentives by local government (20%)
 - Quick-starter, compatibility with draft ZEB-Standards, pilot characteristics, availability of data
- With Sino-Swiss joint feedback and recommendations, MoHURD announced the selected demo projects in March 2022

Sino-Swiss team

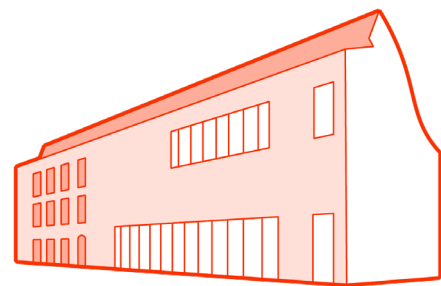
The ZEB team includes Swiss and Chinese specialists. The Chinese DP team first proposed design prototypes and zero-carbon design strategies. After reviewing the design features of the project, the Sino-Swiss expert team gave tailored feedback on the design prototype and strategical concept. The Swiss team also arranged webinars on specific topics based on the questions from the DP team. Ideas contributed by the Swiss experts are based on international experience.

Goals of Sino-Swiss cooperation

ZEB project support to demonstration projects sought to improve the project quality and support compliance with ZEB-standards. The cooperation is mutually beneficial – the Swiss team brings experience and expertise to China, while the Chinese colleagues can share their experiences for the Swiss to learn from. Jointly the Swiss and Chinese teams discover what the best solutions are to develop a successful zero emission building.

Demonstration project selection justification

- The project in Beijing is back by strong political will and engagement by the local municipality.
- The investors have committed not only to design a ZEB project from the operational perspective but also to integrate embodied CO2 emissions into their design. This is a sign that they are willing to extend the ZEB boundaries and consider the life cycle.
- The project is at a good stage to receive Swiss inputs.
- Community buildings of this size are commonly found in well-designed medium-sized housing schemes and could be replicated numerous times to transport the ZEB message.
- The project has star-architectural character thanks to its advanced ZEB technical solutions with comprehensive concept and integration of building and photovoltaic, designed under the lead of Professor Yehao Song. It is therefore particularly attractive for innovative ZEB architects.
- The project is located in an attractive location and the architectural design with simple geometry provides huge potential to become a landmark.
- The building material choices will likely be published, for example in architecture magazines, and generate a lot of attention.
- The building is in a typical climate zone: Cold.
- CO2 reduction potential seems to be significant, particularly in terms of embodied CO2.
- Number of direct users expected to be high.
- With this project, the incentives for embodied CO2 reduction can be tested.
- This project has the potential to largely meet ZEB standards.
- The project is suitable for prototyping an advanced ZEB project.
- The availability of data looks well-functional with a competent and very alert team. The project is well suited to be a lighthouse project, bring the ZEB message to a large audience in a very attractive way. The cooperation with Tsinghua University offers great opportunities for capacity building and communication.



Gongchen Community Center

Fangshan District, Beijing

Multifunction community center, 1200 m²

- BIPV and rooftop PV
- Reused local materials
- High performance envelope
- Flexible space planning
- Energy-efficient air heat pump and heat recovery systems



2. Project initial conditions

2.1. Project organisation

In March 2022, the “Beijing Fangshan China Construction First Building (Group) · Xuefu Yinyue Zero Carbon House Project” was selected as one of the first demonstration projects of the Sino-Swiss ZEB project. This project is a ministerial-level international cooperation project initiated by the Chinese Ministry of Housing and Urban-Rural Development and the Swiss Agency for Development and Cooperation. The project commenced in May 2021 and, after more than two years of joint efforts by Sino-Swiss teams, was officially completed with its construction on September 27th, 2023, and achievement of ZEB goal.

Investor

C-Land Real Estate

Lead planning team

SUP Atelier of THAD (Architect)

Sino-Swiss ZEB joint consulting team

Intep, Skat, CABR, Low-Tech, UAD, HSLU, EMPA, Willers and more others.

2.2. Project overview

Location

Fangshan District, Beijing / China

Climate zone

Cold; Solar resource area II

Area

- Gross building area 1557m² (reduced to 1200m² in final concept), consisting of three above-ground floors and one below-ground floor.
- Energy reference area 1262m² (reduce to 838m² in the end)

2.3. Architectural concept highlights

The building serves as a community center with a multifunctional exhibition hall and several senior apartments (see Figures 2 & 3, and plans in Annex A.1-A.3).

2.4. Energy concept highlights

- Building-integrated photovoltaics (BIPV) on façade and PV on the roof
- Air heat pump / air cooled chiller for space heating and cooling
- Mechanical ventilation with heat recovery (optional with natural ventilation through roof windows)
- High-performance doors and windows

2.5. Other highlights of sustainability concepts

- Free cooling through natural ventilation openings
- Recycled building material without concrete design

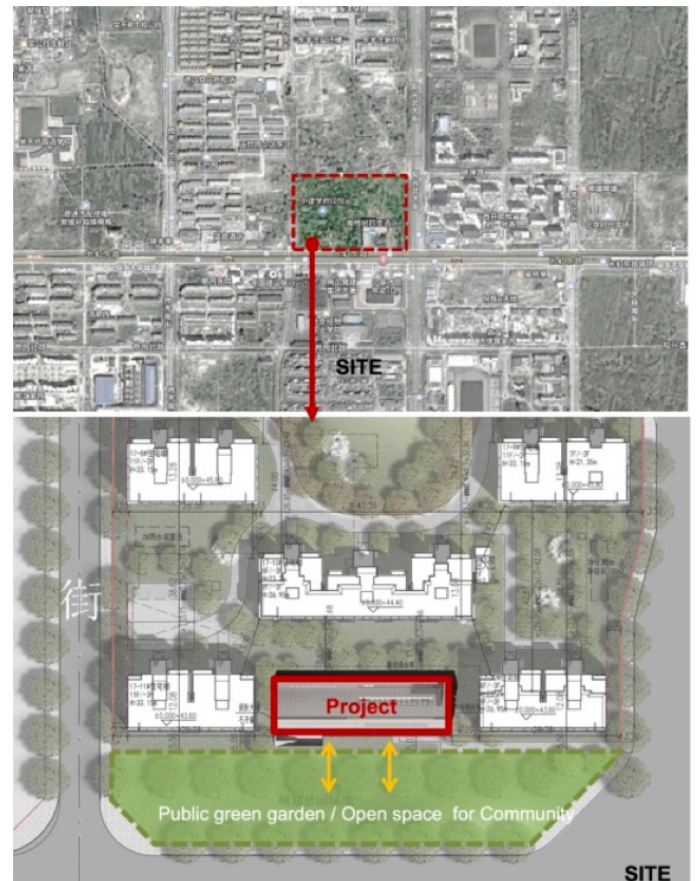


Figure 1. Project located in a residential community with highrise buildings. Source: ©SUP Atelier



Figure 2. Rendering and Section of the project in early planning phase, Source: Project Presentation 22.06.2022 ©SUP Atelier

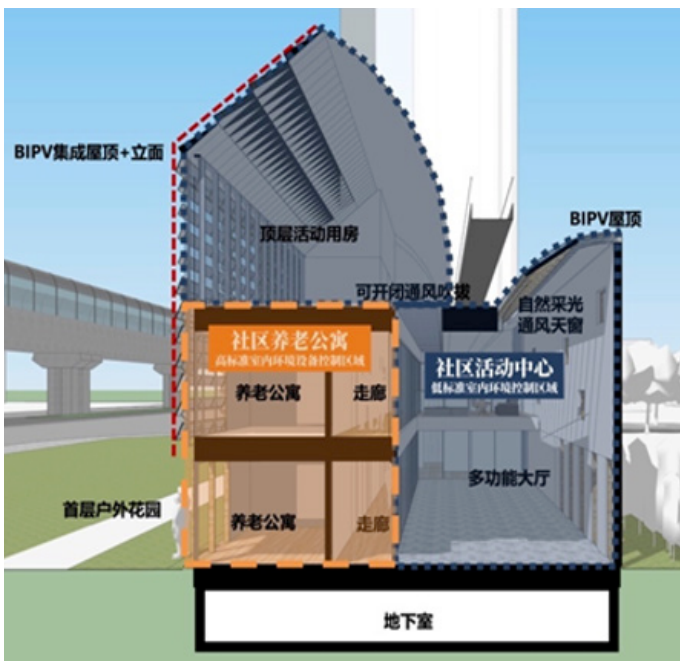


Figure 3. Rendering and Section of the project in early planning phase, Source: Project Presentation 22.06.2022 ©SUP Atelier

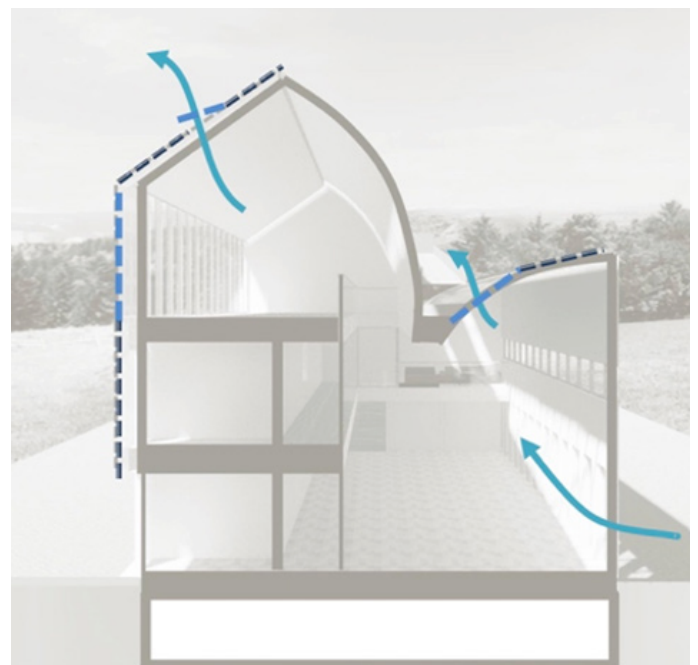


Figure 4. Natural ventilation as passive measure to reduce energy consumption, Source: Project Presentation 22.06.2022 ©SUP Atelier

3. Sino-Swiss Cooperation

3.1. About the design team

SUP Atelier, founded in 2011 by pioneering Chinese green building architect Prof. Yehao Song (Tsinghua University School of Architecture in Beijing) was the lead design team of the Beijing demo project. SUP Atelier explores the simultaneous sustainability of natural resources and human community through high context sensibility, modest architectural strategies, and tectonic research on natural and local materials.

SUP Atelier focuses on sustainability within the scope of architecture, urban studies, and building technology, while highly promoting the combination of modern design and vernacular architecture in China. Regional and local understandings are key in initiating innovative designs. Thus, SUP Atelier's design strategy is to incorporate the latest technical measures or traditional climate adaptation design strategies. The team uses building simulation software and high-end building techniques to assist decision-making within the design strategy.

The landscape architecture was designed by Urban Space Art Design.

A team with international experience at the Ultra-CABR (Energy Consulting) EE at the China Academy of Building Research is consulting the low carbon concept for the building. They researched and promoted advanced energy-saving and low-carbon technologies and solutions for the project, delivered innovative design optimization and cost analysis and on-site project guidance.

3.2. General project impressions

The project impresses with its architectural design and its consistent choice of materials. The artistic wooden structures form high-quality spatial compositions. The building shows how high-quality architecture can be realized with timber construction in a ZEB design.

The wooden structural elements should be reusable; as a pilot-project for ZEB, it would be interesting to consider the life cycle of building materials, such as the possibility to disassemble building elements at the end of its function and reuse them. The idea is to show how to reduce carbon emissions by reusing or recycling old building elements.

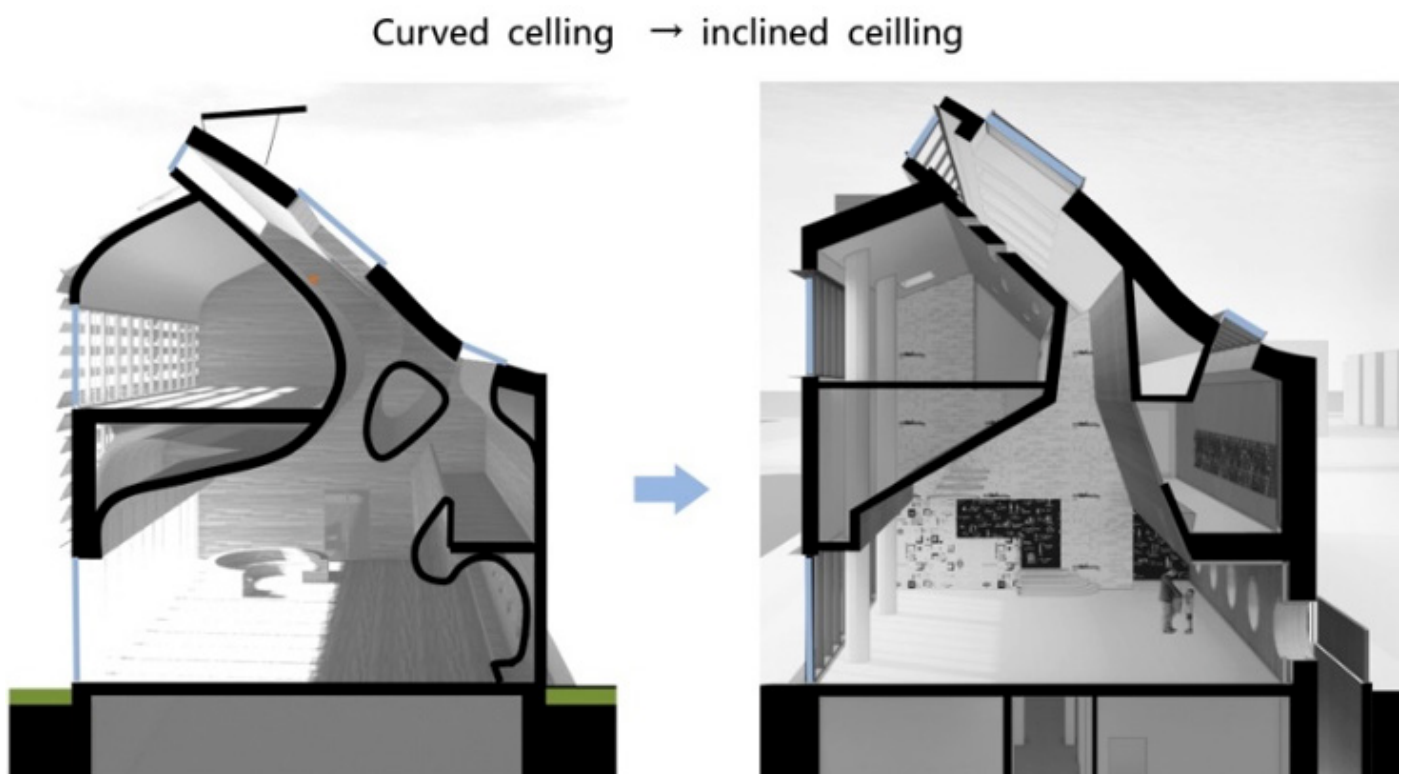


Figure 5. On the investor's request, the design team simplified the construction of the previous curved shape to a polygon form. The new shape improves the natural ventilation in the building and thus contributes to the carbon reduction of the project. Source: Project Presentation 17.11.2022 ©SUP Atelier



Figure 6. Recycled wood on north façade was planned, but unfortunately not implemented due to quality control concerns. Instead, new wood was montaged on façade. Source: Project Presentation 17.11.2022 ©SUP Atelier

3.3. Initial discussion and improvements

During the kickoff and follow-up meetings, the Chinese DP team and Swiss experts engaged in a comprehensive exchange and discussions on various topics. The design team made significant adjustments to the original plan to better consider the multi-functional needs of the community, focus zero-carbon elements on the cross-sectional design of the space, and reorganize natural lighting and ventilation.

China's zero-carbon standards rarely include calculations and simulations of the zero-carbon contribution of natural ventilation and overall design strategies of building sections. Therefore, the Chinese team and Swiss experts discussed in detail the organization of natural lighting and ventilation in this particular sectional prototype. The architectural design principle was supported and recognized by the Swiss expert team.

Next, the DP team proposed potential strategies and improvements, based on the technical know-how experiences shared by the Swiss experts. The Swiss team delivered a range of inputs and consulting activities, including rapid technical input sheets, webinars, workshops, and more other topic focused exchanges. The Chinese design team meticulously researched these inputs and evaluated their feasibility on the demand of the investor and in the context of Chinese conditions. In the end, through mutual understanding and discussions, the following improvements were achieved:

- Quantitative calculations which show that the architectural design will lead to greater carbon reduction compared to reductions through equipment optimization.
- Improved efficiency of HVAC, lighting (smart control) and appliances.
- Refined energy consumption calculations indicate the consumption based on building working hours.
- Heat recovery for mechanical ventilation.
- Increased PV production in collaboration with Chinese PV manufacturer
- Removal of the PV panels outside of the windows to improve indoor natural light.
- The viability of battery system was checked to determine if exported electricity is tracked on an hourly basis.
- Since Chinese regulations have not yet been adjusted to provisions related to timber structures and because the building has assumed a special function of elderly care, the main structure could not be made of wood. To reduce carbon during the construction phase, the Chinese team actively consulted and exchanged ideas with the Swiss expert group on how to better recycle and reuse materials. Swiss experts provided advice on industrial construction using low-carbon cement, low-carbon concrete, and various recycled assembly materials. In the end, the Chinese construction team found ways to use recyclable materials to balance the carbon consumption of



the steel structure within the limits allowed by the owner and Chinese building regulations.

- The flexibility of the building layout is a key feature for the community. The function of the rooms can be easily changed in the future.
- The north façade is covered by recycled wood with low carbon emissions in the production phase.
- The east façade is designed using recycled pipes from the building waste of a neighboring construction site, which has zero carbon emissions in the production phase.
- The color of the indoor walls of the hall will be changed to white to increase reflectivity and bet-

ter use natural light from the skylight windows.

- Windows are equipped with a manual sunshade between two glass layers to reduce sunlight radiation in summer, prevent indoor glare, optimize the indoor light environment, and make the elderly residences more comfortable.
- Air flow simulation in different scenarios showed that natural ventilation will reduce cooling demand in summer.
- Simulations proved that better natural lighting will to reduce the demand for electric lighting.
- The thickness and material of insulation and the ratio between glass and opacity on the facade were optimized for operational performance.



Figure 7. Final rendering of BIPV on south façade, Source: Project Presentation 17.11.2022 ©SUP Atelier



Figure 8. Pipes for recycling, Source: Project Presentation 17.11.2022 ©SUP Atelier

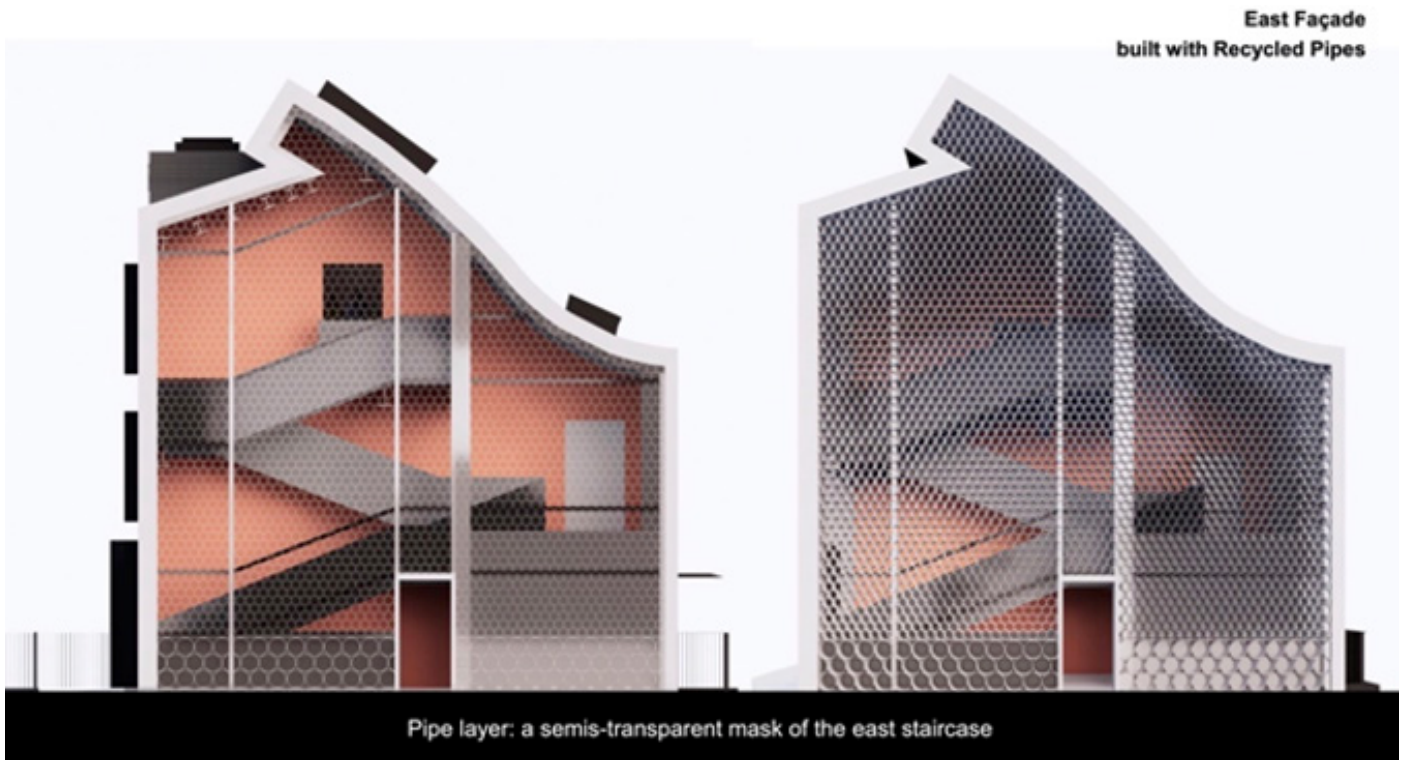


Figure 9. Recycled pipes on north façade, Source: Project Presentation 17.11.2022 ©SUP Atelier

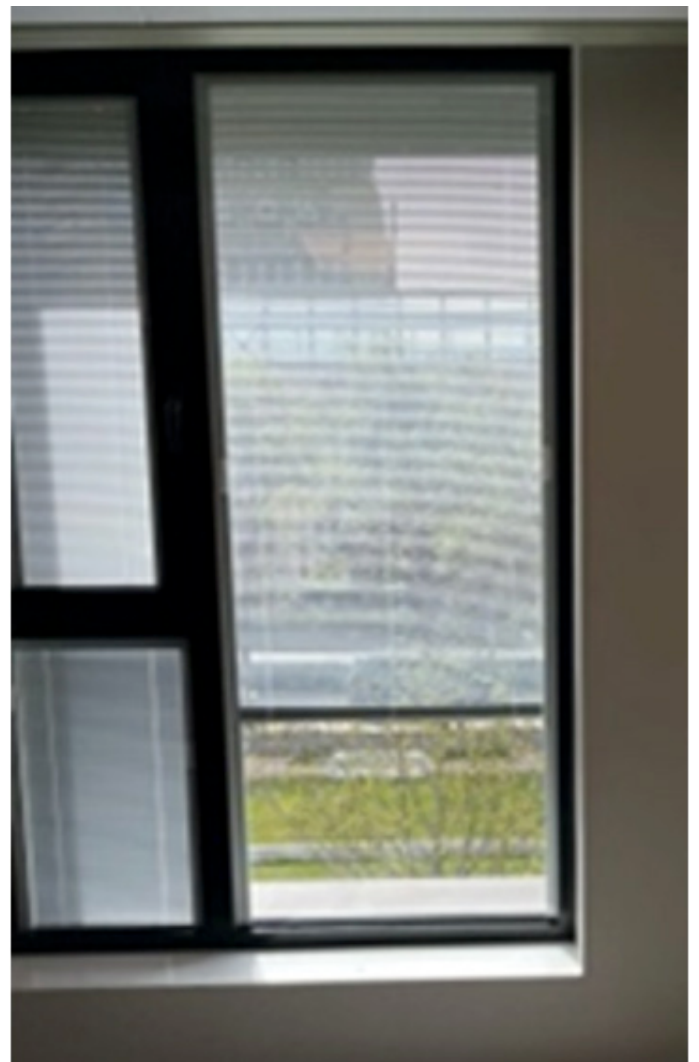


Figure 10. Manual sunshade between two glasses, Source: Project Presentation 17.11.2022 ©SUP Atelier

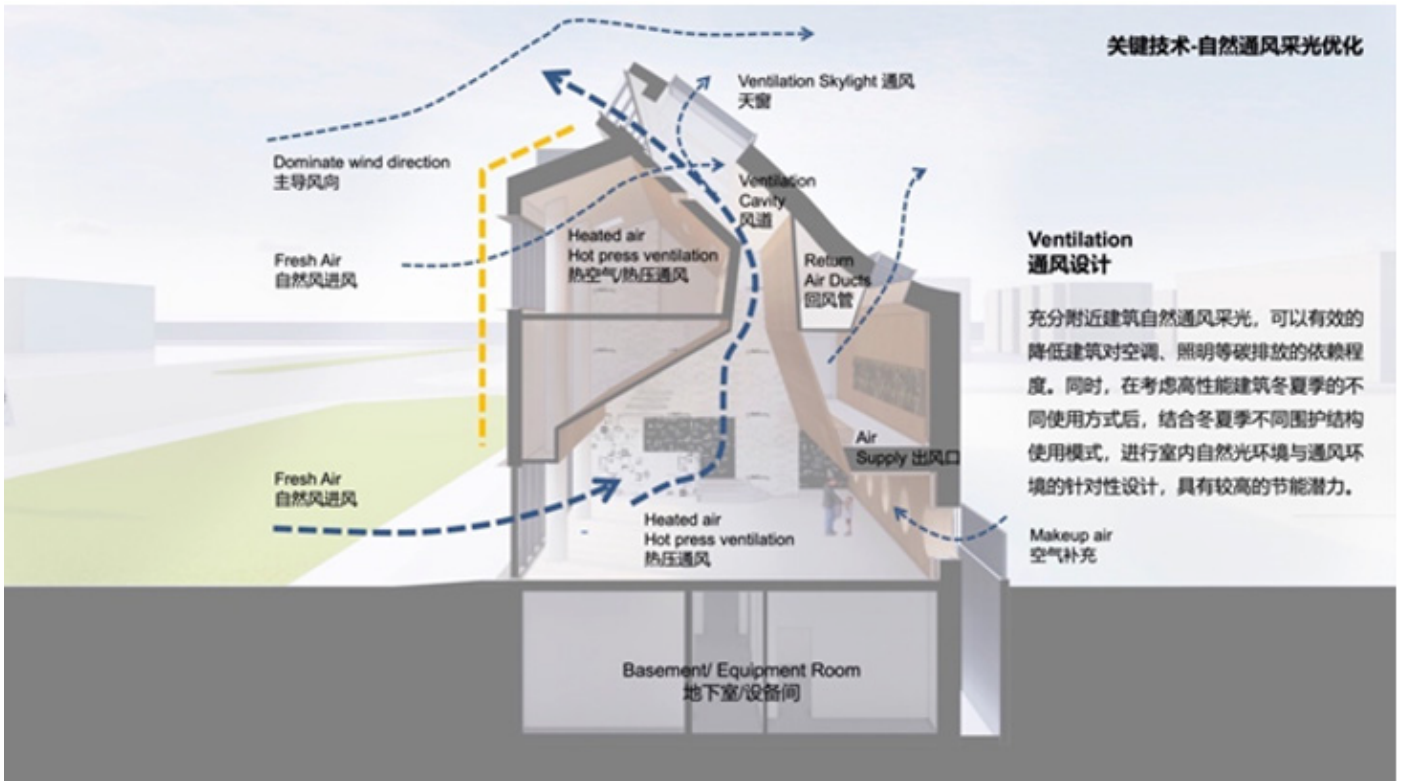


Figure 11. Simulation of air flow in different scenarios, Source: Project Presentation 17.11.2022 ©SUP Atelier

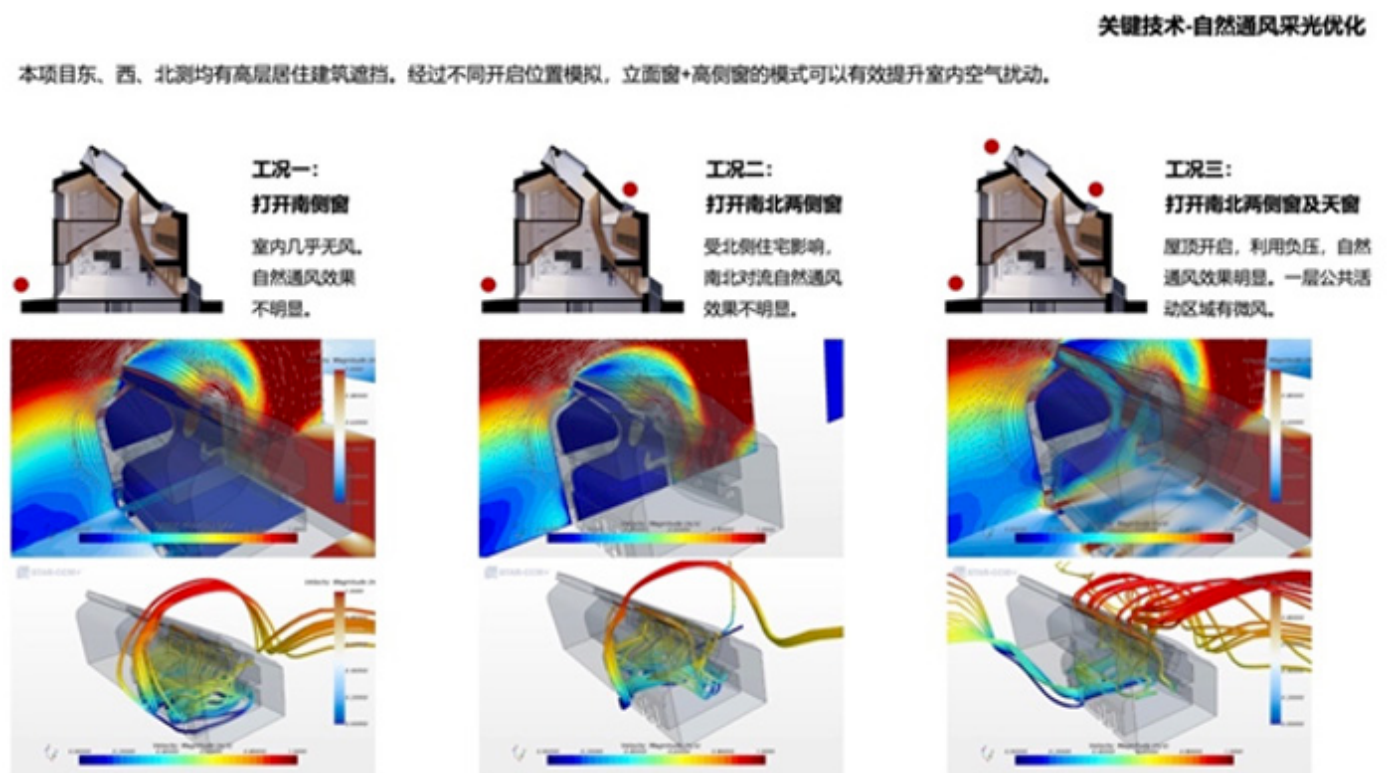
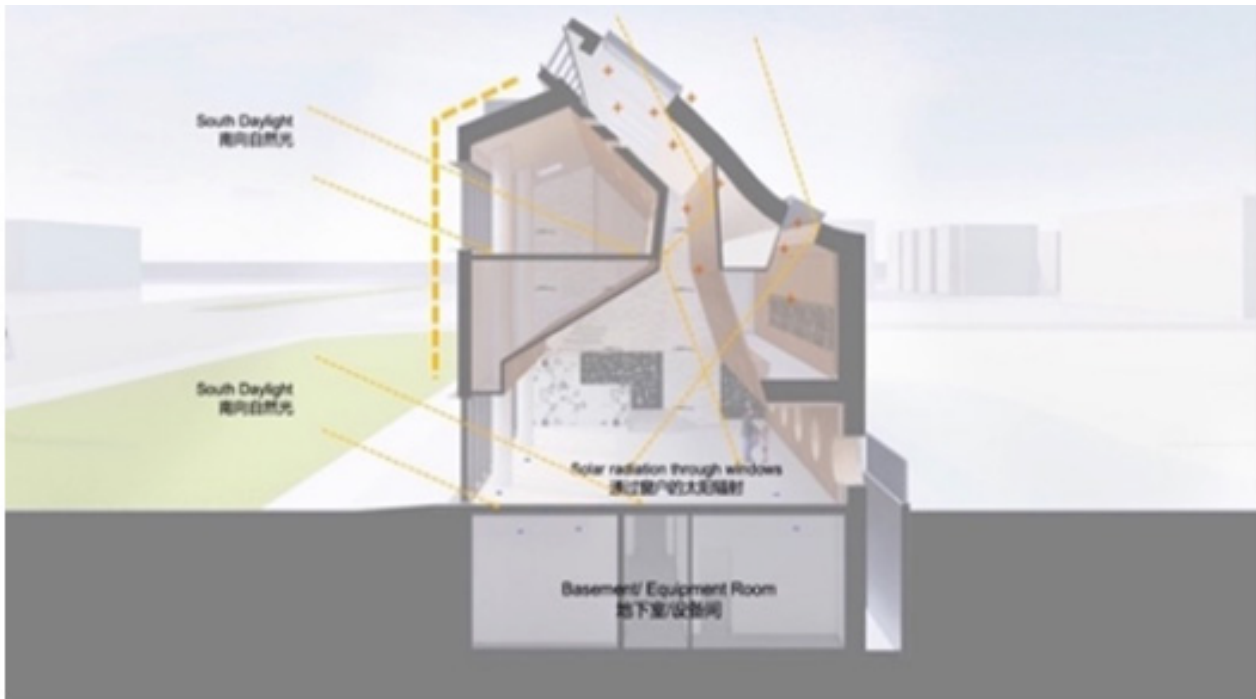
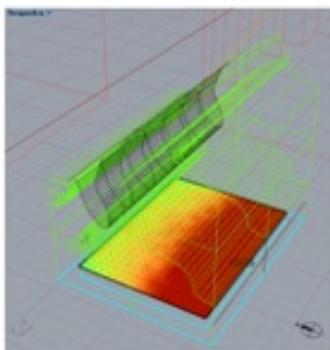


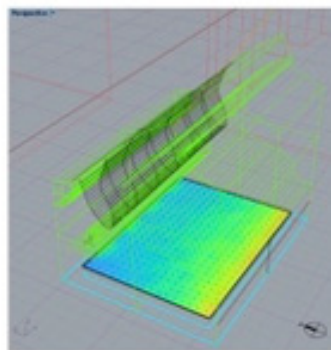
Figure 12. Simulation of air flow in different scenarios, Source: Project Presentation 17.11.2022 ©SUP Atelier



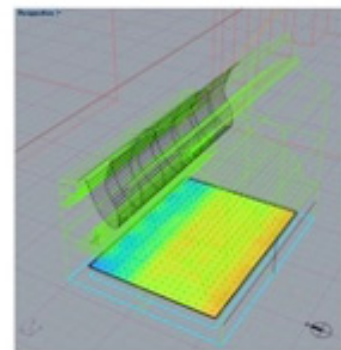
全年平均照度模拟



南北开窗
avg UDIa=54.4%
ASE1000,250=36.0%
avg lux = 4287 lux

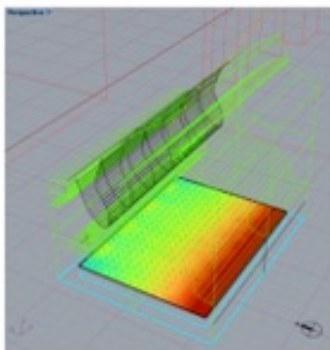


引入遮阳
avg UDIa=85.6%
ASE1000,250=0.0%
avg lux = 1024 lux

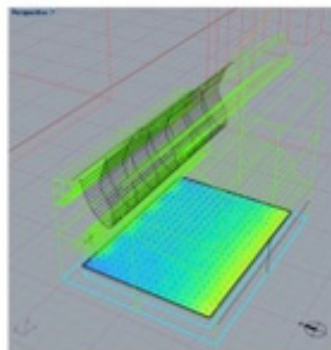


天窗辅助遮阳
avg UDIa=86.2%
ASE1000,250=0.0%
avg lux = 1505 lux

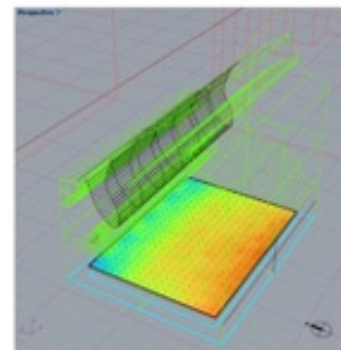
单日照度模拟（7月31日中午12点）



Mean = 1971
Median = 1718
SD = 710.9



Mean = 915
Median = 814
SD = 262.4



Mean = 1738
Median = 1835
SD = 327.8

Figure 13. Simulation of daylight in different situations, Source: Project Presentation 17.11.2022, ©SUP Atelier



Figure 14. Actual daylight in different areas, ©SUP Atelier

3.4. More Swiss inputs & suggestion

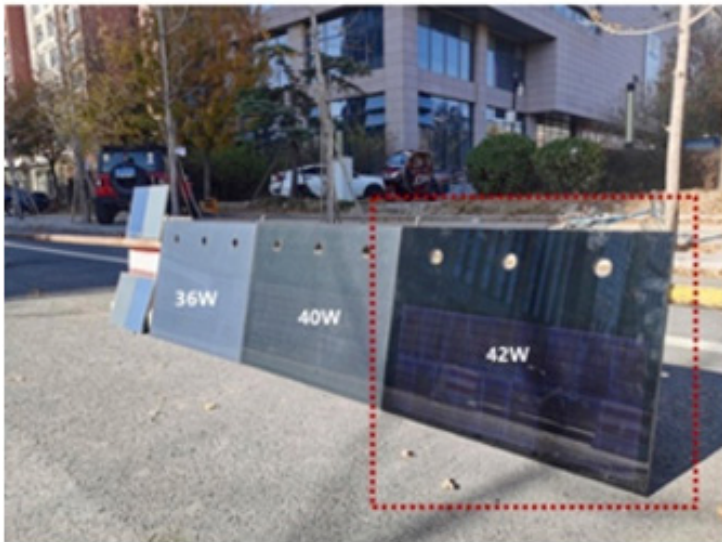
- High performance windows and doors with a better K-Value (glass and frame)
- Improvements in recycling waste building material in architectural design, drawing from experience and examples in Switzerland and Europe
- Abandon the idea of an earth tube.

3.5. Further improvement based on Sino-Swiss exchange

- BIPV (Building Integrated Photovoltaic) for the façade: The DP team cooperated closely with Chinese manufacturers to develop a suitable BIPV, not only for this building, but also for the future architecture in China and over the world. Several mock-up PV models were produced and tested in this crucial collaboration, considering the delicate balance between technical performance and aesthetic quality.
- Recycling building waste (water pipes) into a façade cladding element for the outdoor staircase.

- Using the community center for awareness raising on ZEB (input during kick-off charrette, implemented in the exhibition room on the ground floor)
- DC lighting to reduce loss on transferring DC to AC.
- A reliable system to monitor actual energy consumption and carbon emissions in the operation phase should be implemented, to optimize the operation in the future.
- The exhibition in the hall focuses on sustainability and low-carbon building materials, which can be visited easily by the public to raise the sensitivity of the public towards ZEB buildings and a low carbon lifestyle. The design team strongly recommended that the owner adopt a low-energy consumption exhibition method, and this opinion was adopted.
- The excess electricity generated by the PV system is not allowed to feed back into the city grid. Instead, it will be used to power the lighting of the underground parking area in the neighborhood and be stored in batteries.

Photovoltaic materials comparison



Parameters

Colour index	1262	555	1261
Power (W)	40	36	42
Peak voltage (V)	10.1	9.91	10.1
Peak current (A)	3.96	3.63	4.16
Open circuit voltage (V)	11.9	11.7	11.9
Short circuit current (A)	4.18	3.83	4.37

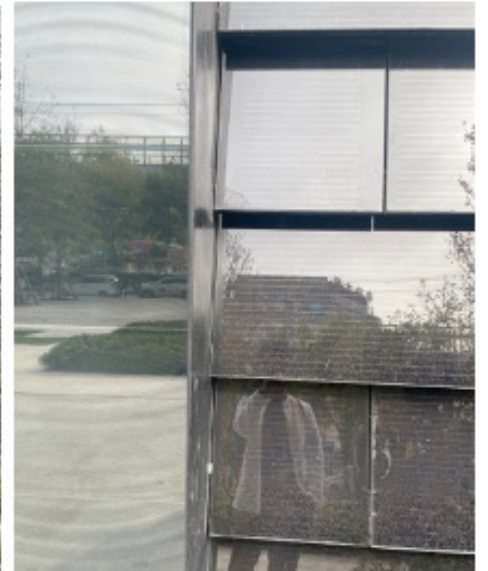


Figure 15. Mock-Up of BIPV and the built BIPV, Source: Project Presentation 17.11.022 and Site Visit 19.10.2023 ©SUP Atelier

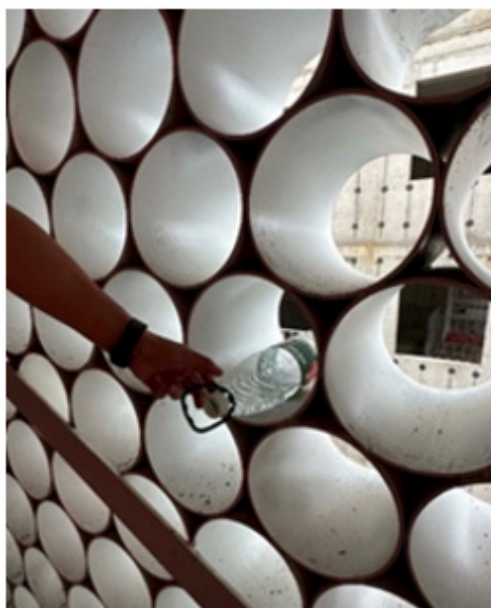


Figure 16. Photos of waste pipes for façade and waste bricks as table/chair, conceived by SUP Atelier and landscape planning team; Source: Site Visit 19.10.2023 ©SUP Atelier



3.6. Calculations

Initial Chinese calculations (Nov. 2022)

- Energy consumption total: 64.9 kWh/m²a
- PV Production: 59.0 kWh/m²a

Swiss calculations (Nov. 2022)

- Energy consumption total: 82.9 kWh/m²a
- PV Production: 84.8 kWh/m²a

Improved calculations

- Reference building: 93.1 kWh/m²a
- Before optimization: 64.9 kWh/m²a
- After optimization: 55.8 kWh/m²a (60% of baseline)
- Total energy demand: 46,752 kWh/a
- Yield of PV system: 63,000 kWh/a (incl. PV in landscape architectural elements such as: pavilion etc.)
- Carbon intensity indicator: 0 kg/m²a (operation)

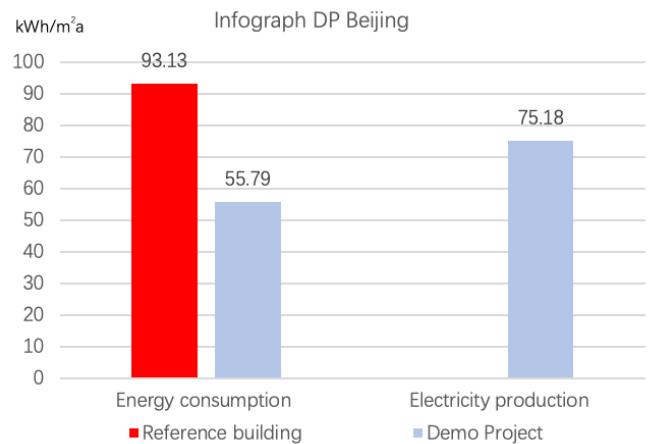


Figure 17. Energy balance DP Beijing. Source: Sino-Swiss ZEB Project

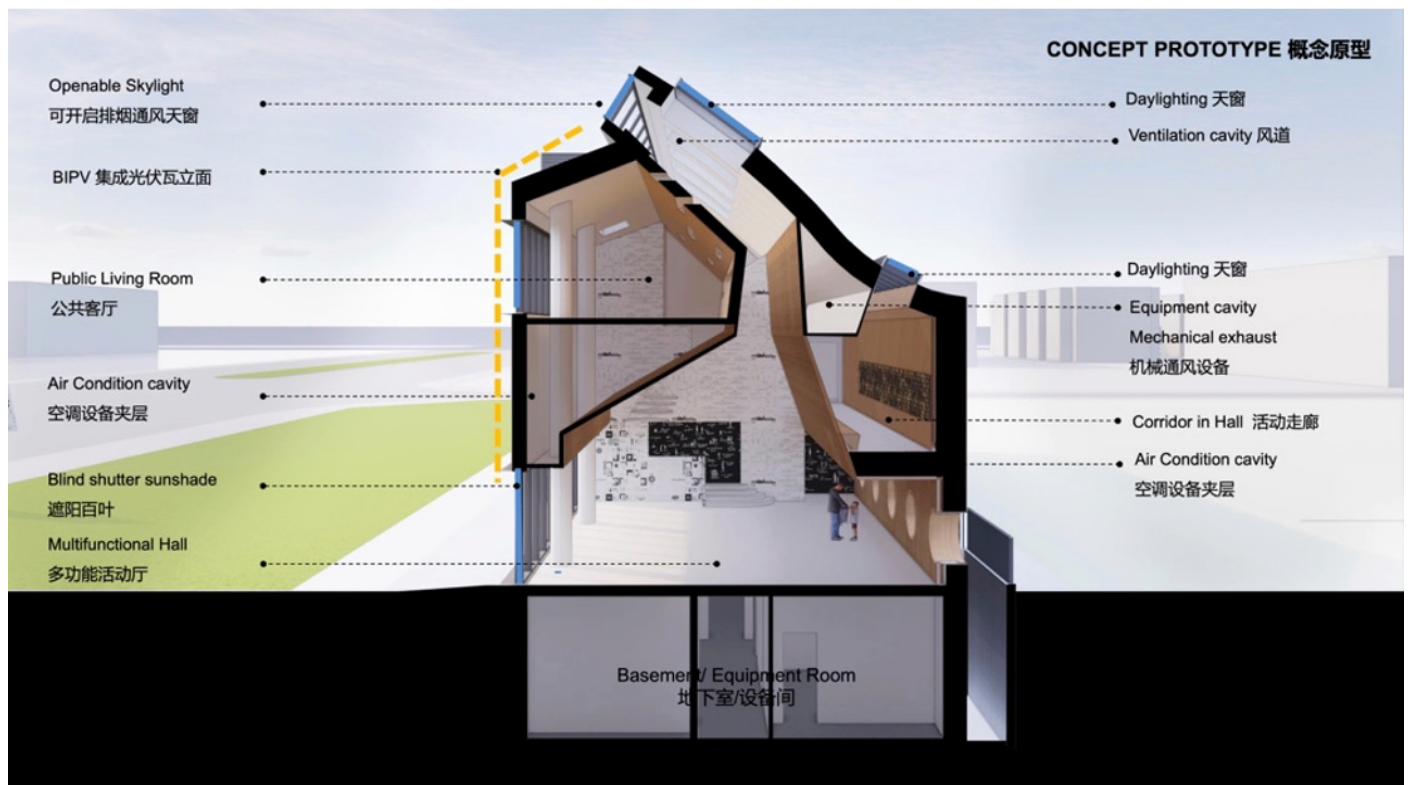


Figure 18. Energy concept schematic. SUP Atelier.

4. Outcomes

4.1. Inauguration ceremony on completion of construction

After more than two years of joint efforts by Sino-Swiss teams, the project was officially completed with its construction on September 27th 2023. A celebration ceremony was held on the same day, marking a milestone as the first completed project under the frame of Sino-Swiss ZEB Project.

Figure 17: an inauguration ceremony for celebration the completing of construction phase was held on 27th September 2023, Source: Zero Energy Building Academic Committee

The Swiss Ambassador of China – Juerg BURRI, the Head of International Cooperation of SDC – Nadia BENANI, the Deputy Director-General of the Planning, Finance and Foreign Affairs Department of the Ministry of Housing and Urban-Rural Development – Zhe LI, the Deputy District Mayor of Fangshan District – Tongwei ZHOU, the General Manager of the Technology and Planning Management Department of China Construction First Building (Group) Real Estate Development Company – Hao LI, and the Party Committee Secretary and Chairman of C-Land - Fei-jun FAN went to the project site to attend the inauguration ceremony.

Mr. Juerg Burri said in his speech that China's urban construction is developing rapidly, and the development of architectural design and green technology is particularly prominent. Switzerland has leading technology in the field of sustainable construction, and cooperation with China in the field of carbon emission reduction in the construction sector has extremely broad prospects. In order to implement the memorandum of understanding signed by the Swiss Federal Ministry of Foreign Affairs and the Chinese Ministry of Housing and Urban-Rural Development, experts from China and Switzerland worked together to successfully promote the completion of the first technical demonstration project, which is a significant step in the international cooperation between China and Switzerland regarding achievement of the zero-carbon goal. Mr. Burri hopes that China and Switzerland will continue to deepen cooperation in the fields of green buildings and zero-carbon buildings and produce more fruitful results.

Mr. Zhe LI said that the Ministry of Housing and Urban-Rural Development has set the goal of "peaking carbon emissions in urban and rural construction before 2030" and actively promotes the construction of green and low-carbon cities. The Sino-Swiss Zero Emission Building Project is one of the key tasks of the Ministry of Housing and Urban-Rural Develop-



Figure 19. Inauguration ceremony for celebration the completing of construction phase was held on 27th September 2023, Source: Zero Energy Building Academic Committee



Figure 20. The Sino-Swiss ZEB Project presents an artwork to the Beijing Demo Project, Source: Swiss Delegation

ment, and the project results are of great significance to the promotion of zero-carbon buildings in China. As the first zero-carbon demonstration building, it is a good start for the cooperation between the two countries. Mr. LI hopes to take the completion of this demonstration project as an opportunity to jointly create a model for Sino-Swiss urban sustainable development cooperation.

The completion of the Beijing demonstration project marks a significant milestone as the first completed technological demonstration project, representing a crucial step in Sino-Swiss international cooperation in the field of zero carbon buildings. The Swiss side will continue to strengthen communication and provide support to the Chinese side in the areas of green building and zero carbon construction. They aim to deepen their collaboration and jointly create a model for sustainable urban development cooperation between China and Switzerland. This partnership will contribute significantly to the promotion of zero carbon buildings in China.

In appreciation of the Beijing Demo Project team's hard work, cooperation and professional contributions to the global climate protection throughout the project, on April 29, 2024, the Sino-Swiss ZEB Project presented the Beijing Demo Project with an artwork crafted by the project's specially invited artist, Krata who was managed by director Ying XU and Katrin IMHOF of Satellite of Art. The artwork, made of wood, features the sky within its frame, resonating

with the elements of "circle" and "wood" as well as the skylight components in the Beijing Demo Project. The clouds in the picture serve not only as cloud patterns but also as traditional Chinese artistic symbols representing auspicious wishes. Placing such an artwork in a living space is particularly fitting. Moreover, the artwork showcases the integration of Eastern and Western thoughts and cultures with science and art, while also looking forward to a green future together between China and Switzerland.

4.2. Overall evaluation of the project

The Beijing project is the first DP that reaches ZEB under the frame of the Sino-Swiss ZEB China Project. According to the calculations and simulations in the planning phase, the carbon emission in the operational phase is less than zero. In addition, through recycling of material, the DP team even decreased emissions from embodied energy.

The project achieved a very positive result, which even surpasses the ZEB Standard requirements. The project can truly be considered as a lighthouse for cold regions in China and even the world (areas with solar radiation class II).

The building will achieve a carbon intensity indicator of about -85 tons of carbon emissions over a lifespan of 50 years.

4.3. Testimonials

From chief architect:

Prof. Dr. Yehao Song, SUP Atelier, Tsinghua University Architectural Design and Research Institute

The role of architecture in the future of sustainable building design will become increasingly important. Even for buildings aimed at achieving zero energy and zero carbon, the role of design can be highly significant when various technical principles are mastered proficiently.

From chief architect:

Ms Jingfen Sung, SUP Atelier, Tsinghua University Architectural Design and Research Institute

Thanks to the ZEB team for building bridges and organizing diverse exchanges across different fields, breaking down barriers between professions. We hope that one day, zero carbon will no longer be regarded as a special technology, but rather as a way of treating natural resources and interacting with society, integrated into our lifestyle and mindset.

From project energy consultant:

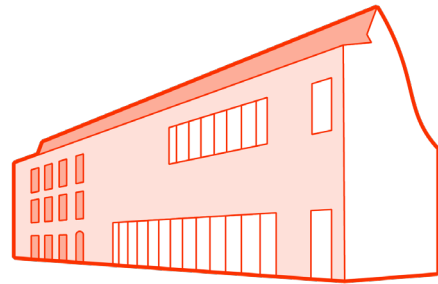
Dr. Jiaxin Yang, Institute of Building Environment and Energy, China Academy of Building Research

Throughout the project, we adhered to the design principle of “prioritizing the reduction of energy demand, then improving energy efficiency, while ensuring indoor comfort.” In small projects, every flaw’s impact is magnified. Achieving a small yet refined project that integrates numerous key low-carbon technologies is a significant challenge. The technical exchanges with the Swiss team during the process of overcoming difficulties were particularly impressive!

From Investor:

Mr. Pengfei Mao, C-Land Real Estate

Although this project is small in scale, it holds significant demonstrative value for our future low-carbon sustainable projects. Every stage, from the planning of future projects to design, to the construction process, and subsequent operations, requires comprehensive and coordinated consideration.



Gongchen Community Center

Fangshan District, Beijing

Multifunction community center, 1200 m²

- BIPV and rooftop PV
- Reused local materials
- High performance envelope
- Flexible space planning
- Energy-efficient air heat pump and heat recovery systems

4.4. Confirmation of ZEB demo project

It is confirmed that the project reached the ZEB goal as required in ZEB standards, especially in the operational phase.

It is confirmed that the project considered carbon emissions throughout the building life cycle to reduce embodied emissions as much as possible.



5. Lessons Learned

5.1. Management and organization

The short design phase in China is very challenging for the Swiss expert team. Effective and continuous communication with the DP team is crucial for the development of the project. The Swiss team was required to respond promptly to the DP team's enquiries and provide quick inputs to ensure swift integration of ideas into the project within the limited timeframe.

Concrete factors and numbers are more persuasive than words or theory. For instance, through the utilization of a calculation tool developed by a Swiss expert, the Swiss team communicated with the DP team in a very constructive way. The project effort is a common achievement of Sino-Swiss joint team.

5.2. Technical solutions

Building Integrated Photovoltaics (BIPV) is a developing technology and very suitable for ZEB in the future. The Beijing demo project collaborated with a local PV producer and developed a BIPV solution with high technical quality and aesthetics. This product should be widely spread in China and all over the world.

Due to the layout of this project and China's strict regulations on fire protection in wooden buildings, wooden structural elements could not be used in this project. Timber structures are currently very difficult to implement in China due to inherent contradictions in the regulations of various localities and building functions.

5.3. Communication & Cooperation

The following formats and means of communication were actively used in the project procedure:

Charrettes incl. technical response by the Swiss team

- Kick-off charrette
- Update charrette
- Offline workshop and onsite visit
- Kick-off meeting on building automation and smart control

Joint charrettes with DPs from first batch

- ZEB Duty Book
- Circular construction
- Fire safety of timber structures
- Facility management and ZEB operation
- Zero Emission District
- Computational fluid dynamics (CFD) Simulation
- Green PV
- Swiss technologies and products

Rapid technical input sheets (RITS) about:

- BIPV solutions incl. façade PV and photovoltaic tiles, local product manufacturer recommendations
- KBOB – Swiss Coordination Conference of Building and Property Bodies of Public Sector Developers
- Low carbon cement LC3
- High performance windows and doors
- Facility management
- Shading systems and products
- Greenery and PV

Q&A sheet and further thematic inputs on:

- ISO norm and SIA2040
- U-value / visible light transmission (VLT)
- Heat recovery / air handling unit / AC
- Earth tubes for ventilation system

Further performances:

- ZEB Duty Book developed, shared and presented
- Regular exchanges and discussions per WeChat, telephone and email
- Site visit and technical exchange on construction site
- Public and internal ZEB Talks on various ZEB topics
- Booklet regarding ZEB policies, regulations, standards, concepts and techniques
- Exchanges and discussion on events like National NEZB Conferences and the Sino-Swiss Industry University Research Collaboration Forum on Zero Emission

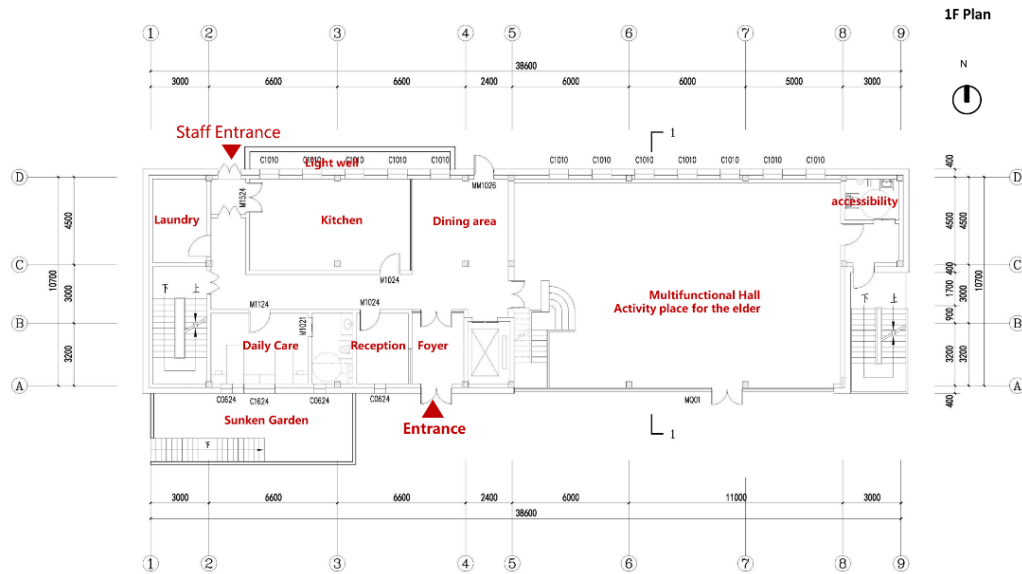


Figure 21. Ground floor plan. SUP Atelier.

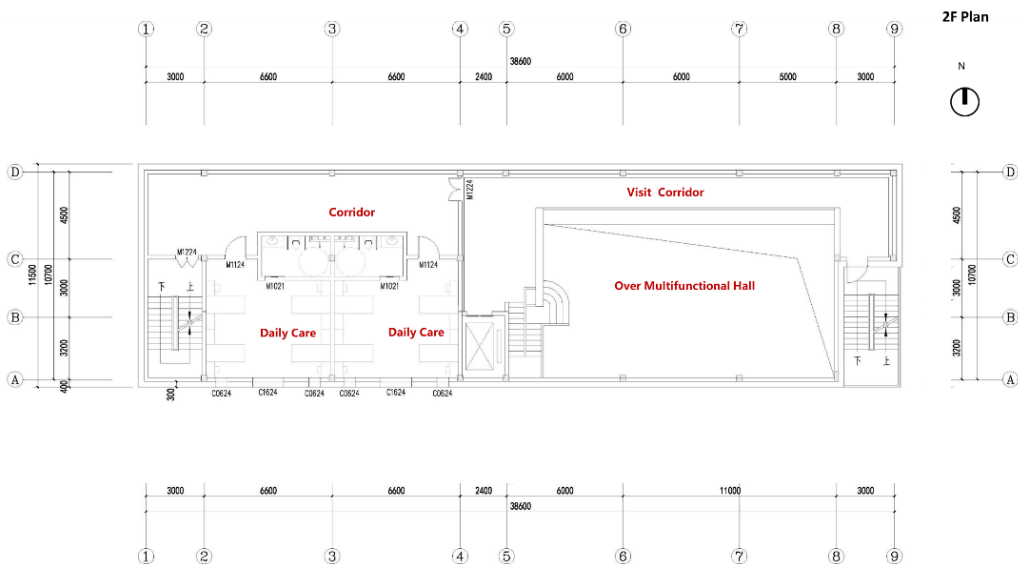


Figure 22. First floor plan. SUP Atelier.

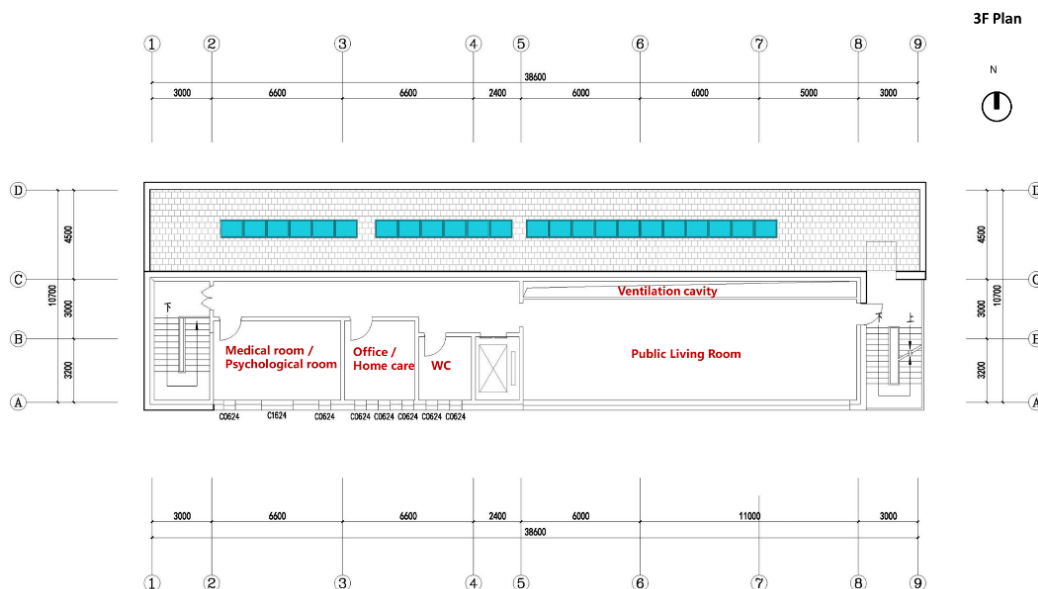


Figure 23. Second floor plan. SUP Atelier.



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