

# Project Documentation

## Abstract



**Cuicheng D 23#**

### Data of building

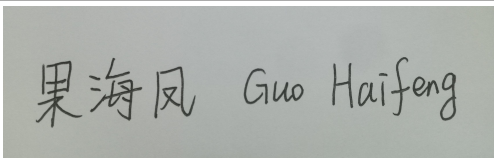
Year of construction	2017	<b>Space heating</b>	15 kWh/(m2a)
U-value external wall	0.141 W/ ( m2 • k )		
U-value basement	0.103 W/ ( m2 • k )	Primary Energy Renewable(PER)	
U-value roof	0.122 W/ ( m2 • k )	Generation of renewable Energy	
U-value window	0.8 W/ ( m2 • k )	Non-Renewable Primary Energy (PE)	114 kWh/(m2a)

Heat recovery	75% W/ ( m <sup>2</sup> • k )	Pressurization test n <sub>50</sub>	0.2h <sup>-1</sup>
Special features	The first certified project by German PHI in Beijing		

### Responsible project participants

<b>Architektur</b>	北京市住宅建筑设计研究院有限公司 Beijing Institute of Residential Building Design and Research Co. LTD
<b>Implementation planning</b>	北京市住宅建筑设计研究院有限公司 Beijing Institute of Residential Building Design and Research Co. LTD
<b>Energieberatung</b>	北京住总集团有限责任公司技术开发中心 Technological Development Center, Beijing Uni-Construction Group Co., Ltd. (BUCC)
<b>Certifying body</b> <b>Zertifizierung</b>	德国被动房研究所 Passive House Institute www.passiv.de
<b>Certificationg ID</b>	
<b>5171</b>	Project-ID <a href="https://passivehouse-database.org/index.php?lang=en#d_5171">https://passivehouse-database.org/index.php?lang=en#d_5171</a>

### Author of project documentation

Date	Signature
24,4,2017	

## 1 Abstract of building project

---

### Brief Description

The function of the building is a disabled rehabilitation center. The building has a construction space of 2519 square meters with 3 stories above the ground and 1 story underground. The U-value of exterior is 0.14 by using 300 mm thick rock wool.

Building type

health care buildings

Location CN - 10002 Beijing (Beijing)

Number of apartments / units :1

Treated Floor Area according to PHPP 1730 m<sup>2</sup>

Construction type masonry construction

Year of construction 2015

As the first passive house building in Beijing, Cuicheng D 23# is of great significance. We can learn from less experience, so before the start of the project, our team conducted detailed research and argumentation, and We take full communication with German passive house experts.

Because the experience can be used for reference is less, the construction technology is different from the ordinary building, the project team must pay attention to the design and construction quality of each detail node at any time, the construction of rock wool insulation, the installation of passive room windows, the drilling of ground source heat pump under the building, etc., each link needs our team to rely on its own professional accomplishment, and continue to push forward in groping.

## 2 Elevation view of the building (photo)



East



East



East



East



West



North



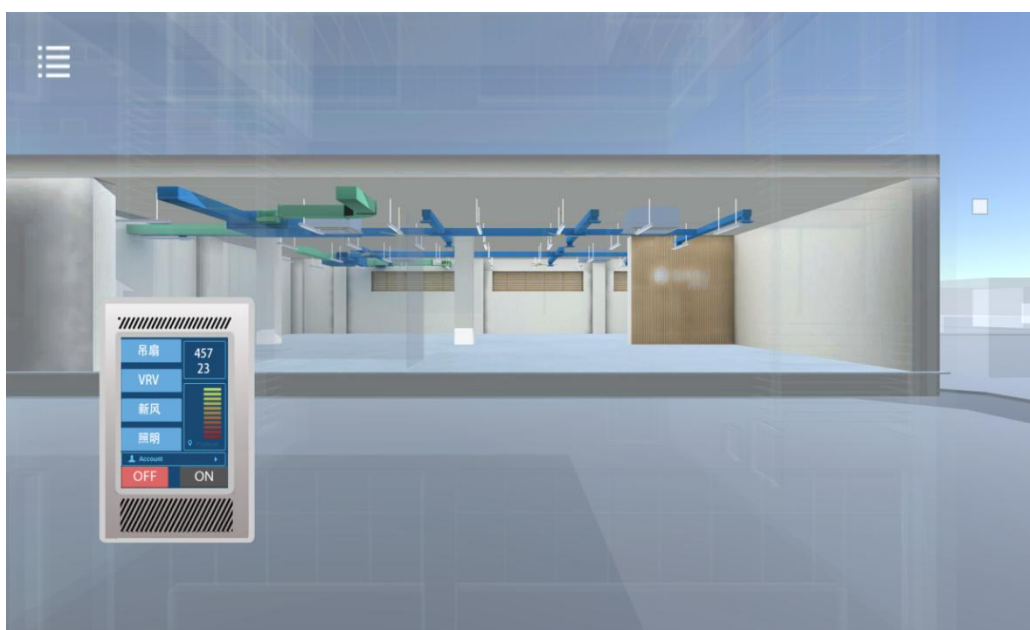
South



South



### 3 Exemplary photo from the inside of the building







#### 4 Sectional view of the building



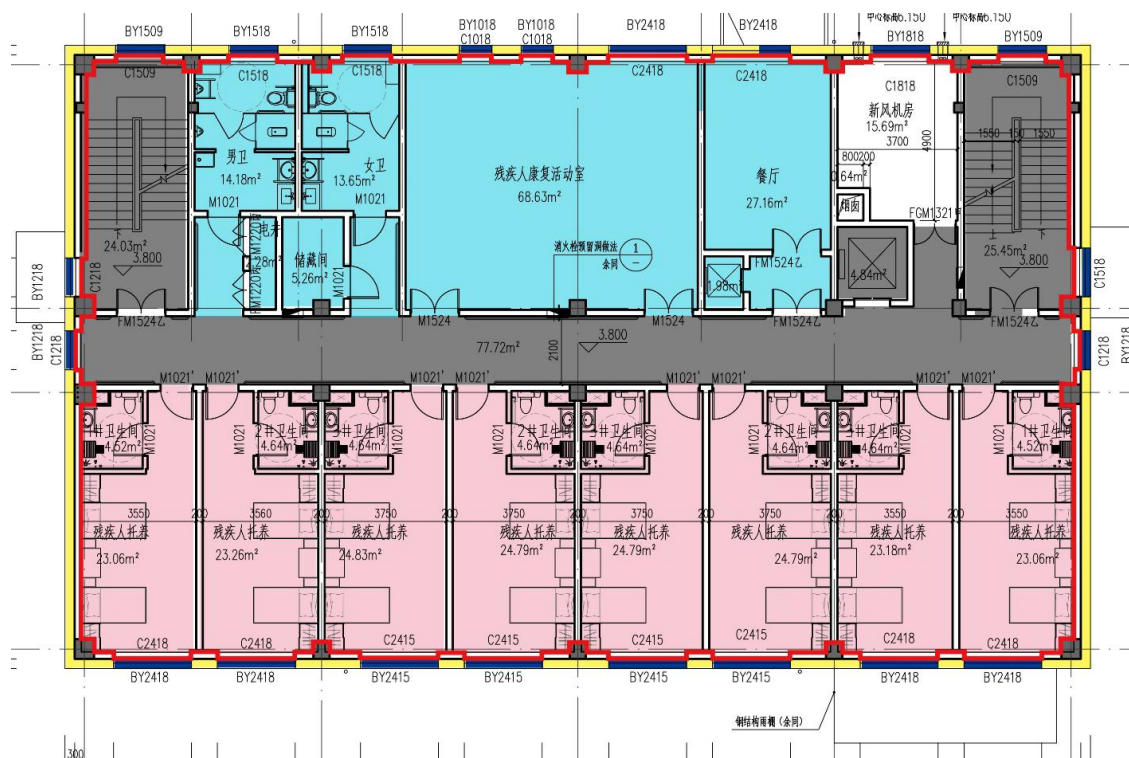
Figure 1 is a detailed architectural floor plan of the second floor of the Kunming Metro Kunming South Station. The plan shows a complex arrangement of rooms and corridors. Key areas include:

- Outdoor Sports Field Auxiliary Rooms:** Located at the top and bottom of the plan, these rooms are colored light blue. The top row includes two rooms, each 28.43m², and the bottom row includes two rooms, each 119.35m² and 119.28m².
- Restrooms and Showers:** A central area contains restrooms (e.g., 14.15m², 13.53m²) and a shower room (39.61m²).
- Other Rooms:** Includes a new wind machine room (18.85m²), a laundry room (7.33m²), a storage room (14.82m²), and a rest room (14.82m²).
- Corridors and Stairs:** Multiple corridors (e.g., 69.38m², 64.60m²) and stairwells are shown throughout the plan.
- Structural Details:** The plan includes numerous annotations regarding structural elements, such as "无震并块柱外檐外挑250厚钢筋混凝土板 (余同)" (Non-seismic composite column outer overhang 250mm thick reinforced concrete slab (same as others)) and "有震并块柱外檐外挑300厚岩棉板 (余同)" (Seismic composite column outer overhang 300mm thick rock wool board (same as others)).
- Room Numbers and Codes:** Various room numbers and codes are used to identify specific areas, such as C1518, M1024, and FGM1524.

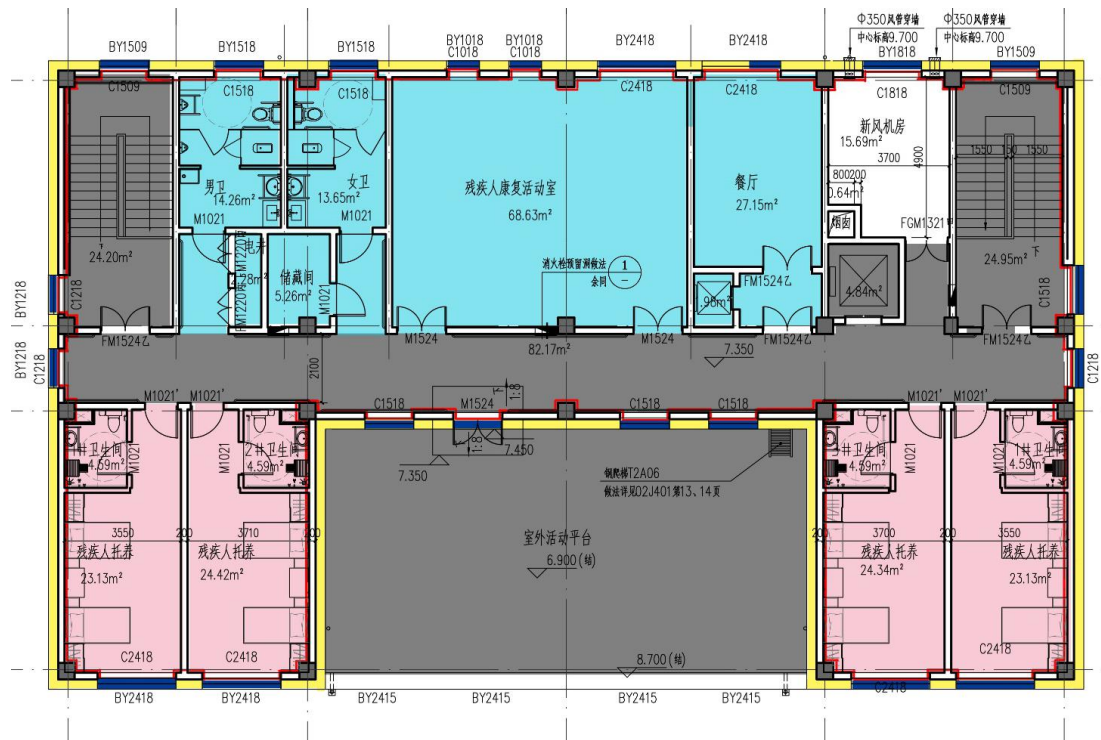
### Basement floor plan



## First floor plan

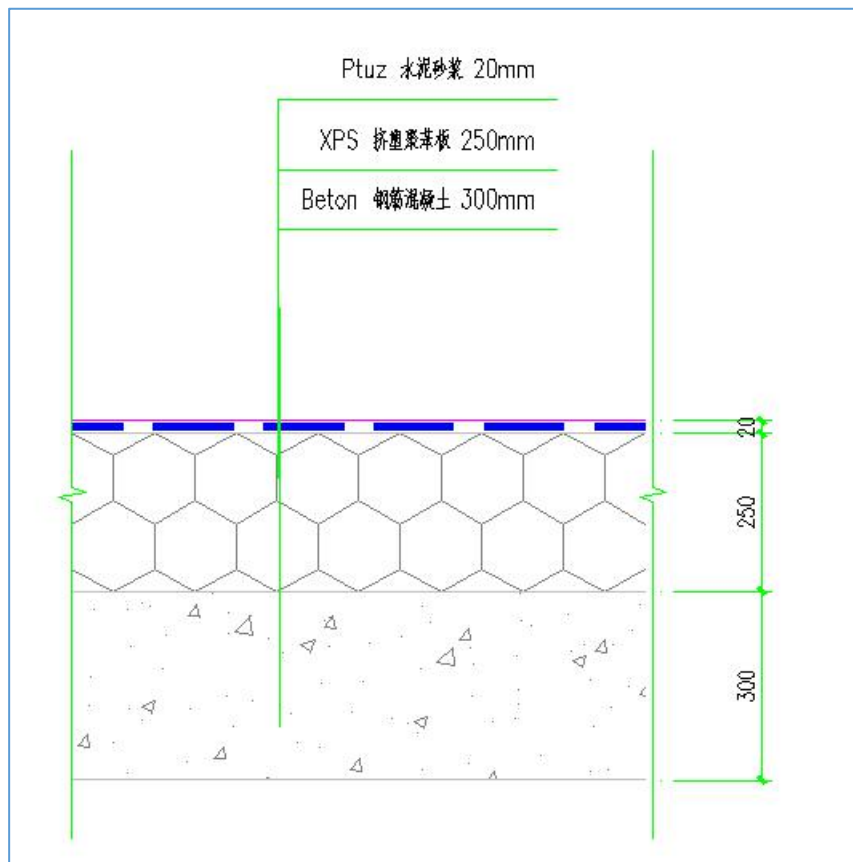


## Second floor plan



Third floor plan

## 6 Construction of floor slab / basement ceiling



Bauteil Nr.

02ud

AW Erde

Innendämmung?

Wärmeübergangswiderstand [m<sup>2</sup>K/W]

Ausrichtung des Bauteils

0.17

innen R<sub>si</sub>

0.17

Angrenzend an

0

außen R<sub>se</sub>

0.00

Teilfläche 1	λ [W/(mK)]	Teilfläche 2 (optional)	λ [W/(mK)]	Teilfläche 3 (optional)	λ [W/(mK)]	Dicke [mm]
Beton	1.740					300
XPS	0.032					250
Putz	0.930					20

Flächenanteil Teilfläche 1

100%

Flächenanteil Teilfläche 2

Flächenanteil Teilfläche 3

Summe

57.0

cm

U-Wert-Zuschlag:

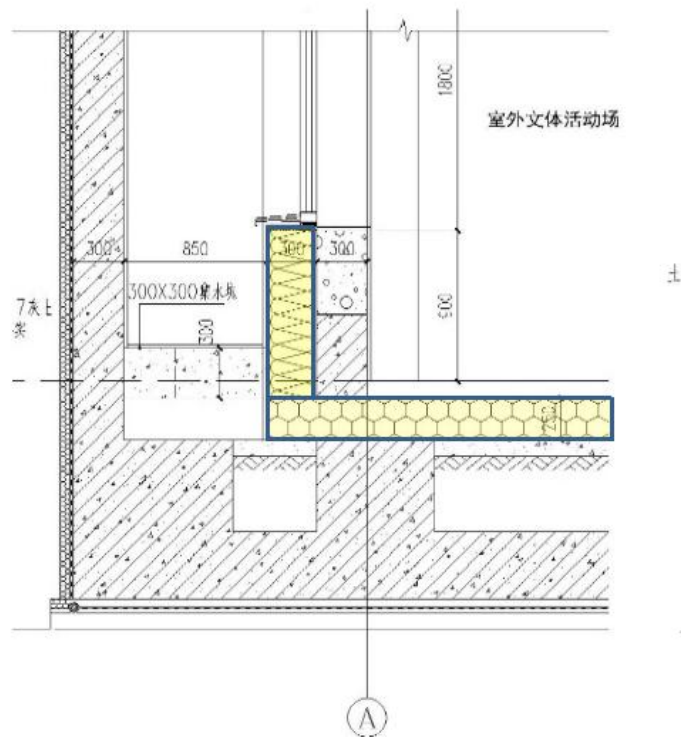
W/(m<sup>2</sup>K)

U-Wert:

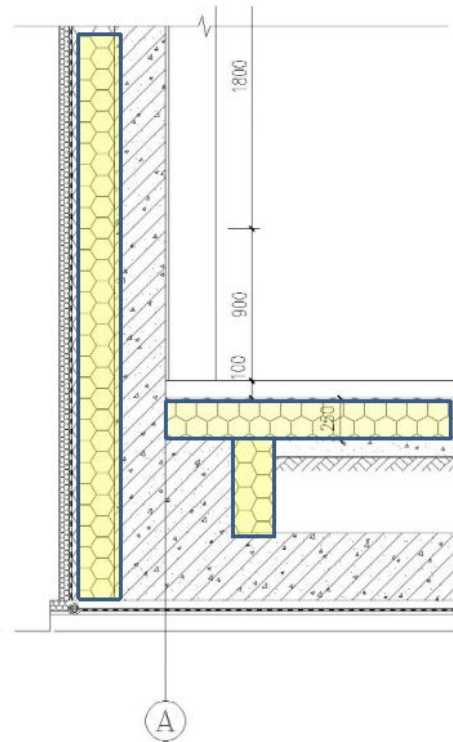
0.122

W/(m<sup>2</sup>K)



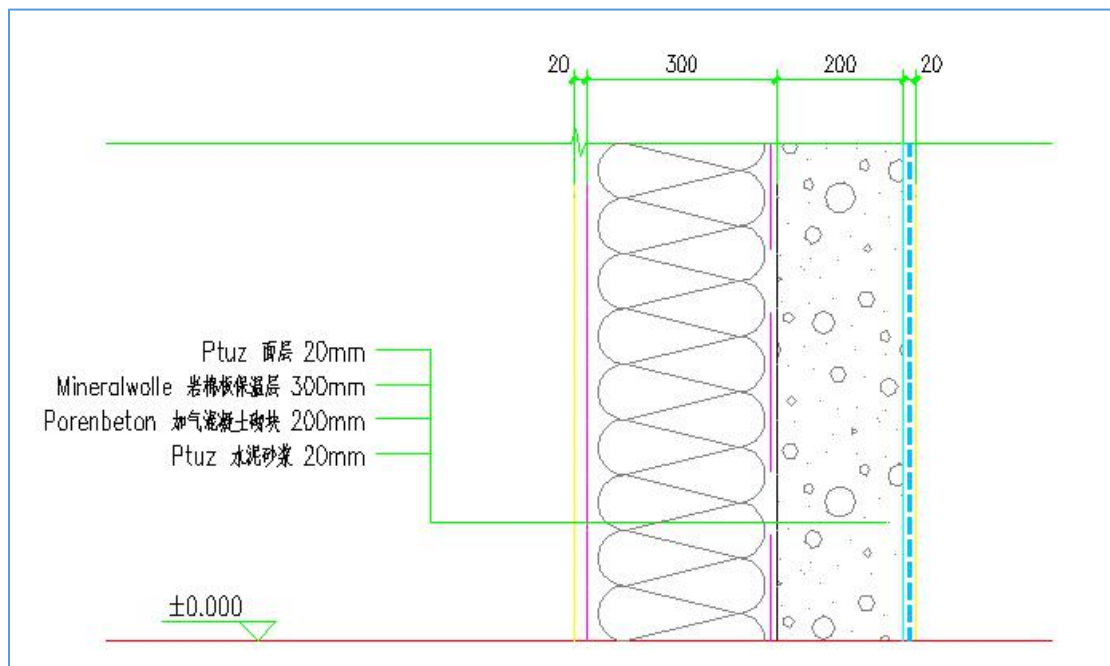


### Design of external insulation joint of Foundation (with window well)



**Design of external insulation joint of Foundation (no window well)**

## 7 Construction of the exterior walls



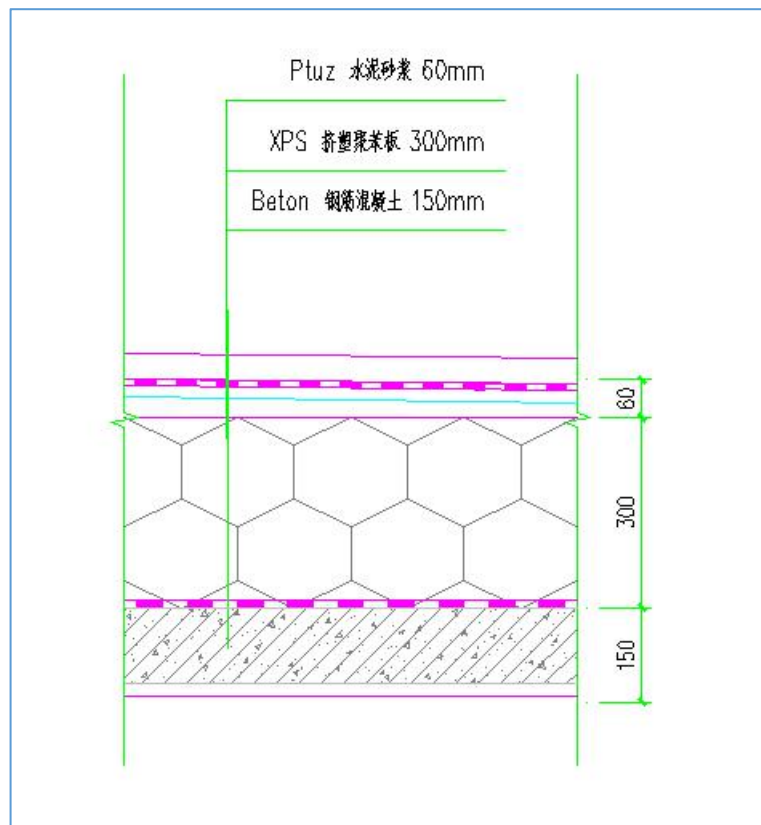
A photograph of a multi-story building under construction in an urban setting. The building has a light-colored facade and large windows. Scaffolding and construction equipment are visible on the exterior. The foreground shows a dirt and debris area, and other tall buildings are visible in the background.







## 8 Construction roof / ceiling of the top floor

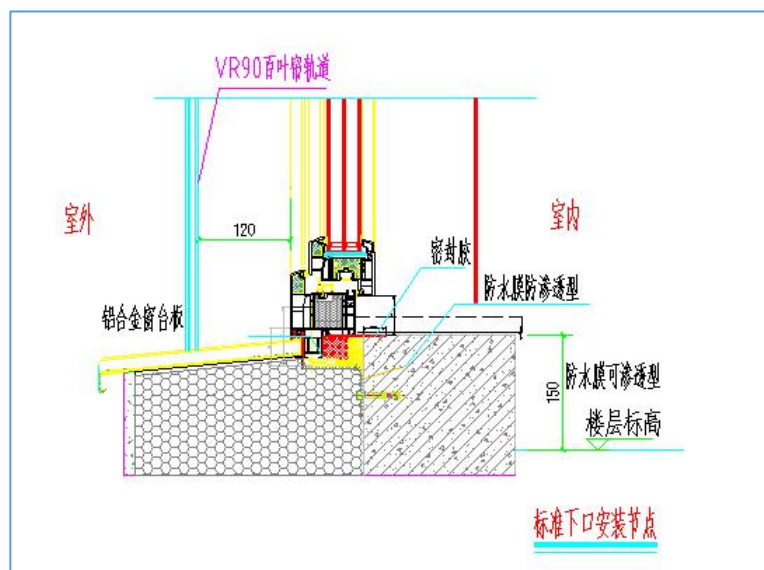
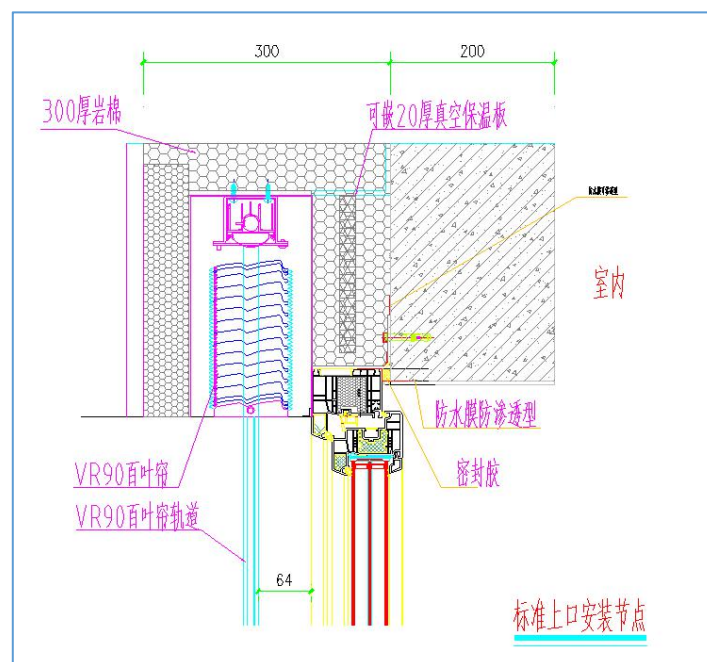


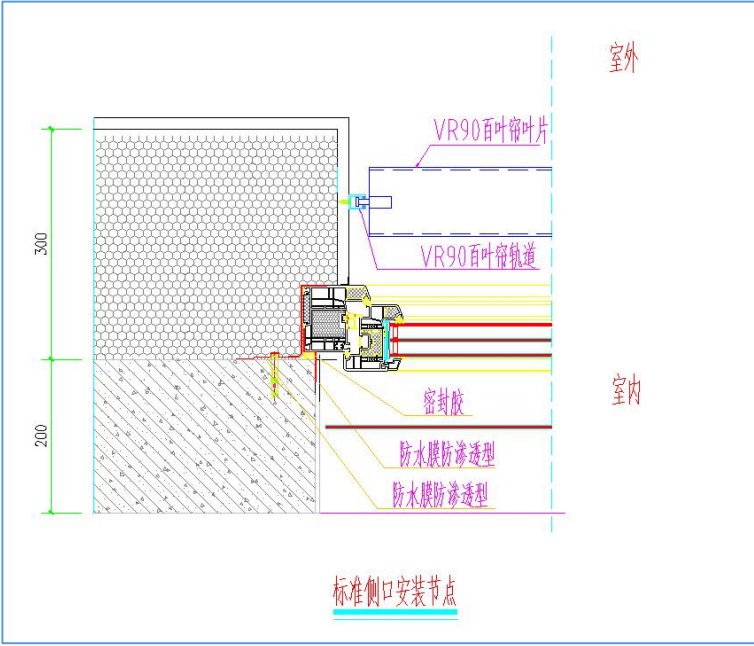




## 9 Windows and installation of the window

Window frames $U_f$	$\leq 0.8 \text{ W/m}^2\text{K}$	Window profile Certified by PHI
Glazing $U_g$	$\leq 0.6 \text{ W/m}^2\text{K}$	3-layer hollow insulating glass with argon gas 6Low-E + 12Ar + 5white glazing + 12Ar + 6Low-E 、 with warm edge
Glazing SHGC	$\geq 0.45$	6Low-E + 12Ar + 5white glazing + 12Ar + 6Low-E
$U_w$	$\leq 0.8 \text{ W/m}^2\text{K}$	Window Certified by PHI





Category: Window Frame  
Manufacturer: Hebei Orient Sundar Window Co., Ltd.,  
Gaobeidian City, Hebei Province,  
People's Republic of China  
Product name: 130 C

This certificate was awarded based on the following criteria for the cool, temperate climate zone

Comfort  $U_W = 0.79 \leq 0.80 \text{ W/(m}^2 \text{ K)}$   
 $U_{W, \text{installed}} \leq 0.85 \text{ W/(m}^2 \text{ K)}$   
with  $U_g = 0.70 \text{ W/(m}^2 \text{ K)}$

Hygiene  $f_{Rsi=0.25} \geq 0.70$

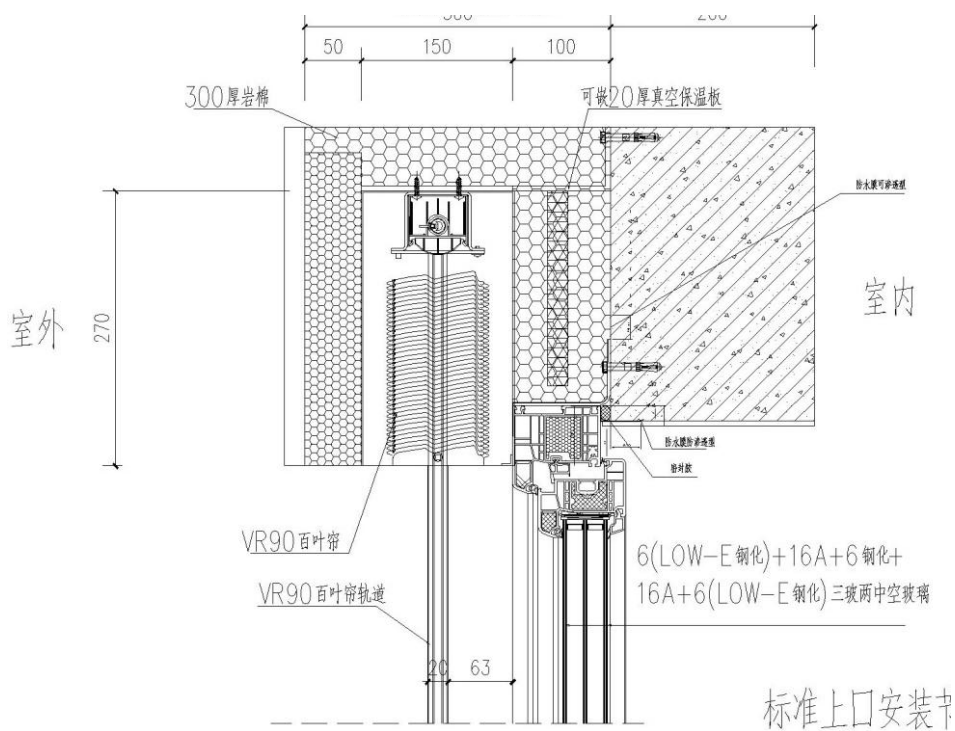


Bauteilaufbauten (U-Werte)						Wärmebrücken (Ψ-Werte)		
Empfohlener Startwert für die Optimierung: U-Werte für Wände und Dächer   Bodenplatten: 0,15 W/(m²K)   0,59 W/(m²K)						1		
ID	Bausystem	Bauteil	Gesamtdicke	U-Wert	Innen-däm-mung	Wärmebrückenbezeichnung	Ψ-Wert	f <sub>lin</sub> -Wert
Zusammenstellung der im Blatt 'U-Werte' berechneten Aufbauten			m	W/(m²K)	-		W/(mK)	(R <sub>s</sub> =0,25)
01ud	AW Luft	AW Luft	0.940	0.141	0			
02ud	AW Erde	AW Erde	0.570	0.122	0			
03ud	Dach	Dach	0.510	0.103	0			
04ud	Keller Fußboden	Keller Fußboden	1.350	0.113	0			
05ud	Kellerdecke	Kellerdecke	0.657	0.116	0			
06ud								
07ud								
08ud								
09ud								
10ud								

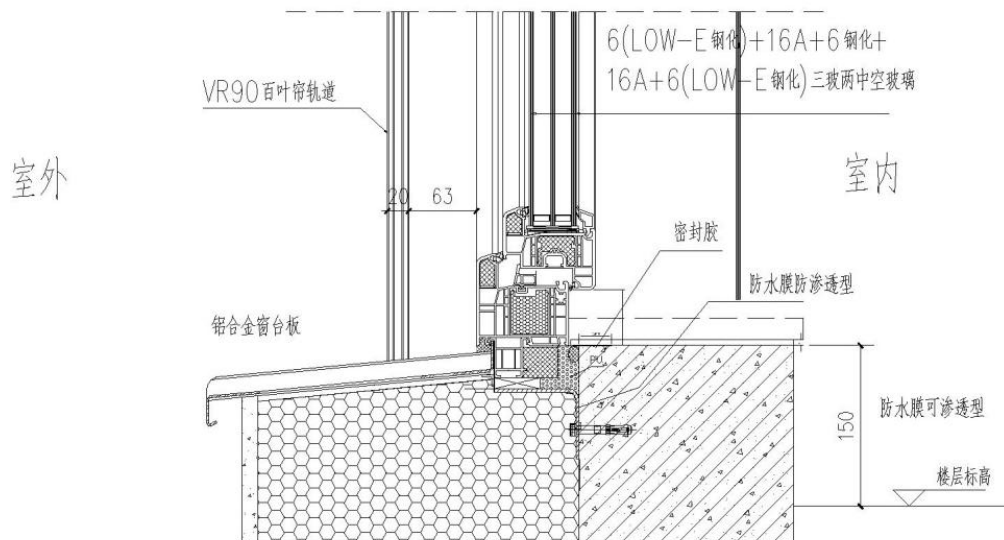
Fensterrahmen															Fensterrahmen									
		U <sub>f</sub> -Wert				Rahmenbreite				Glasrand Wärmebrücke				Einbau Wärmebrücke				Flächen R.- Fassaden:						
ID	Bezeichnung	links	rechts	unten	oben	links	rechts	unten	oben	W <sub>Urand</sub> links	W <sub>Urand</sub> rechts	W <sub>Urand</sub> unten	W <sub>Urand</sub> oben	W <sub>Einbau</sub> links	W <sub>Einbau</sub> rechts	W <sub>Einbau</sub> unten	W <sub>Einbau</sub> oben	Kor-Wert Glasträger						
		W/(m²K)	W/(m²K)	W/(m²K)	W/(m²K)	m	m	m	m	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/K						
01ud	profine GmbH - KOMMERLING 88plus Flügelüberschlagverklebung - SWISSPACER V	0.80	0.80	0.79	0.80	0.120	0.120	0.140	0.120	0.029	0.029	0.029	0.029	0.03	0.03	0.03	0.03	0.000						
02ud	RWCO - FRAMETS - with Swisspacer-opening	1.20	1.20	1.20	1.20	0.121	0.121	0.121	0.121	0.032	0.032	0.032	0.032	0.03	0.03	0.03	0.03	0.000						
03ud		0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000						
04ud		0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000						
05ud		0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000						
06ud		0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000						
07ud		0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000						
08ud		0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000						
09ud		0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000						
10ud		0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000						

Verglasungen															Verglasungen									
Als Startkomponente für die Optimierung empfohlene Verglasung: 3-fach Wärmeschutzglas (Bitte Behaglichkeitskriterium beachten!)																								
ID	Bezeichnung														g-Wert	U <sub>g</sub> -Wert								
																W/(m <sup>2</sup> K)								
01ud	Hebei Orient Sundar Window Co., Ltd.														0.52	0.66								
02ud															0.00	0.00								
03ud															0.00	0.00								
04ud															0.00	0.00								
05ud															0.00	0.00								
06ud															0.00	0.00								
07ud															0.00	0.00								
08ud															0.00	0.00								
09ud															0.00	0.00								
10ud															0.00	0.00								





**Installation node of louver and window upper opening**



**Installation node of louver and window lower opening**

## 10 Airtight building envelope

Cuicheng D 23# 于 2016 年 11 月 16 日，由国家建筑节能质量监督检验中心  
(National Center of quality supervision and testing for building energy conservation)

检测方法：鼓风门测试法（风扇增压法）

检测内容：建筑围护结构整体气密性能检测

本项目地上 3 层，地下 1 层，建筑高度 12m，总建筑面积 2519m<sup>2</sup>，建筑内净面积 2127.53m<sup>2</sup>，净体积为 7312m<sup>3</sup>。

测点布置

选择首层东南门（正门）作为风机安装位置。

Cuicheng D 23#

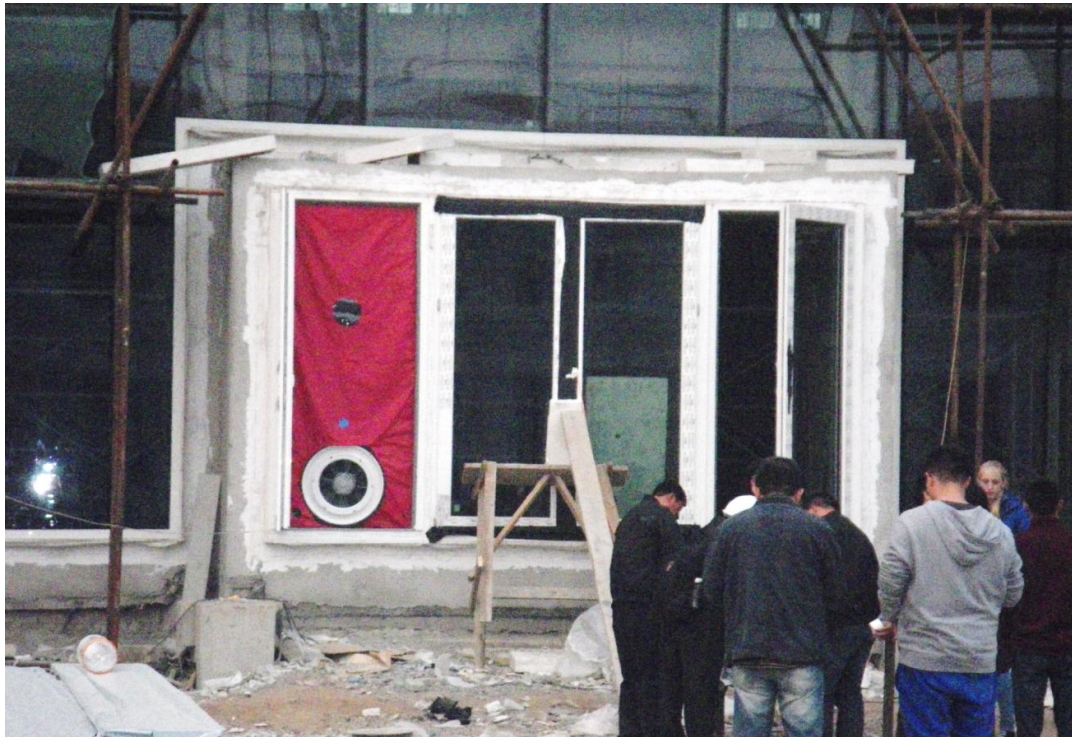
Test time: November 16, 2016:

Testing unit: National Center of quality supervision and testing for building energy conservation

Detection method: blower door test method (fan booster method)

Test content: test of overall air tightness of building envelope

## Measuring point layout



Air tightness practices

The junction of different materials: airtight tape

Wall: indoor plaster

Floor: Concrete

Window: paste the waterproof vapor barrier on the inside, and paste the waterproof and breathable layer on the outside

Roof: concrete, waterproof vapor barrier

测试结果 Test Results

(1) 负压测试 Negative pressure test

表 2 压差与漏气量一览表		
室内外设置压差 (Pa)	室内外平均压差 (Pa)	漏气量 (m³/h)
-60	-58.9	1533.9
-55	-56.4	1481.2
-50	-50.5	1387.2
-45	-44.7	1287.1
-40	-40.0	1192.4
-35	-35.1	1103.7
-30	-30.9	1022.9
-25	-25.6	916.6

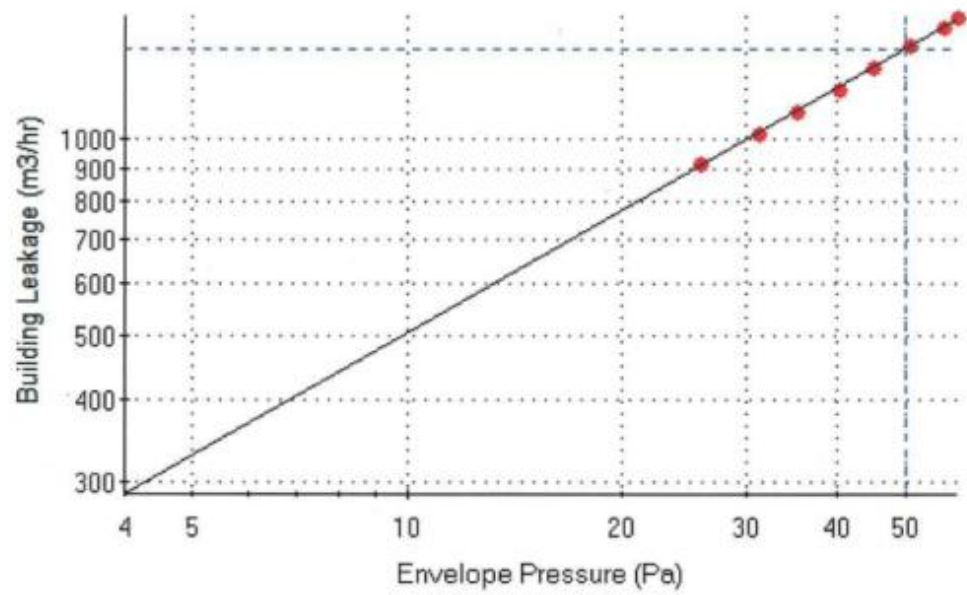


图 3 压差-漏气量曲线

根据压差与漏气量曲线可以得到-50Pa 下漏气量为 1368m³ /h，换气次数为 0.19h<sup>-1</sup>。

## (2) 正压测试 Positive pressure test

表 3 压差与漏气量一览表

室内外设置压差 (Pa)	室内外平均压差 (Pa)	漏气量 (m <sup>3</sup> /h)
60	60.1	1512.5
55	55.5	1449.8
50	50.1	1370.6
45	45.2	1274.0
40	41.2	1222.0
35	36.2	1101.1
30	30.2	990.4
25	24.5	864.7

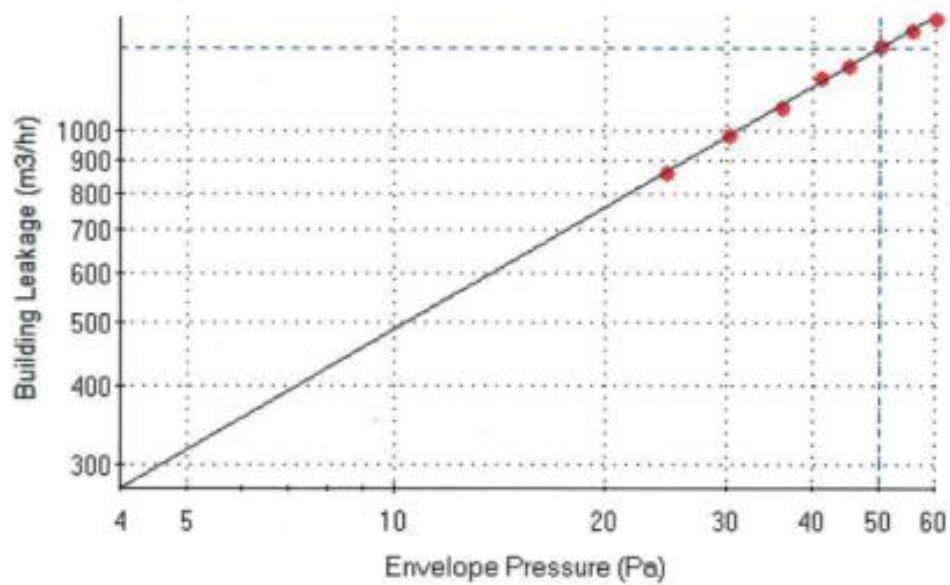
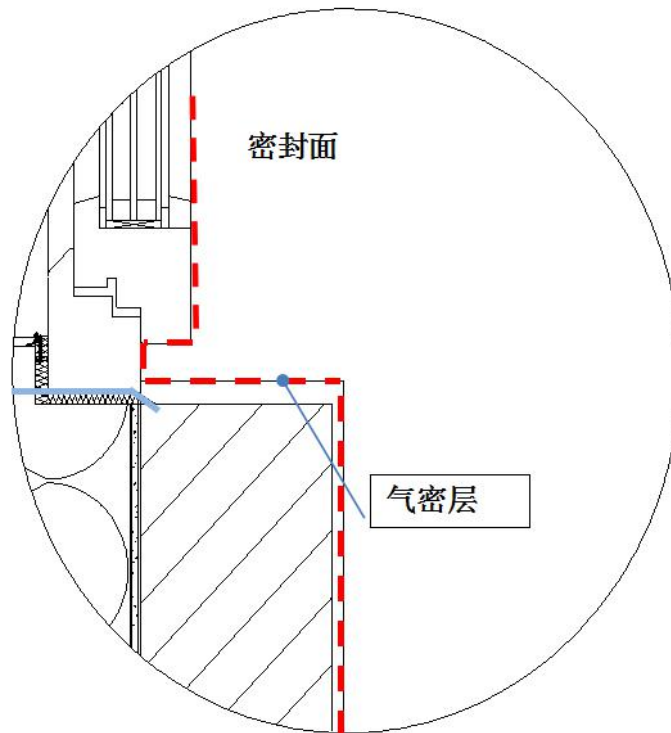
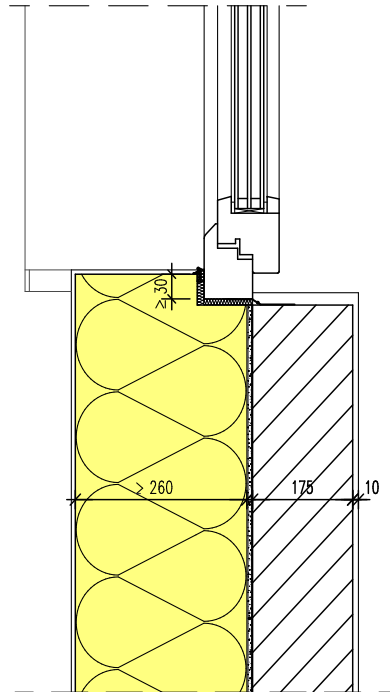


图 4 压差-漏气量曲线

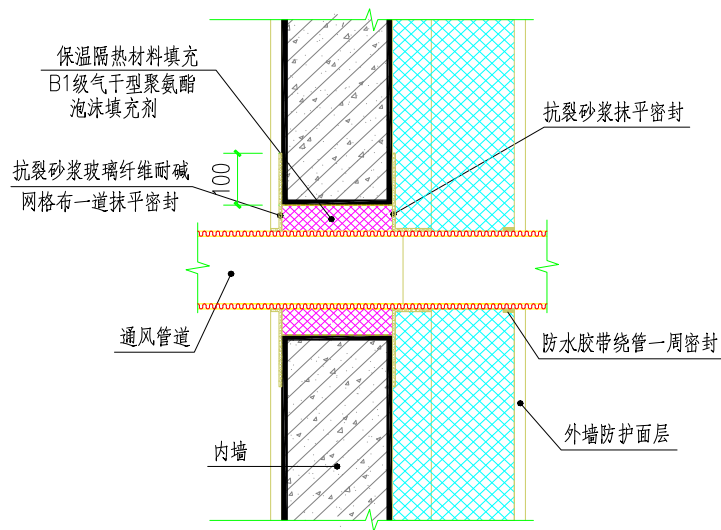
根据压差与漏气量曲线可以得到 50Pa 下漏气量为 1353m<sup>3</sup>/h，换气次数为 0.19h<sup>-1</sup>。

PHPP values

Air tightness<sub>n50</sub> = 0.2/h



Air tight tape



**Joint of pipe passing through external**



**wall**

**Air tight tape**

## 11 Layout of the ventilation system ducting

Standard for fresh air volume of pipe through external wall joint:  $30\text{m}^3 / (\text{H} \cdot \text{person})$

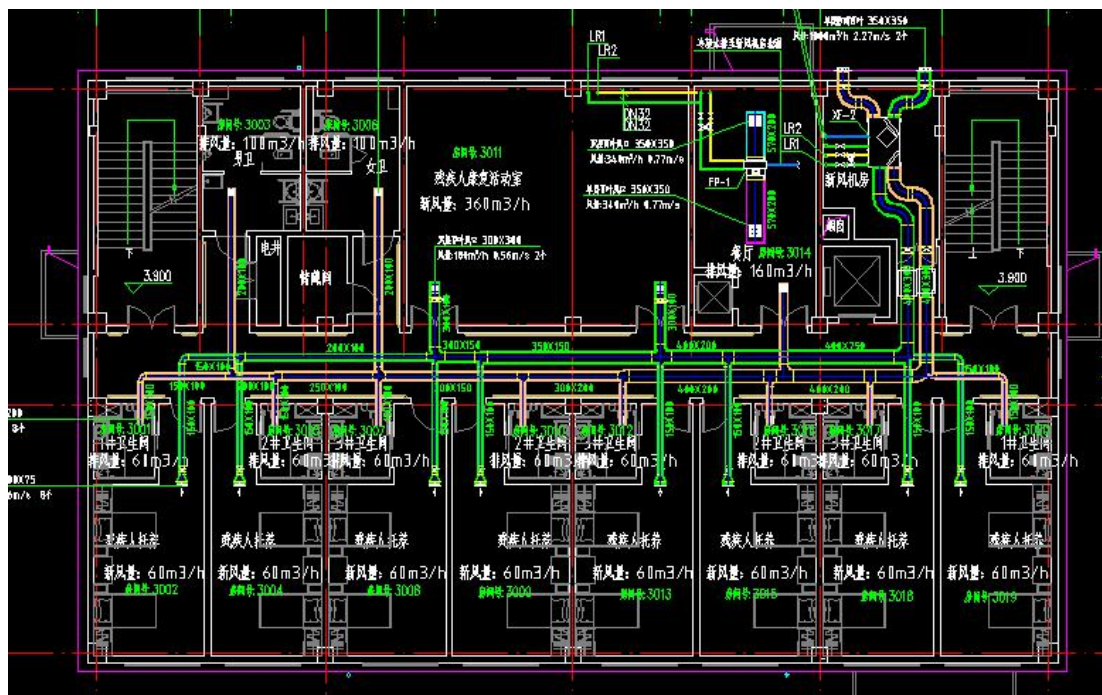
According to the horizontal partition, each floor is an independent fresh air system. Each floor is equipped with a fresh air machine room, four fresh air units, which take air from each floor and exhaust air from each floor. The high-efficiency fresh air treatment unit with heat recovery is adopted, and plate heat exchanger is set inside. The temperature exchange efficiency shall not be less than 75%; the enthalpy exchange efficiency of the whole heat recovery device shall not be less than 70%; the power consumption of the fan per unit air volume of the heat recovery device shall be less than  $0.45 \text{ w} / (\text{m}^3 / \text{h})$

The fresh air unit is equipped with primary effect filter and medium effect filter, and

the PM2.5 filtering efficiency is more than 90%.

Toilet: no exhaust shaft, heat exchange with fresh air, uniform discharge.

Kitchen: set up independent fume exhaust and air supplement system, set up fume exhaust shaft and air supplement fan, without heat recovery.



## 12 Ventilation unit / central ventilation unit

Mechanical systems

Ventilation Zehnder

Heat recovery efficiency is 75%

The electrical efficiency is 0.45 w / (m<sup>3</sup> / h)

Category: **Heat recovery unit**  
Manufacturer: **Zehnder Group Nederland B.V.**  
**8028 PM Zwolle, NETHERLANDS**  
Product name: **ComfoAir XL1500**

**This certificate was awarded based on the following criteria:**

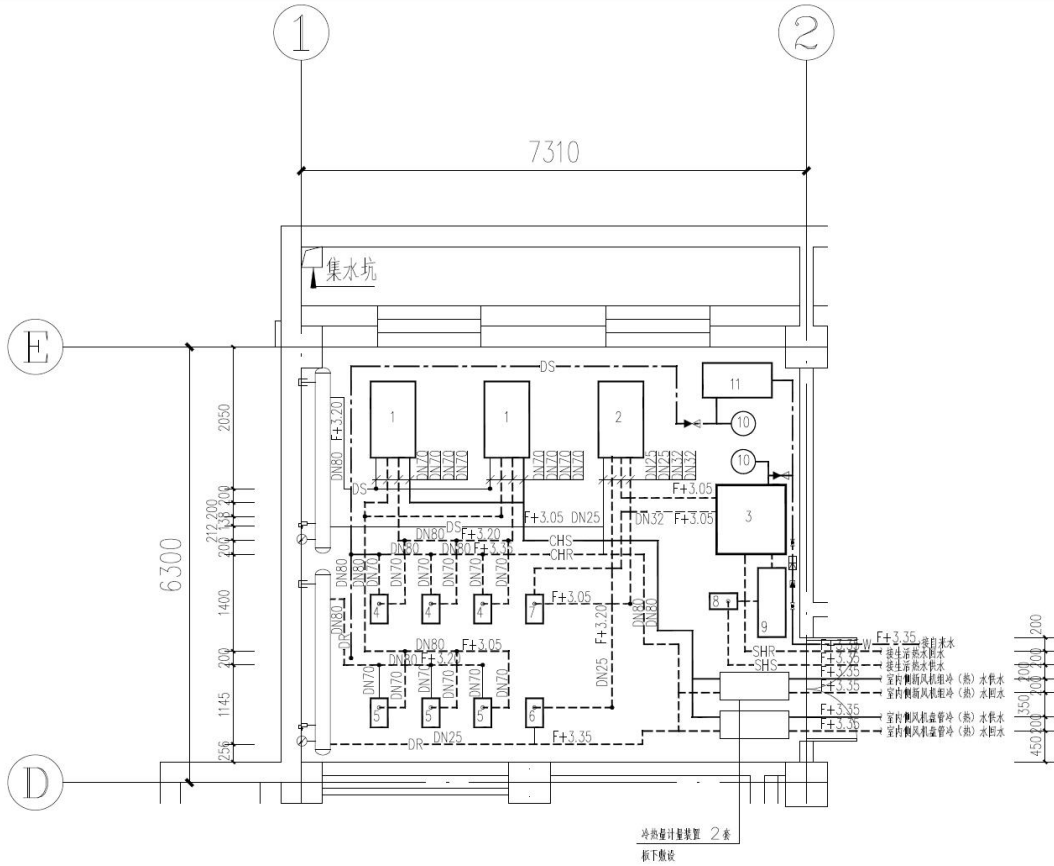
Thermal comfort	$\Theta_{\text{supply air}} \geq 16.5 \text{ }^{\circ}\text{C}$ at $\theta_{\text{outdoor air}} = -10 \text{ }^{\circ}\text{C}$
Effective heat recovery rate	$\eta_{\text{HR,eff}} \geq 75\%$
Electric power consumption	$P_{\text{el}} \leq 0.45 \text{ Wh/m}^3$
Performance number	$\geq 10$
Airtightness	Interior and exterior air leakage rates less than 3% of nominal air flow rate
Balancing and adjustability	Air flow balancing possible: yes Automated air flow balancing: yes
Sound insulation	It is assumed that large ventilation units are installed in a separate building services room.  Sound levels documented in the appendix of this certificate
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies mentioned in the appendix of this certificate



.....

Lüftungsgeräte mit Wärmerückgewinnung							Lüftungszusätzliche Geräte		
Empfohlene Startbedingungen für die Optimierung: Frostschutz: Ja, Feuchterückgewinnung: Ja, 75 %				0.45					
ID	Bezeichnung	Wärmebereitstellungsgrad	Rückfeuchte-zahl $\eta_{FKG}$	Elektroeffizienz	Einsatzbereich		ext. Pressung je Strang	Einbauten $D_{p, intern}$	Frostschutz erforderlich
	Nutzerdefinierter Bereich	%	%	Wh/m³	m³/h	m³/h	Pa	Pa	
01ud	Vent-B1	75%	0.35	0.23	1500	1500	100		
02ud	Vent-F1	75%	0.3	0.31	1000	1000	100		
03ud	Vent-F2	75%	0.3	0.31	1000	1000	100		
04ud	Vent-F3	75%	0.3	0.33	800	800	100		
05ud									
06ud	HRV UG	75%	0.35	0.23	500	500	100		
07ud									
08ud									
09ud									
10ud									

13 Heat Supply






The cold and heat sources of the project are ground source heat pump, heating and cooling end: the end of the project is high-efficiency fresh air unit with heat recovery and fan coil.

## 14.Available Research Material / Publications

(HaifengGuo2019) The running, debugging and data analysis of HVAC in Cui cheng  
D23 Passive house in the coldest winter.

Published in 《Building Thermal Ventilation and Air Conditioning 》,2019

## 15.Short Documentation of PHPP-Results (verification sheet)

Passivhaus-Nachweis																																																																										
																																																																										
<b>Objekt:</b> D-23居住公服《翠城经济适用房4期项目》Cuicheng D 23#																																																																										
<b>Straße:</b> 朝阳区垡头街道翠城馨园D区23号楼Cuicheng Xinyuan, Fato																																																																										
<b>PLZ/Ort:</b> 100023 北京 Beijing																																																																										
<b>Provinz/Land:</b> 北京 Beijing CN-中国																																																																										
<b>Objekt-Typ:</b> 残疾人康复托养中心rehabilitation Center for the disabled																																																																										
<b>Klimadatensatz:</b> CN0002a-Beijing																																																																										
<b>Klimazone:</b> 3: Kühl-gemäßigt <b>Standorthöhe:</b> 55 m																																																																										
<b>Bauherrschaft:</b> 北京住总房地产开发有限公司Beijing Uni-Construction																																																																										
<b>Straße:</b> 朝阳区望京里320号 320 Huizhongli, Chaoyang District																																																																										
<b>PLZ/Ort:</b> 100101 北京 Beijing																																																																										
<b>Provinz/Land:</b> 北京 Beijing CN-中国																																																																										
<b>Haustechnik:</b> 北京市住宅建筑设计研究院有限公司Beijing Institute of Resi																																																																										
<b>Straße:</b> 东城区东直门胡同5号 5 Dongzongbu Hutong, Dongcheng																																																																										
<b>PLZ/Ort:</b> 100005 北京 Beijing																																																																										
<b>Provinz/Land:</b> 北京 Beijing CN-中国																																																																										
<b>Architektur:</b> 北京市住宅建筑设计研究院有限公司Beijing Institute of																																																																										
<b>Straße:</b> 东城区东直门胡同5号 5 Dongzongbu Hutong, Dongcheng																																																																										
<b>PLZ/Ort:</b> 100005 北京 Beijing																																																																										
<b>Provinz/Land:</b> 北京 Beijing CN-中国																																																																										
<b>Energieberatung:</b> 北京住总集团有限责任公司技术开发中心Technological																																																																										
<b>Straße:</b> 朝阳区十里堡北里1号世泰大厦A座201A-201,Hengtai Buik																																																																										
<b>PLZ/Ort:</b> 100025 北京 Beijing																																																																										
<b>Provinz/Land:</b> 北京 Beijing CN-中国																																																																										
<b>Baujahr:</b> 2015 <b>Innentemperatur Winter [°C]:</b> 20.0 <b>Innentemp. Sommer [°C]:</b> 25.0																																																																										
<b>Zahl WE:</b> 1 <b>Interne Wärmequellen (IWQ) Heizfall [W/m²]:</b> 2.9 <b>IWQ Kühlfall [W/m²]:</b> 2.9																																																																										
<b>Personenzahl:</b> 48.0 <b>spez. Kapazität [W/K pro m² EBF]:</b> 204 <b>Mechanische Kühlung:</b> x																																																																										
<b>Zertifizierung:</b> 德国被动房研究所Passive House Institute																																																																										
<b>Straße:</b> 莱茵大道44/46号 Rheinstraße 44/46																																																																										
<b>PLZ/Ort:</b> 64283 达姆施塔特 Darmstadt																																																																										
<b>Provinz/Land:</b> 黑森州 Hessen DE-德国																																																																										
<b>Gebäudekennwerte mit Bezug auf Energiebezugsfläche und Jahr</b>																																																																										
<table border="1"><thead><tr><th colspan="2">Energiebezugsfläche m²</th><th>1729.7</th><th colspan="2">Kriterien alternative Krite</th><th>Erfüllt?</th></tr></thead><tbody><tr><td rowspan="2">Heizen</td><td>Heizwärmebedarf kWh/(m²a)</td><td>16</td><td>≤</td><td>15</td><td>-</td><td>ja</td></tr><tr><td>Heizlast W/m²</td><td>10</td><td>≤</td><td>-</td><td>10</td><td>ja</td></tr><tr><td rowspan="2">Kühlen</td><td>Kühl- + Entfeuchtungsbedarf kWh/(m²a)</td><td>14</td><td>≤</td><td>20</td><td>20</td><td>ja</td></tr><tr><td>Kühllast W/m²</td><td>5</td><td>≤</td><td>-</td><td>11</td><td>-</td></tr><tr><td colspan="2">Übertemperaturhäufigkeit (&gt; 25 °C) %</td><td>-</td><td>≤</td><td>-</td><td>-</td><td>-</td></tr><tr><td colspan="2">Häufigkeit überhöhter Feuchte (&gt; 12 g/kg) %</td><td>0</td><td>≤</td><td>10</td><td>-</td><td>ja</td></tr><tr><td>Luftdichtheit</td><td>Drucktest-Luftwechsel n<sub>50</sub> 1/h</td><td>0.2</td><td>≤</td><td>0.6</td><td>-</td><td>ja</td></tr><tr><td rowspan="2">Nicht erneuerbare Primärenergie (</td><td>PE-Bedarf kWh/(m²a)</td><td>114</td><td>≤</td><td>120</td><td>-</td><td>ja</td></tr><tr><td>PER-Bedarf kWh/(m²a)</td><td>61</td><td>≤</td><td>-</td><td>-</td><td>-</td></tr><tr><td>Erneuerbare Primärenergie Erzeugung erneuerb. Energie(</td><td>PER kWh/(m²a)</td><td>0</td><td>≥</td><td>-</td><td>-</td><td>-</td></tr></tbody></table>		Energiebezugsfläche m²		1729.7	Kriterien alternative Krite		Erfüllt?	Heizen	Heizwärmebedarf kWh/(m²a)	16	≤	15	-	ja	Heizlast W/m²	10	≤	-	10	ja	Kühlen	Kühl- + Entfeuchtungsbedarf kWh/(m²a)	14	≤	20	20	ja	Kühllast W/m²	5	≤	-	11	-	Übertemperaturhäufigkeit (> 25 °C) %		-	≤	-	-	-	Häufigkeit überhöhter Feuchte (> 12 g/kg) %		0	≤	10	-	ja	Luftdichtheit	Drucktest-Luftwechsel n <sub>50</sub> 1/h	0.2	≤	0.6	-	ja	Nicht erneuerbare Primärenergie (	PE-Bedarf kWh/(m²a)	114	≤	120	-	ja	PER-Bedarf kWh/(m²a)	61	≤	-	-	-	Erneuerbare Primärenergie Erzeugung erneuerb. Energie(	PER kWh/(m²a)	0	≥	-	-	-
Energiebezugsfläche m²		1729.7	Kriterien alternative Krite		Erfüllt?																																																																					
Heizen	Heizwärmebedarf kWh/(m²a)	16	≤	15	-	ja																																																																				
	Heizlast W/m²	10	≤	-	10	ja																																																																				
Kühlen	Kühl- + Entfeuchtungsbedarf kWh/(m²a)	14	≤	20	20	ja																																																																				
	Kühllast W/m²	5	≤	-	11	-																																																																				
Übertemperaturhäufigkeit (> 25 °C) %		-	≤	-	-	-																																																																				
Häufigkeit überhöhter Feuchte (> 12 g/kg) %		0	≤	10	-	ja																																																																				
Luftdichtheit	Drucktest-Luftwechsel n <sub>50</sub> 1/h	0.2	≤	0.6	-	ja																																																																				
Nicht erneuerbare Primärenergie (	PE-Bedarf kWh/(m²a)	114	≤	120	-	ja																																																																				
	PER-Bedarf kWh/(m²a)	61	≤	-	-	-																																																																				
Erneuerbare Primärenergie Erzeugung erneuerb. Energie(	PER kWh/(m²a)	0	≥	-	-	-																																																																				
Ich bestätige, dass die hier angegebenen Werte nach dem Verfahren PHPP auf Basis der Kennwerte des Gebäudes ermittelt wurden. Die Berechnungen mit dem PHPP liegen diesem Nachweis bei.																																																																										
<table border="1"><thead><tr><th>Funktion</th><th>Vorname</th><th>Nachname</th></tr></thead><tbody><tr><td>2-Zertifizierer</td><td>Min</td><td>Zhu</td></tr><tr><td>2-Zertifizierer</td><td>Sichen</td><td>Sheng</td></tr><tr><td>2-Zertifizierer</td><td>Berthold</td><td>Kaufmann</td></tr></tbody></table>		Funktion	Vorname	Nachname	2-Zertifizierer	Min	Zhu	2-Zertifizierer	Sichen	Sheng	2-Zertifizierer	Berthold	Kaufmann																																																													
Funktion	Vorname	Nachname																																																																								
2-Zertifizierer	Min	Zhu																																																																								
2-Zertifizierer	Sichen	Sheng																																																																								
2-Zertifizierer	Berthold	Kaufmann																																																																								
<b>Passivhaus Classic?</b> ja <b>Unterschrift</b> B. Kaufmann																																																																										
15706-15722_PHI_PH_20170424_SCS 42849 Darmstadt																																																																										