Project Documentation
Gebäude-Dokumentation

Abstract | Zusammenfassung

Xinyang Shangtianti New Material (Carbon Neutral) Industrial Park nearly zero energy consumption multi-functional residential model room project

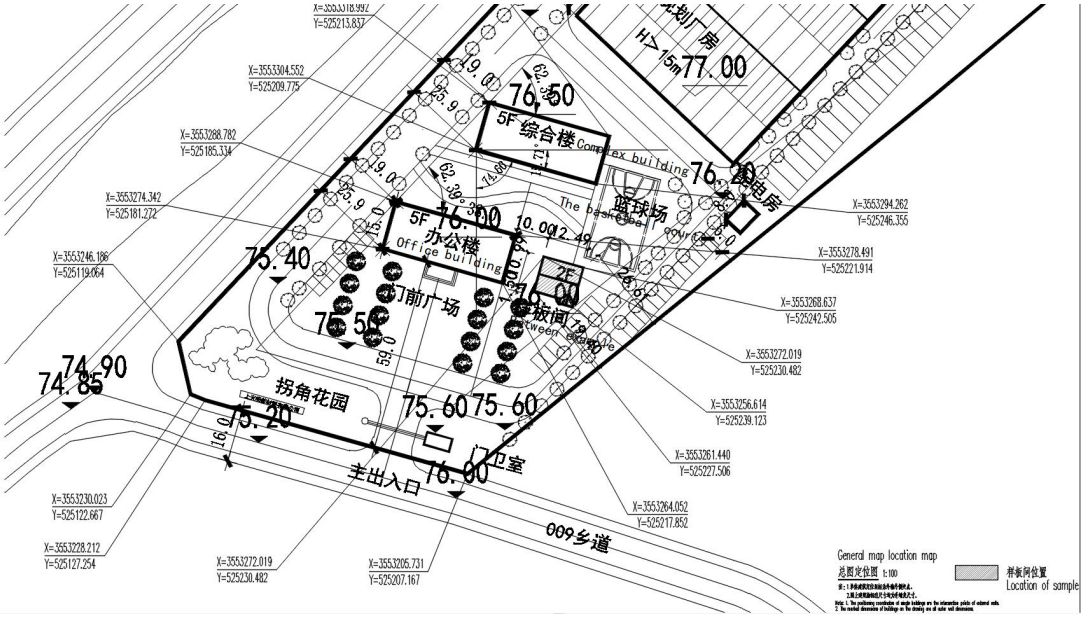
Data of building | Gebäudedaten

Year of construction Baujahr	2021	**Space heating** **Heizwärmebedarf**	**14** **kWh/(m²a)**
U-value external wall U-Wert Außenwand	0,144 W/(m²K)		
U-value basement U-Wert Kellerdecke	0,162 W/(m²K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	54.98 kWh/(m²a)
U-value roof U-Wert Dach	0,121 W/(m²K)	Generation of renewable Energy Erzeugung erneuerb. Energie	56.15 kWh/(m²a)
U-value window U-Wert Fenster	0,95 W/(m²K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	93.92 kWh/(m²a)
Heat recovery Wärmerückgewinnung	78 %	Pressurization test n_{50} Drucktest n_{50}	0,46 h^{-1}
Special features Besonderheiten	As the first near-zero energy consumption residential building project in Xinyang area, the near-zero energy consumption multi-functional residential model room project of Xinyang Shangtianti New Material (Carbon Neutral) Industrial Park will help the large-scale landing and promotion of zero-energy, near-zero energy consumption and ultra-low energy consumption residential buildings in the Shangtianti management area.		

Brief Description

Passive House Darmstadt Kranichstein

Xinyang Shangtian ladder new material (carbon neutral) industrial park near-zero energy consumption multi-functional residential model room project is located in Xinyang City, Henan Province, the district of Shangtian ladder management area, for the new residential building. The project is located next to the office building of the park, and only one model room will be used as a test and demonstration of near-zero energy residential buildings.
The project has a construction area of 293.85 m² above ground, a building height of 8.05 m, and a building with 2 floors, and the building functions include living room, dining room, kitchen, bedroom, toilet, storage room, chess and card room, etc., and three-bay room types to meet the needs of self-occupied and homestay.
The project is a residential building, the façade adopts the "new Chinese" design concept, through the external wall and window cover, the outer wall and the line foot of the concave and convex layers, coupled with the double slope roof, so that the architectural shape is subtle and rich.



© Fivewin Architectural Tecnology Group General Layout

Project construction objectives
(1) According to the requirements of the relevant national technical standards for near-zero energy consumption residential buildings, through performance design, on the basis of reasonable control of incremental costs, a comfortable and healthy indoor air environment is realized, while greatly reducing the power consumption of operation.
(2) Create a demonstration project with high standards of science and technology and residential facilities, lead the demonstration of building energy conservation in Xinyang City, and promote the realization of the goal of clean heating demonstration cities in the northern region in hot summer and cold winter.
(3) Through scientific and technological innovation, help Xinyang Shangtianti New Material Technology Co., Ltd. establish a social image of "science and technology, green and humanities" and enhance the influence of enterprises.

Responsible project participants
Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Fivewin Architectural Tecnology Group：Yun Qinghua,Yang Cheng
Implementation planning Ausführungsplanung	-
Building systems Haustechnik	Fivewin Architectural Tecnology Group：Ye Xiaobei,Yu Muyang,Liu Yutian
Structural engineering Baustatik	-
Building physics Bauphysik	Fivewin Architectural Tecnology Group：Zhang Jing,Lin Miaomiao,Li Yingying
Passive House project planning Passivhaus-Projektierung	Fivewin Architectural Tecnology Group：Zhang Jing,Lin Miaomiao,Li Yingying
Construction management Bauleitung	-

Certifying body
Zertifizierungsstelle

Passivhaus Institut Darmstadt
www.passiv.de

Certification ID
Zertifizierungs ID

6971	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivhausprojekte.de)

Author of project documentation
Verfasser der Gebäude-Dokumentation

Passivhaus Institut Darmstadt
www.passiv.de

Date Datum	Signature Unterschrift
03.10.2022	Jing Zhang

1.1. Exterior Photos

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1.2. Typical Interior Photos

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1.3. Building Envelope

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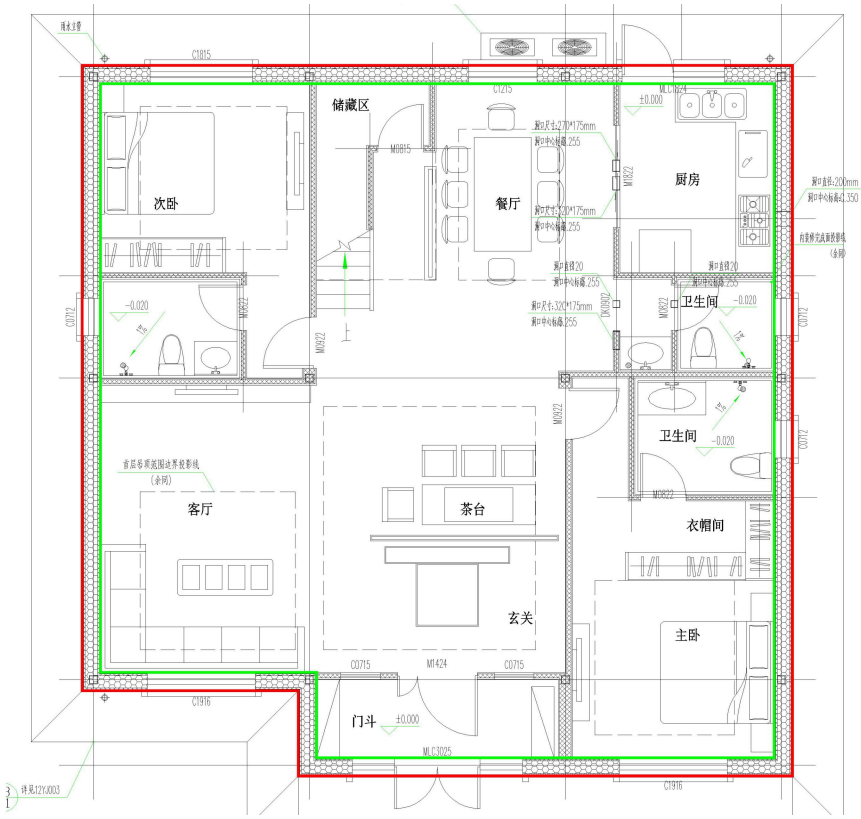

Firsr layer insulation and airtight line

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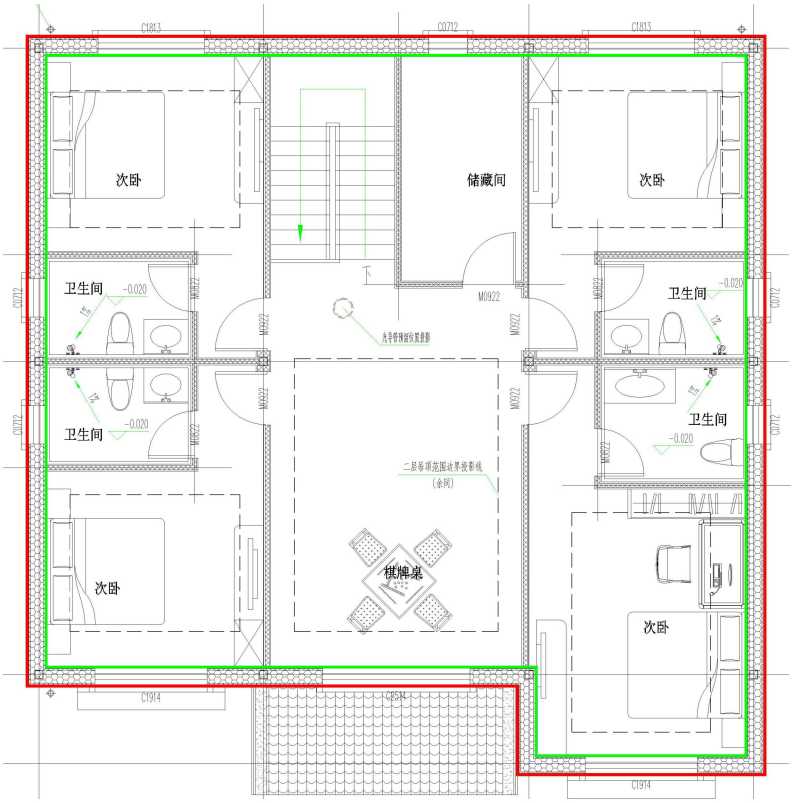

Second layer insulation and airtight line

1.3. Building Envelope

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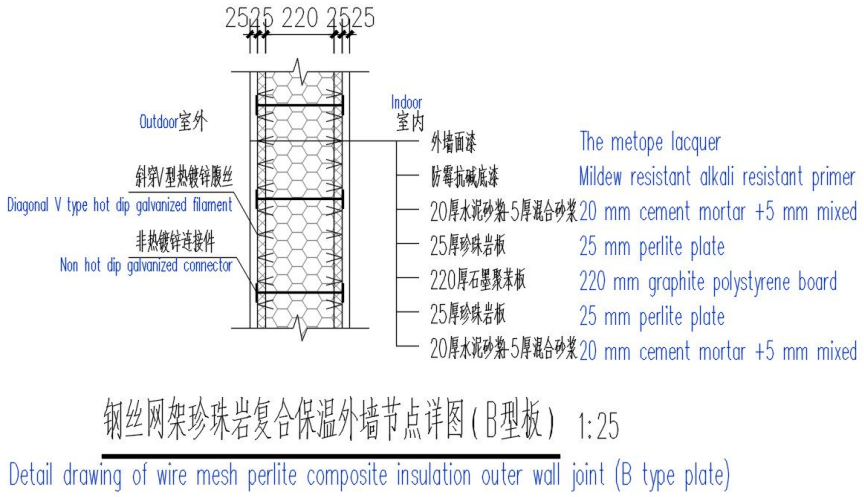

Schematic Diagram of Exterior Wall Thermal Insulation Structure

(1) Exterior wall

The outer wall of the near zero energy consumption multi-function residential model room project in Xinyang New Materials (Carbon Neutralization) Industrial Park is made of 220 thick graphite polystyrene board (steel wire grid perlite composite insulation board), and the average heat transfer coefficient of the outer wall is 0.144 W/(m² • K)

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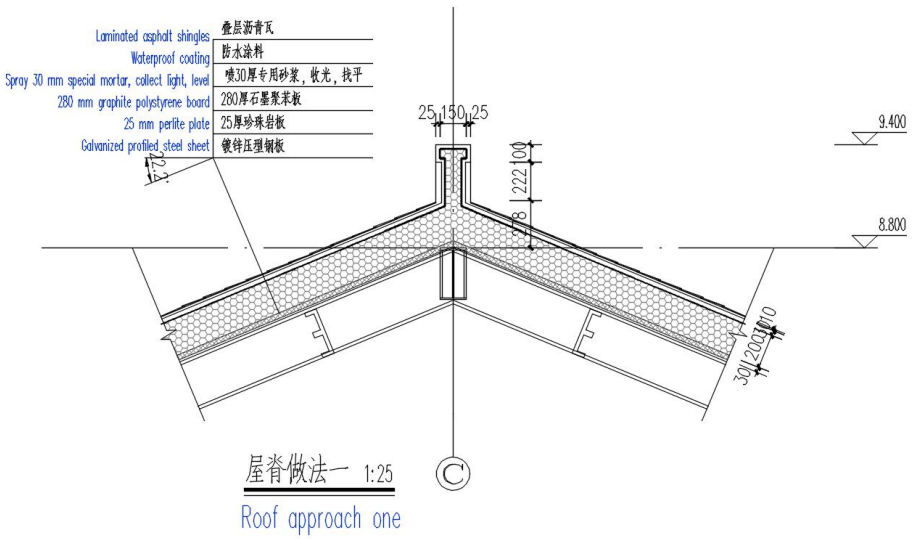

Schematic Diagram of Roof Insulation Structure

(2) Roofing

280 thick graphite polystyrene board (steel wire grid perlite composite insulation roof panel) is used for the roof, and the average heat transfer coefficient of the roof is 0.121 W/(m² • K).

1.3. Building Envelope

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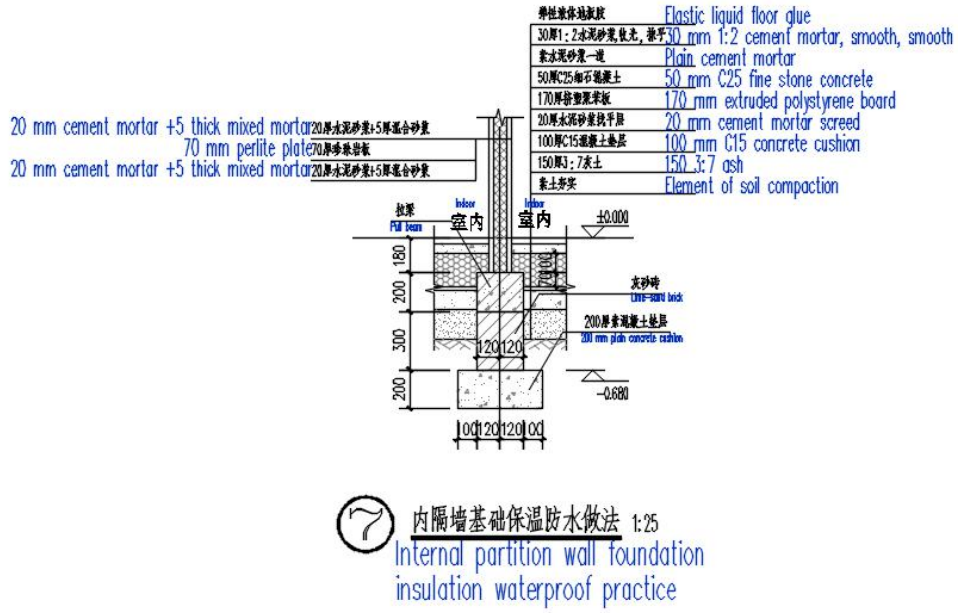

Schematic Diagram of Ground Insulation Structure

(3) Ground

The ground is insulated with at least 150mm extruded polystyrene board, and the average heat transfer coefficient of the ground is 0.162W/(㎡• K)

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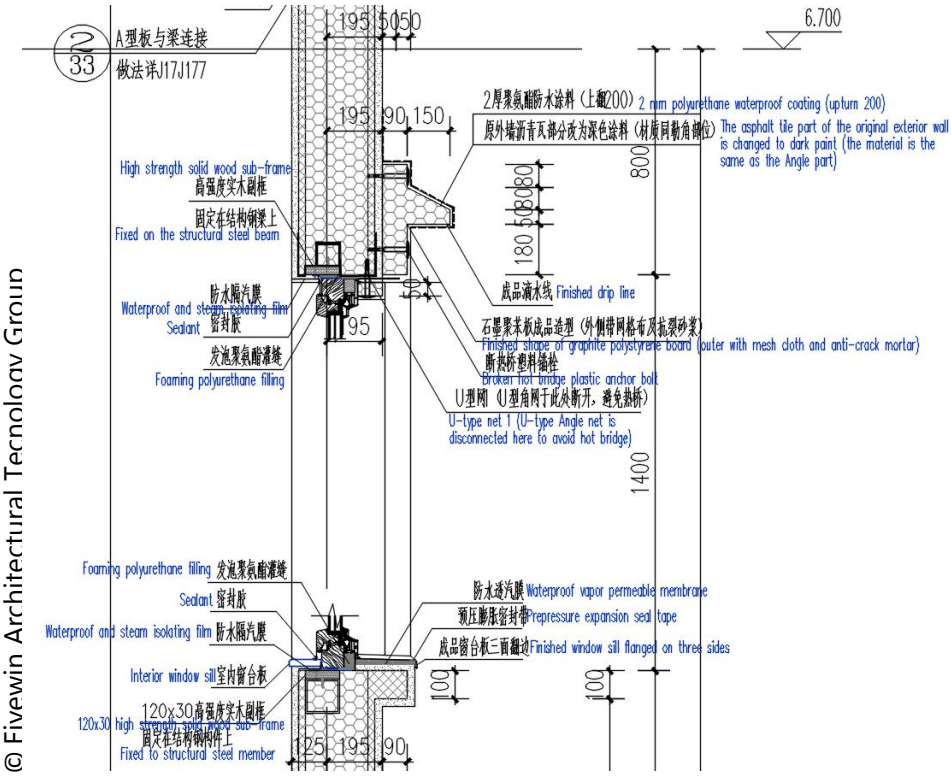

Schematic Diagram of Outer Window Insulation Structure

(4) External doors and windows

The external doors and windows are constructed with three glasses and two cavities, double Low-e, the hollow layer is filled with inert gas, and the heat transfer coefficient of the window is 1.0W/(m ²· K) (including the installation of thermal bridge), the heat transfer coefficient of the outer door is 1.1 W/(m ²· K) (including the installation of thermal bridge), the solar heat gain coefficient (SHGC) is 0.32. The opening part shall be equipped with screen window, and the external window sash must be equipped with anti falling device. The glass gap adopts warm edge spacer strip, and the installation depth of glass in the window frame is 25~30mm.

2.1 Air tightness treatment

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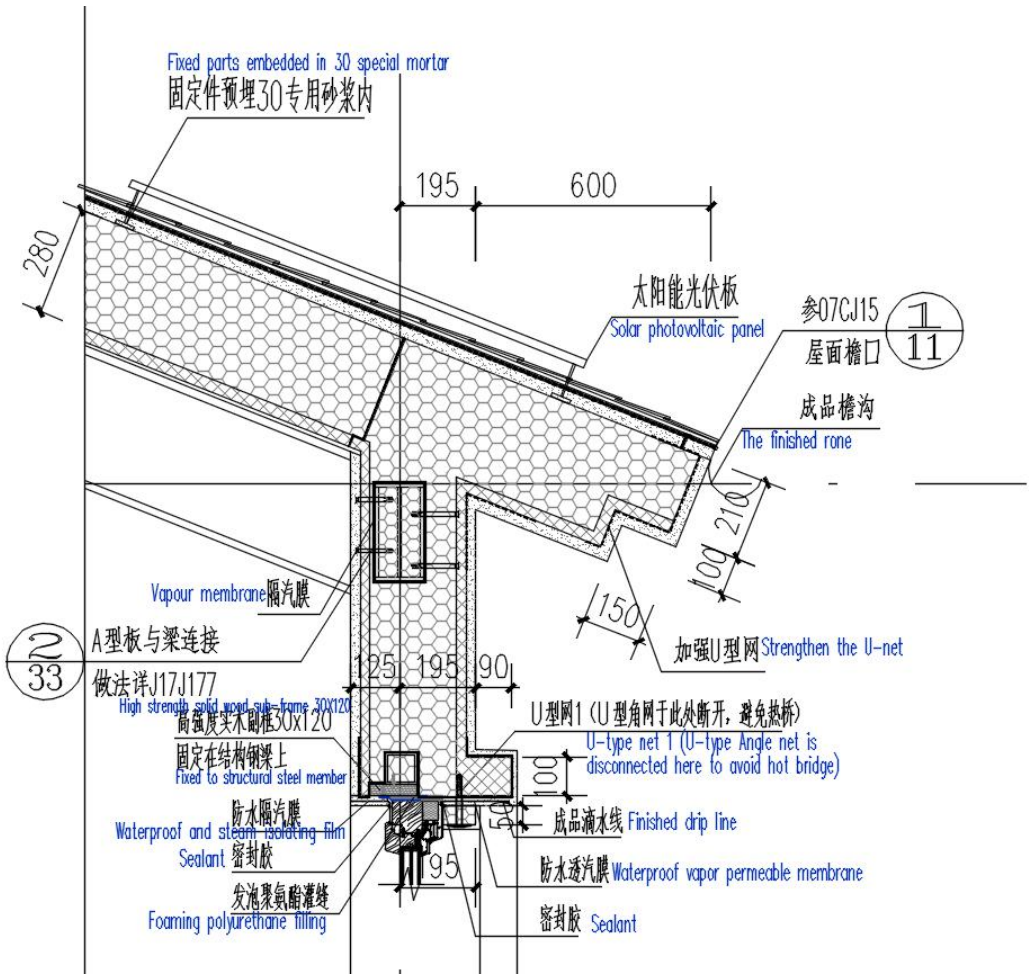

Schematic Diagram of Air Tightness Structure of Eaves and External Windows

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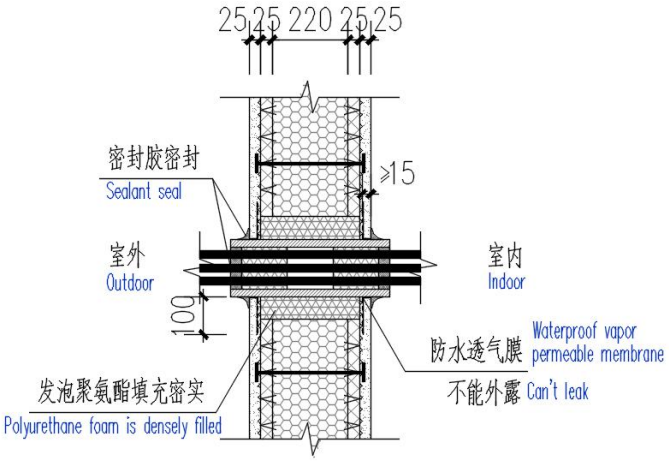

Schematic Diagram of Air Tightness Structure of Condensate Pipe Passing through Exterior Wal

For the fabricated steel structure system of this project, the sealing and waterproof method is material waterproof, and waterproof vapor barrier membrane and waterproof vapor permeable membrane are used.

The assembly rate of this project reaches 80%, reaching a high assembly rate. Waterproof vapor barrier film and waterproof breathable film are used on the inside and outside of the window, the inside and outside of the joint of perlite composite insulation board and steel structure, the inside and outside of the pipe opening through the wallboard, and the inside and outside of the pipe opening through the roof as important measures and effective ways for waterproof of prefabricated buildings.

2.1 Air tightness treatment

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Assembled construction process of steel structure and exterior wall roof

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Construction of waterproof membrane and breathable membrane for external windows

2.2 Design without thermal bridge

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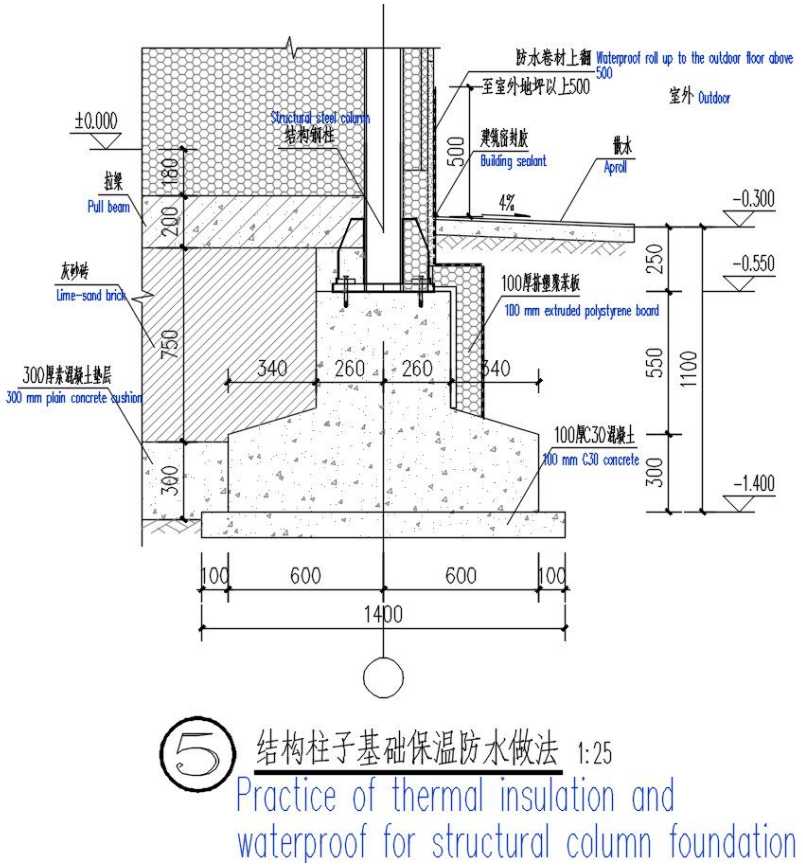

Schematic Diagram of Thermal Insulation and Waterproof Nodes of Structural Column Foundation

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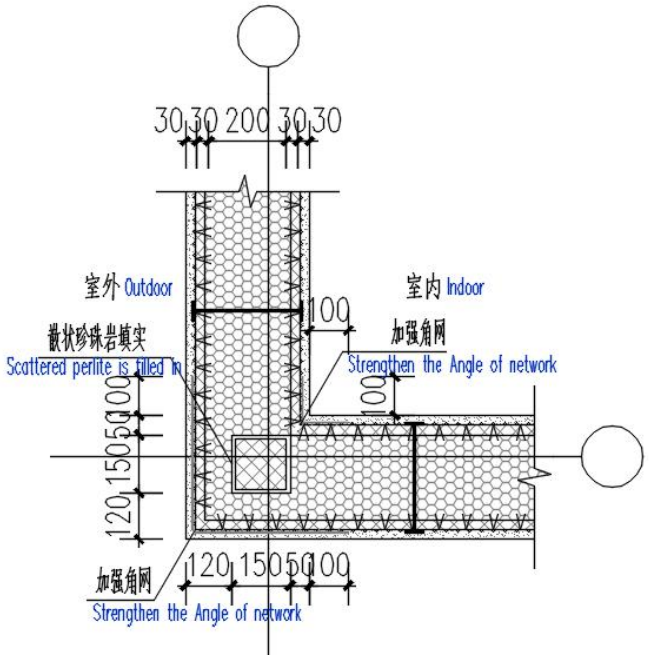

Schematic Diagram of External Corner Node of External Wall

Thermal bridges have a great impact on building energy consumption. In addition, the appearance of thermal bridges will cause the indoor surface temperature to be too low, which will lead to dew and mildew on the indoor walls and damage the building comfort. The project is located in the north of the hot summer and cold winter climate zone, so it is necessary to consider the design without thermal bridge as much as possible.

2.2 Design without thermal bridge

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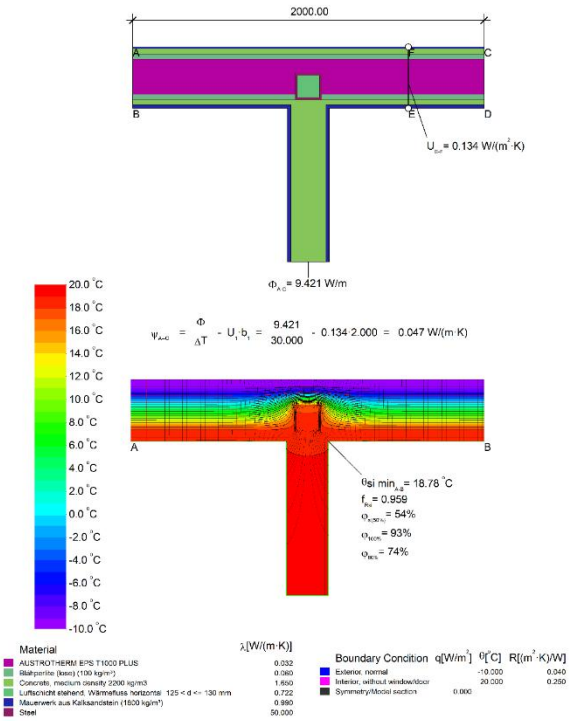

Calculation of thermal bridge at the junction of external wall and square steel

The project adopts a steel structure frame composed of square steel and I-beam steel, and the heat transfer coefficient of metal components is relatively large. In order to prevent condensation and condensation, the boundary conditions for thermal bridge calculation and verification of the risk of mildew and condensation on the inner surface are set separately, especially for the latter, according to the logic of flixo thermal bridge calculation software, considering its most unfavorable situation with reference to DIN 4108-2 standard, and the modeling material parameters and boundary conditions set are supplemented, Specific calculation results, such as thermal bridge value, minimum temperature and position of inner surface, are as follows：

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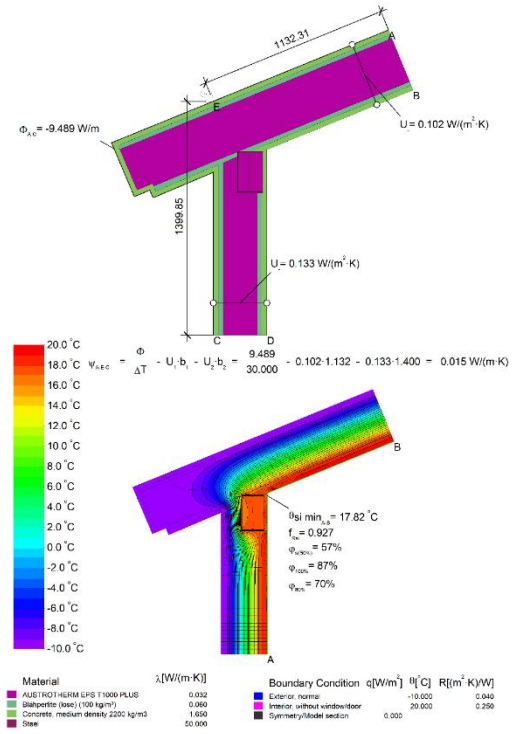

Calculation of thermal bridge at the joint of eaves and I-beam

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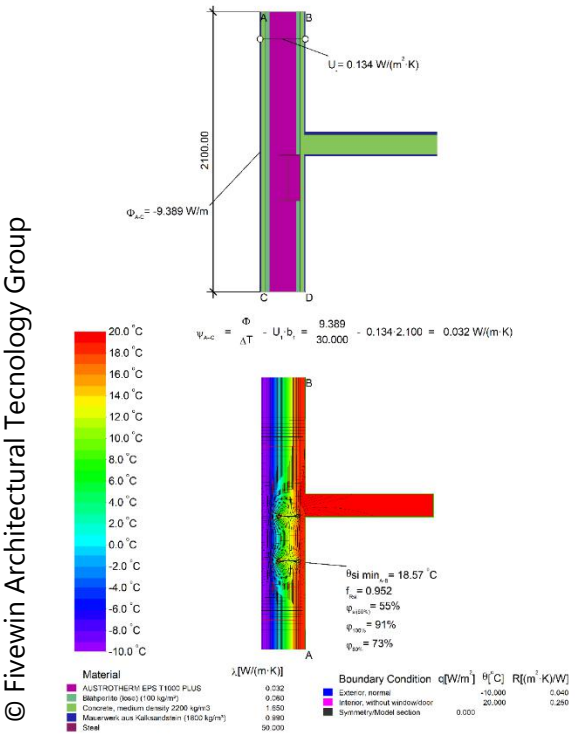

Calculation of thermal bridge at the junction of floor slab and I-beam

3 Fresh air conditioning system

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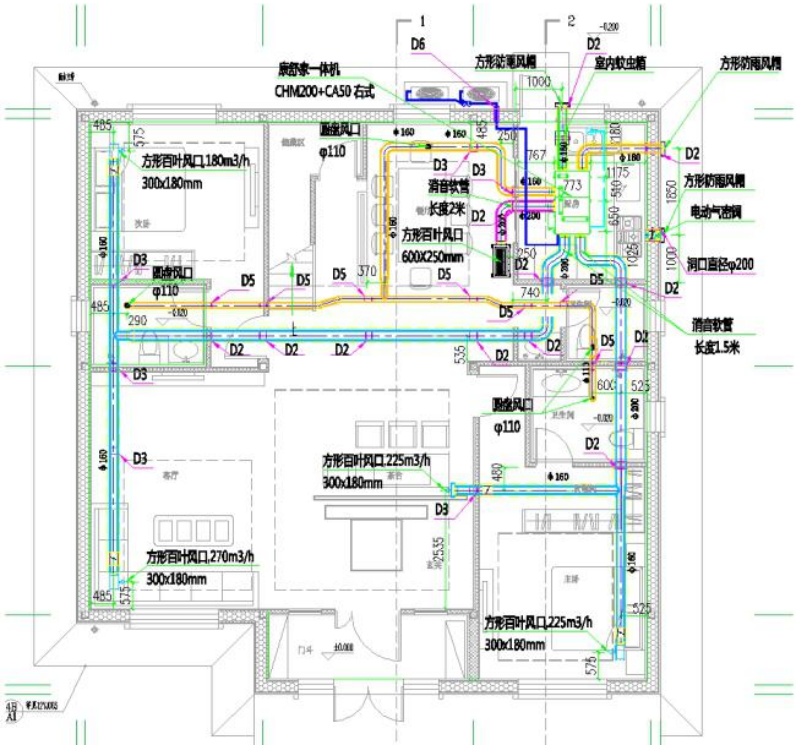

First floor fresh air all-in-one machine plan

Basic scheme: all-in-one fresh air conditioner

The all-in-one environmental control machine for fresh air conditioner integrates the functions of total heat recovery fresh air, refrigeration, heating, dehumidification and purification, and can automatically adjust the opening of fresh air valve, circulating air valve, exhaust valve and the operating frequency of EC blower, EC exhaust fan and compressor according to indoor air parameters (such as temperature, humidity, CO2 concentration, PM2.5 concentration, etc.), so as to achieve a high and comfortable indoor air quality environment

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Fresh air all-in-one machine

4 Domestic hot water system& Renewable energy utilization

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Flat plate solar water collector

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Picture of installation of flat panel solar water collector and solar photovoltaic panel

Considering the water consumption and energy conservation and practicality, the solar energy+electric auxiliary hot water system is adopted for domestic hot water.
The flat water collector is adopted, and the water storage tank is placed indoors, which makes the building appearance more neat and beautiful.
According to the data provided in the design specification, the annual radiation in Xinyang area is 4818MJ/m ²; The designed PV installed power is 4.5KWp, and the module installation area is about 20 ㎡. Estimated annual power generation is 2825.3 KWh

5 Construction process

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Assembled construction process of steel structure and exterior wall roof

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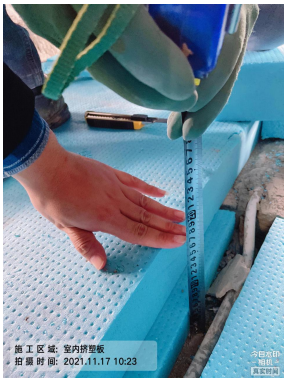
Fresh air duct on the first floor



Insulation thickness of exterior wall, roof and ground

6 PHPP-Results Building

Passive House Verification

Building:	Xinyang Shangtianti New Material (Carbon Neutral) Indus		
Street:	Shangtianti New Materials (carbon neutral) Industrial Par		
Postcode/City:	464100	Xinyang	
Province/Country:	Henan		CN-China
Building type:	Residential Building		
Climate data set:	ud---01-CN0045(a)-Xinyang		
Climate zone:	4: Warm-temperate	Altitude of location:	76 m
Home owner / Client:	Xinyang Shangtianti New Material Technology Co., Ltd.		
Street:	4F, Administrative Service Center Shangtianti Administra		
Postcode/City:	464000	Xinyang	
Province/Country:	Henan		CN-China

Architecture:	Fivewin Architectural Tecnology Group：Yun Qinghua,Yang Cheng		
Street:	No. 299 Jinshui Road		
Postcode/City:	450003	Zhengzhou	
Province/Country:	Henan		CN-China
Energy consultancy:	Fivewin Architectural Tecnology Group：Zhang Jing,Lin Miaomiao,Li Yingying		
Street:	No. 299 Jinshui Road		
Postcode/City:	450003	Zhengzhou	
Province/Country:	Henan		CN-China

Mechanical engineer:	Fivewin Architectural Tecnology Group：Ye Xiaobei,Yu Muyang,Liu Yutian		
Street:	No. 299 Jinshui Road		
Postcode/City:	450003	Zhengzhou	
Province/Country:	Henan		CN-China
Certification:	Passive House Institute		
Street:	Rheinstraße 44/46		
Postcode/City:	64283	Darmstadt	
Province/Country:	Hessen		DE-Germany

Year of construction:	2021	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	2.3	IHG cooling case [W/m²]:	2.31
No. of occupants:	3.1	Specific capacity [Wh/K per m² TFA]:	132	Mechanical cooling:	x

Specific building characteristics with reference to the treated floor area

				Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area m²	243.0				
Space heating	Heating demand kWh/(m²a)	12.31	≤	15	-	yes
	Heating load W/m²	10.33	≤	-	10	
Space cooling	Cooling & dehum. demand kWh/(m²a)	19.46	≤	21	21	yes
	Cooling load W/m²	10.44	≤	-	10	
	Frequency of overheating (> 25 °C) %	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg) %	0.00	≤	10		yes
Airtightness	Pressurization test result n_{50} 1/h	0.46	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	93.92	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	54.98	≤	60	60	yes
	Generation of renewable energy (in relation to projected building footprint area) kWh/(m²a)	56.15	≥	-	-	

[2] Emptyfield: Data missing; '-': No requirement

I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification.

Passive House Classic? yes

Task:	First name:	Surname:	Signature:
2-Certifier	Georgios	Pediotakis	
	Certificate ID	Issued on: City:	
		Darmstadt, Germany	