

## Abstract | プロジェクト概要



埼玉県志木市に建つご家族3名の為の深い軒が特徴の戸建て住宅です。

## Shiki Passive House/志木パッシブハウス

## Data of building | 物件データ

Year of construction 竣工年	2022	Space heating 年間暖房需要	9
U-value external wall U-value 外壁	0,135 W/(m <sup>2</sup> K)		kWh/(m <sup>2</sup> a)
U-value basement U-value 床または基礎	0,318 W/(m <sup>2</sup> K)	Primary Energy Renewable (PER) 総一次エネルギー消費量(PER)	62
U-value roof U-value 屋根	0,114 W/(m <sup>2</sup> K)	Generation of renewable Energy 再生可能エネルギーによる創エネ	75
U-value window U-value 窓	0,73 W/(m <sup>2</sup> K)	Non-renewable Primary Energy (PE) 旧基準による総一次エネルギー消費量 (PE)	127
Heat recovery 換気熱交換効率	75 %	Pressurization test n <sub>50</sub> 気密性能 n <sub>50</sub>	0,3 h <sup>-1</sup>
Special features 特記事項	幹線道路に近い住宅街です。		

### Shiki Passive House

Located approximately 23 km from Chiyoda-ku, Tokyo, a weather observation site, "Shiki Passive House" is a detached house for a family of three, a couple and a child, newly built in Shiki City, Saitama Prefecture. The surrounding environment is a residential area close to a relatively busy highway, but the building site abuts the road to the southwest at an angle, so there is a vacant lot on the south side, which is a good condition for an urban residential area considering the use of solar radiation.

The plan is a simple two-bedroom house with the LDK and water on the first floor and a private area including two private rooms on the second floor. The floor plan is simple, with the LDK and water on the first floor and a private area on the second floor, including two private rooms. Although the space is not large compared to other houses in the area, it is large enough for three people to live in.

One of the planning concepts was "a traditional Japanese-style house," and the deep eaves are a distinctive feature of the design. The deep eaves are a good design in terms of the traditional housing method that "summer is the best season," but they also have their disadvantages when considering the use of solar radiation in winter, which was the most important point when considering Passive House. As a result, the high envelope performance for a temperate region allowed for a heating demand and load with a margin to the standard, making it possible to consider deep eaves that inherit the ancient meaning of the term, focusing mainly on cooling demand.

Since the house will be used as a model house for about a year after its completion, we have not heard any feedback from the family, so we look forward to hearing their impressions of living in the house.

## 物件概要

### 志木パッシブハウス

気象観測地の東京都千代田区から約23 kmの距離にある「志木パッシブハウス」は、埼玉県志木市に新築されたご夫婦とお子様一人のご家族3人で暮らすための一戸建て住宅である。

周辺環境は、比較的通行量のある幹線道路に近い住宅地であるが、建築地は南西にある道路と斜めに接しているため、南面に空地があるような状況になっており、日射利用を考えると都市部の住宅地としては条件のよい場所である。

プランは1階にLDKと水回り、2階は2つの個室を含むプライベートなエリアとなる2LDKのシンプルな間取りである。広さは、周辺の住宅と比較しても広いとは言えないが、3人暮らしを考えると住まうに足る十分な広さである。

計画コンセプトの1つに「昔ながらの日本らしい住まい」があったが、深い庇があるデザインが特徴的であると言える。深い庇は「夏を旨とすべし」という古来の住宅手法としては良いデザインではあるが、冬の日射利用を考えると一長一短とも言え、パッシブハウスを検討する上での最大のポイントであった。

結果として、温暖地としては高い外皮性能とすることで基準に余裕をもった暖房需要・負荷となったことで、主に冷房需要にフォーカスした古来の意味を継承する深い庇を検討することを可能とした。

完成から1年間ぐらいはモデルハウスとして利用するため、ご家族からの感想は聞けていないので、暮らしの感想をお聞きするのを楽しみにしている。

## Responsible project participants 物件関係者

Architect 基本設計者	PASSIVESCAPE Archibuild <a href="https://passivescape.net/">https://passivescape.net/</a>
Implementation planning 実施設計者	PASSIVESCAPE Archibuild <a href="https://passivescape.net/">https://passivescape.net/</a>
Building systems 設備設計者	ECOMO Co., Ltd. <a href="http://www.kht-eco.com/index.html">http://www.kht-eco.com/index.html</a>
Structural engineering 構造設計者	-
Building physics 建築物理	ArchiAtelierMA Corp. <a href="https://ma-archi.com/">https://ma-archi.com/</a>
Passive House project planning パッシブハウス・コンサルタント	ArchiAtelierMA Corp. <a href="https://ma-archi.com/">https://ma-archi.com/</a>
Construction management 現場監理	PASSIVESCAPE Archibuild <a href="https://passivescape.net/">https://passivescape.net/</a>
Certifying body 認定機関	
Passive House Japan <a href="http://www.passivehouse-japan.org">www.passivehouse-japan.org</a>	
Certification ID PHデータベース ID	
6966	Project-ID ( <a href="http://www.passivehouse-database.org">www.passivehouse-database.org</a> ) Projekt-ID ( <a href="http://www.passivhausprojekte.de">www.passivhausprojekte.de</a> )

## Author of project documentation 本物件記録の作成者

Akihisa Maruyama

Date  
日付

Signature  
署名

22.10.2022

丸山晃希



## 1. Ansichtsfotos 外觀写真



South east



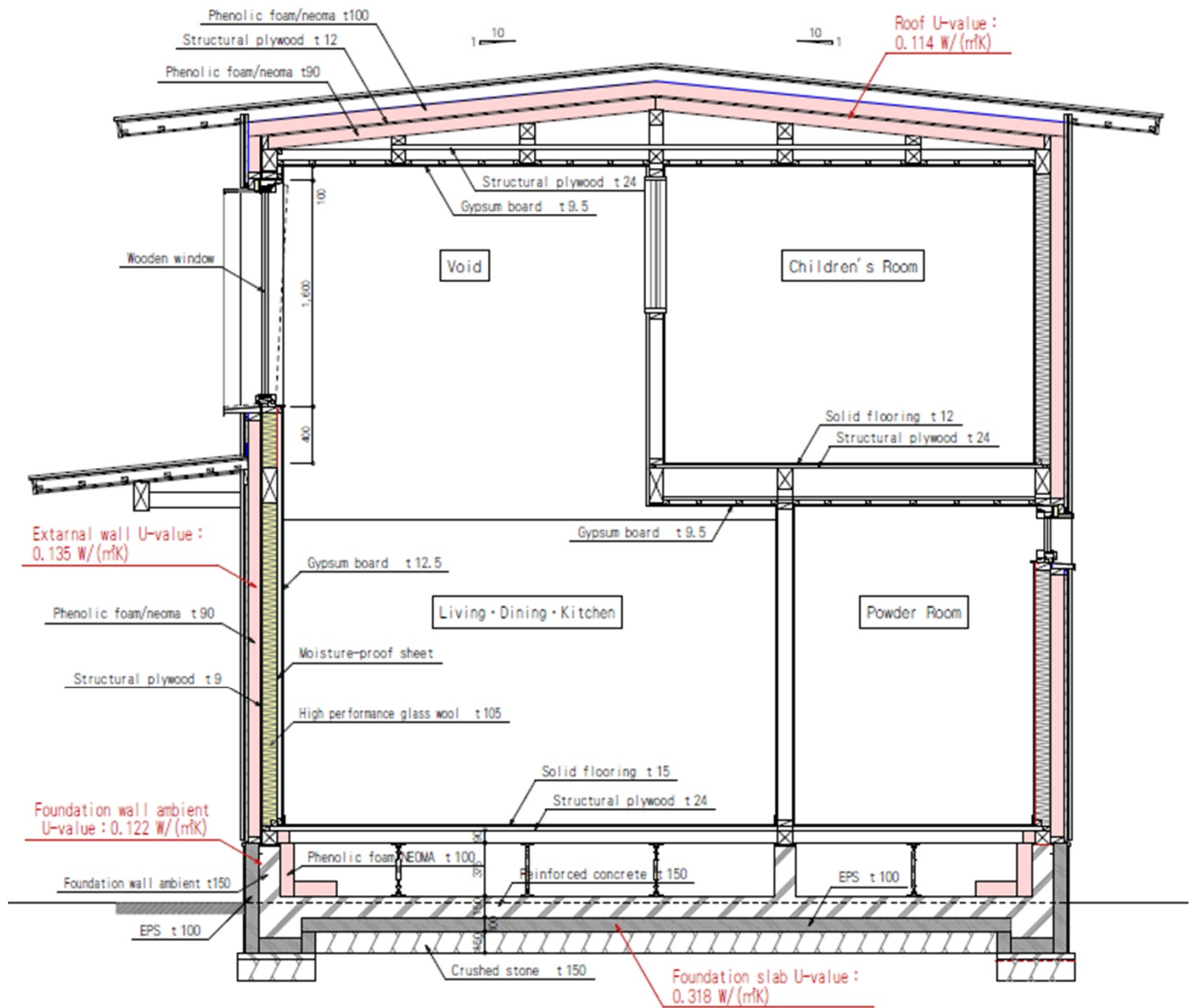
North west



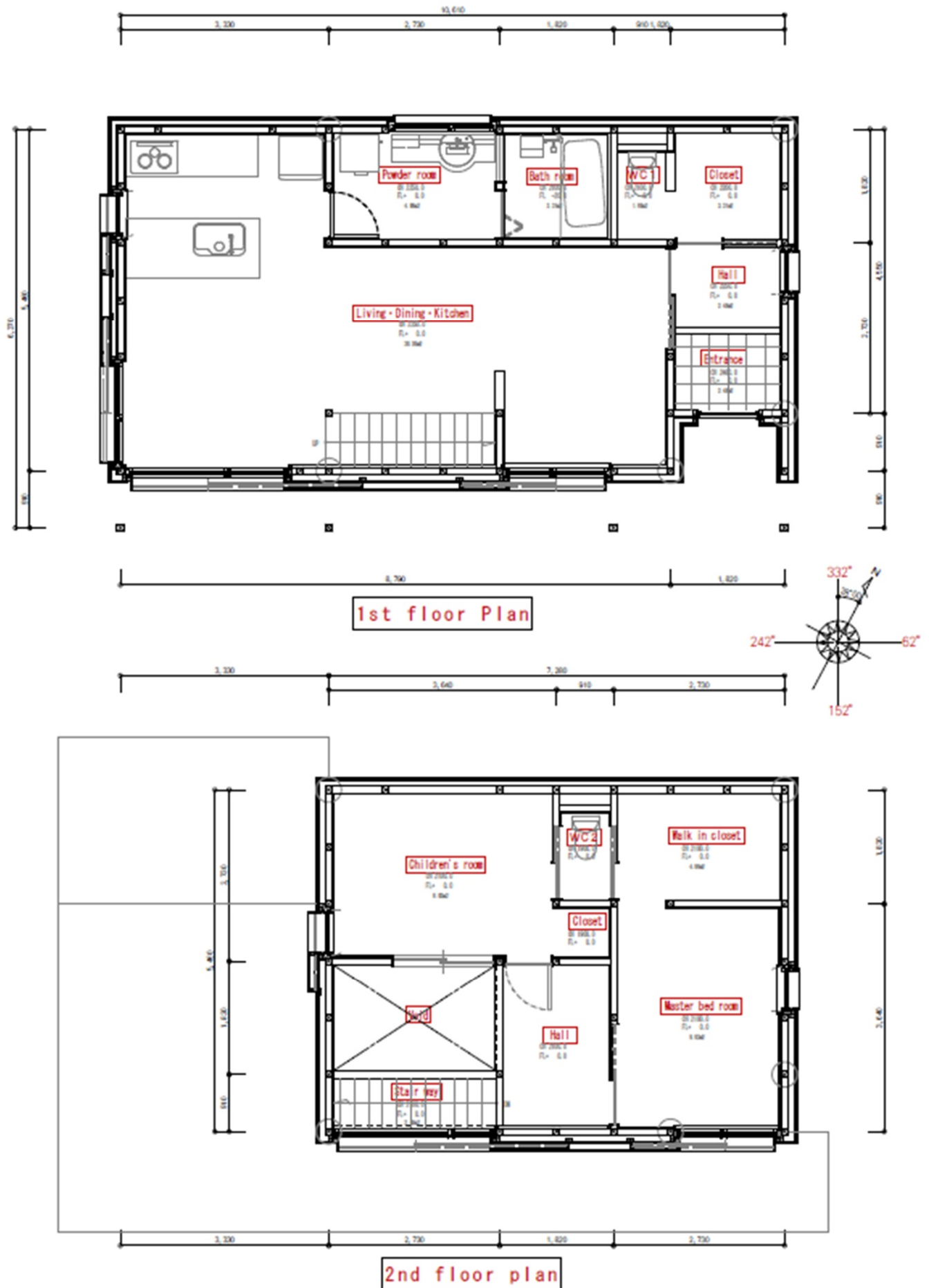
## 2. Innenfoto exemplarisch 内観写真



### 3. Schnittzeichnung 断面图



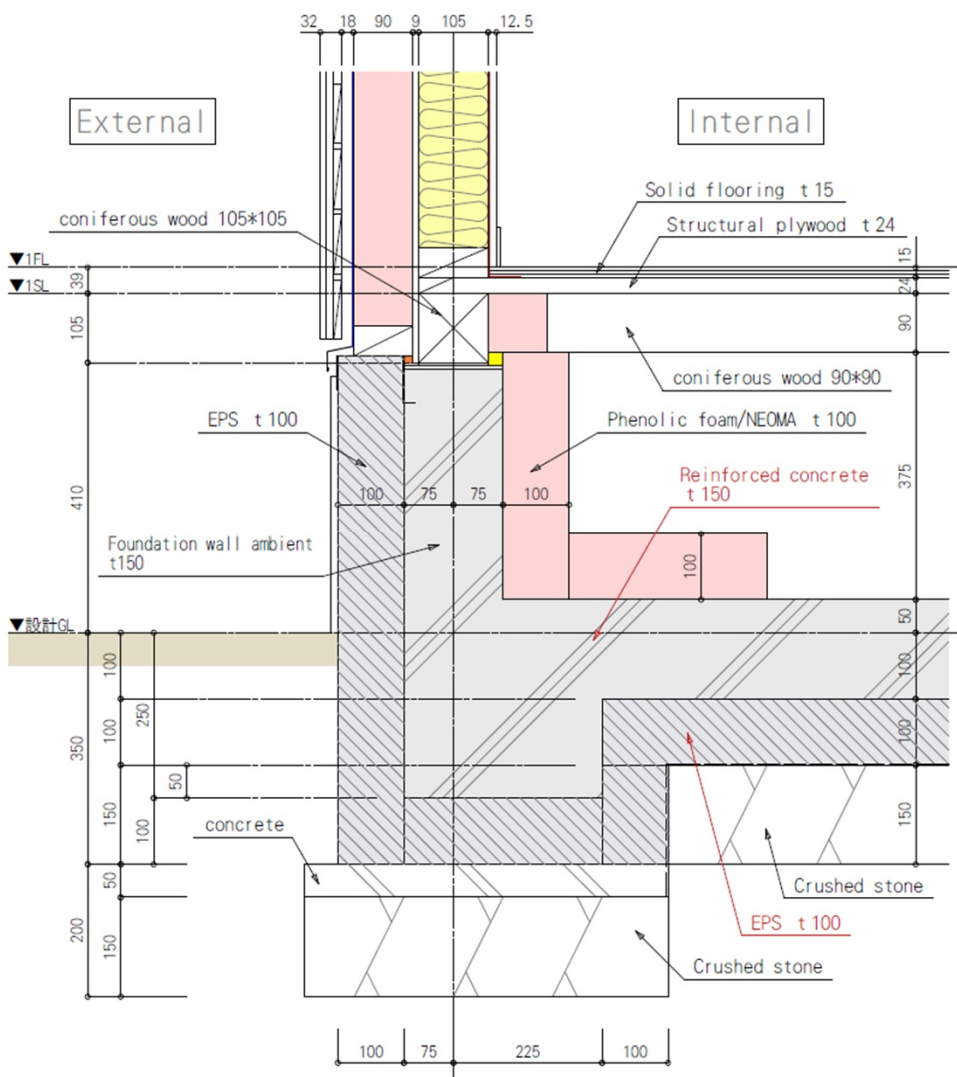
## 4. Grundrisse 平面图





5. Konstruktion der Bodenplatte 床（または基礎）の構成A

EPS insulation is used on the outside and neo-mafoam insulation on the inside. Insulation is also installed at the foundation on the inside to prevent thermal bridging.



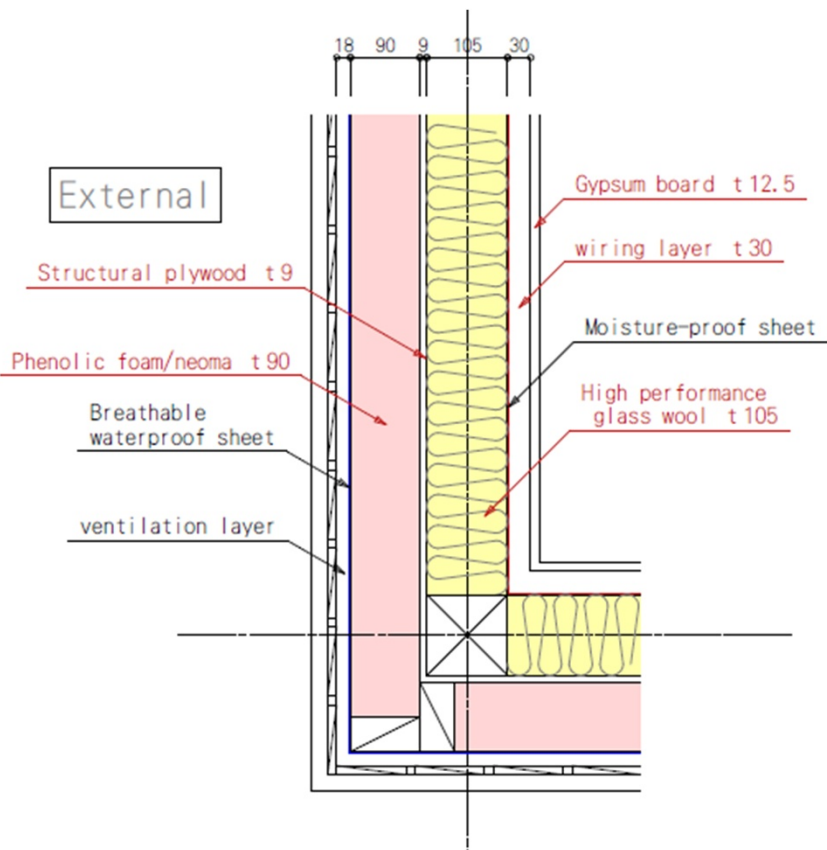
部位番号		内断熱?	
07ud	Foundation slab		
外皮の方位		表面熱抵抗[m <sup>2</sup> K/W]	
外部条件		室内側 R <sub>si</sub>	0.13
		屋外側 R <sub>se</sub>	0.00
断面構成 1	λ [W/(mK)]	断面構成 2 (オプション)	λ [W/(mK)]
Reinforced concrete	2.100		
EPS	0.034		
断面1の割合		断面2の割合	断面3の割合
100%			
U値の補正		U値:	0.318 W/(m <sup>2</sup> K)

厚み [mm]
150
100
合計
25.0 cm



6. Konstruktion der Außenwände 外壁の構成

Neoma foam insulation is used for additional insulation, and high-performance glass wool insulation is used for filling insulation. A wiring layer is installed on the indoor side, and the moisture-proof dense layer is devised so that it can be continued properly.



部位番号

03ud

External wall

内断熱?

表面熱抵抗 [m<sup>2</sup>K/ W]

外皮の方位

2外壁

室内側 R<sub>si</sub>

0.13

外部条件

3通気層

屋外側 R<sub>se</sub>

0.13

断面構成 1	λ [W/(mK)]	断面構成 2 (オプション)	λ [W/(mK)]	断面構成 3 (オプション)	λ [W/(mK)]	厚み [mm]
Gypsum board	0.210					13
wiring layer	0.160					30
High performance glass wool	0.034	Timber	0.130			105
Structural plywood	0.120					9
Phenolic foam/NEOMA	0.020					90

断面1の割合

84%

断面2の割合

16.5%

断面3の割合

合計

24.7

cm

U値の補正

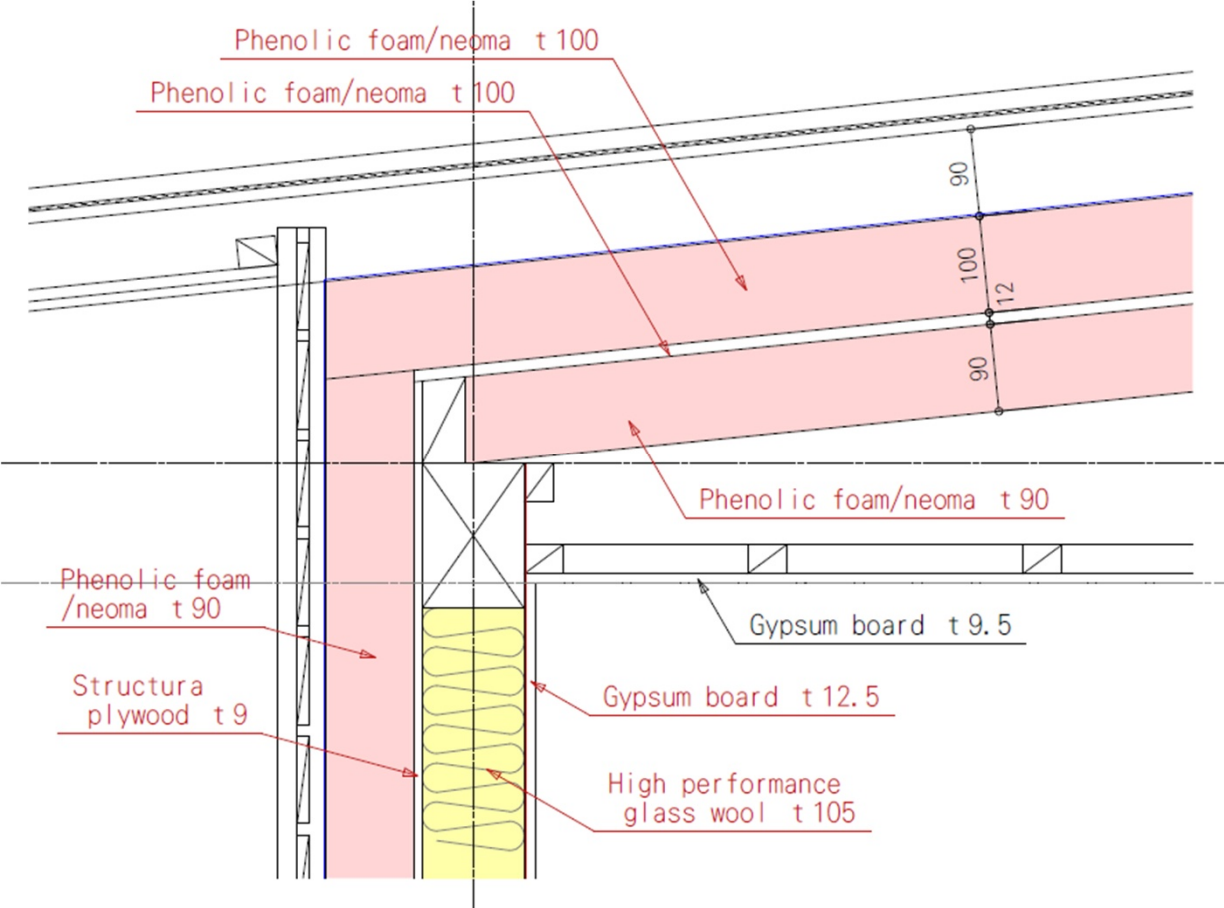
W/(m<sup>2</sup>K)

U値:

0.135

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

7. Konstruktion des Daches 屋根の構成

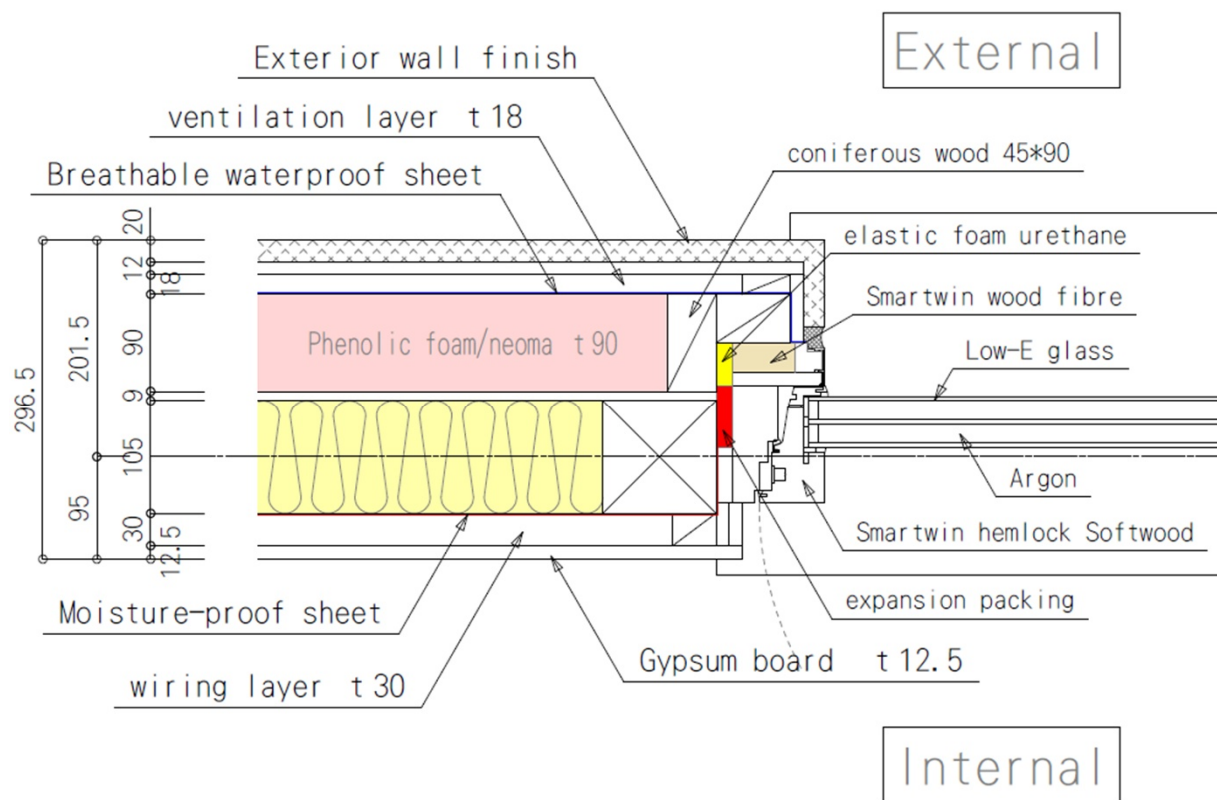


Both additional insulation and filling insulation use Neoma foam insulation. The thickness of the roof is suppressed by using insulation material with good thermal conductivity.

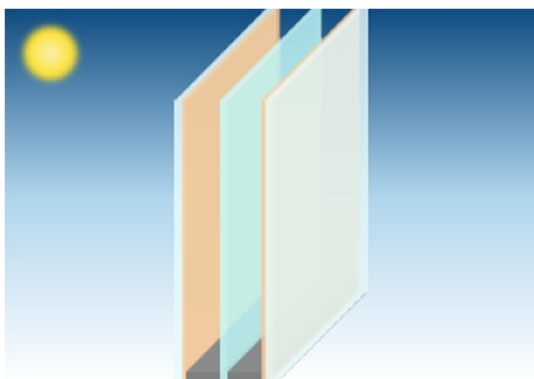
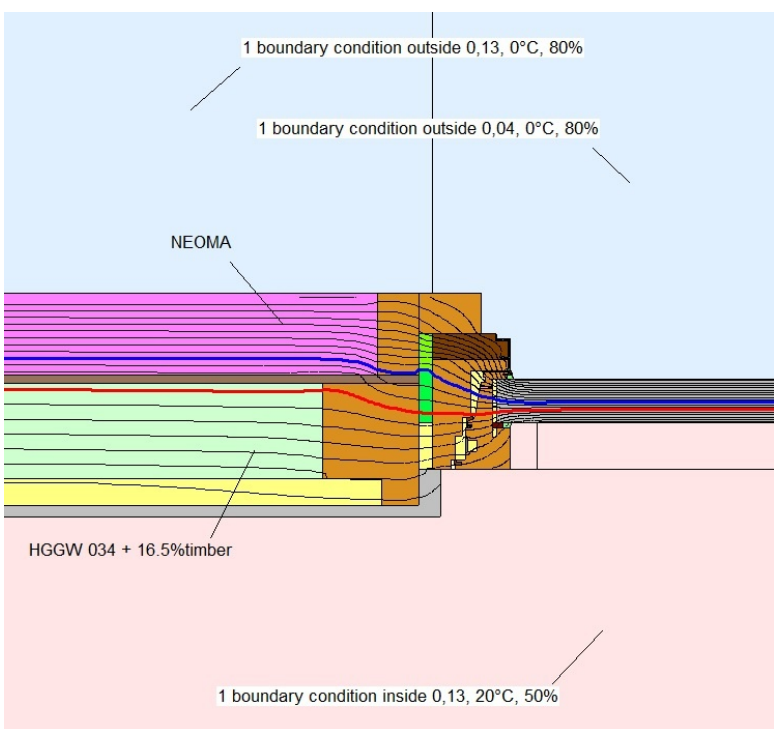


部位番号	外皮断面構成				内断熱?
01ud	Roof				
表面熱抵抗[m²K/ W]					
外皮の方位	1.屋根	室内側 R <sub>si</sub>	0.13		
外部条件	3.通気層	屋外側 R <sub>se</sub>	0.13		
断面構成 1	λ [W/(mK)]	断面構成 2 (オプション)	λ [W/(mK)]	断面構成 3 (オプション)	λ [W/(mK)]
Phenolic foam/NEOMA	0.020	Timber	0.130		
Structural plywood	0.170				
Phenolic foam/NEOMA	0.020				
断面1の割合		断面2の割合		断面3の割合	
90%		9.9%			
U値の補正					U値: 0.114
W/(m²K)					W/(m²K)
					20.2 cm

8. Fenster und Fenster-Einbau 窓とその収まり図



Description of the window (frame) construction, Smartwin、 Wooden Windows manufacturer	
Make of window Wooden frame with Aluminum (frame; product name)cladding ( FIX、 DK )	
Frame U-value $U_f 0.61 \text{ W/(m}^2\text{K)}$	



Pane 1	PLANICLEAR (4 mm) ECLAZ
Cavity 1	ARGON (90%) / AIR (10%) / 18 mm
Pane 2	PLANILUX (4 mm)
Cavity 2	ARGON (90%) / AIR (10%) / 18 mm
Pane 3	ECLAZ PLANICLEAR (4 mm)



SOLAR FACTORS

EN410 (2011-04)

Solar factor (g) 0.5942  
Shading Coefficient (SC) 0.6829



THERMAL TRANSMISSION

EN673 (2011-04)

$U_g$  0.525  $\text{W/m}^2\text{.K}$   
0° related to vertical position



## 9. Beschreibung der luftdichten Hülle 気密測定結果

After the construction was completed, on May 12, 2022, Mr. Chiba of Mihara Jutsu conducted an airtightness measurement.

Depressurization						
Measurement	1		2 (if necessary)		3 (if necessary)	
	$\Delta P$	Fan Flow Q	$\Delta P$	Fan Flow Q	$\Delta P$	Fan Flow Q
Measurement point	[Pa]	[m <sup>3</sup> /h]	[Pa]	[m <sup>3</sup> /h]	[Pa]	[m <sup>3</sup> /h]
1	20.0	30.7				
2	30.0	40.2				
3	40.0	51.0				
4	50.0	67.7				
5	60.0	77.0				
			1	2	3	
Characteristic value	$n(1 \leq n \leq 2)$		1.16			
Air permeability	$a(m^3/h \cdot Pa^{1/n})$		2.22			
$\Delta P=9.8Pa$ Ventilation volume	$Q_{9.8}(m^3/h)$		27.44			
coefficient b	$b: b=0.627 p^{1/2}$		0.69			
$\Delta P=50Pa$ Ventilation volume	$Q_{50}(m^3/h)$		64.41			
	$Q_{50}(m^3/h)$ Average		64.41			
Pressurization						
Measurement	1		2 (if necessary)		3 (if necessary)	
	$\Delta P$	Fan Flow Q	$\Delta P$	Fan Flow Q	$\Delta P$	Fan Flow Q
Measurement point	[Pa]	[m <sup>3</sup> /h]	[Pa]	[m <sup>3</sup> /h]	[Pa]	[m <sup>3</sup> /h]
1	20	32.1				
2	30	42.6				
3	40	51.0				
4	50	61.7				
5	60	72.5				
			1	2	3	
Characteristic value	$n(1 \leq n \leq 2)$		1.37			
Air permeability	$a(m^3/h \cdot Pa^{1/n})$		3.50			
$\Delta P=9.8Pa$ Ventilation volume	$Q_{9.8}(m^3/h)$		18.51			
coefficient b	$b: b=0.627 p^{1/2}$		0.69			
$\Delta P=50Pa$ Ventilation volume	$Q_{50}(m^3/h)$		61.00			
	$Q_{50}(m^3/h)$ Average		61.00			
Results	Net Air Volume $V_t$		186.13	$m^3$ (according to PHPP)		
	Q50	Uncertainty		n50	Uncertainty	
	$m^3/h$	%		1/h	%	
Depressurisation	64.41			0.35		
Pressurisation	61.00			0.33		
Average	62.71			0.34		



### Air tightness concept

Roof: Structural plywood with airtight tape

External wall: Structural plywood covered with airtight tape

Floor: Concrete

Junction between roof and External wall: airtight tape

Exterior wall and foundation: airtight packing  
windows: expansion packing

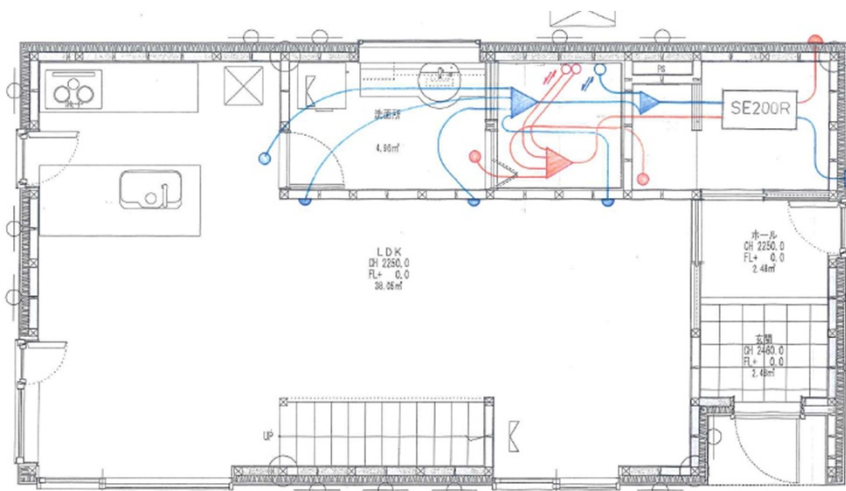
## 10. Lüftungsgerät 換気装置

Although the heat exchange rate is reduced because it is not a Passive House certified product, a heat exchange ventilation system was adopted to achieve a good balance between performance and cost.



specification	Sensible heat exchange efficiency $h_{HR}$	Humidity exchange efficiency	Specific power consumption
ユーザー設定データ	%	%	Wh/m <sup>3</sup>
Royal SE200R	75%	52%	0.56

## 11. Lüftungsplanung Kanalnetz ダクト計画



air supply chamber

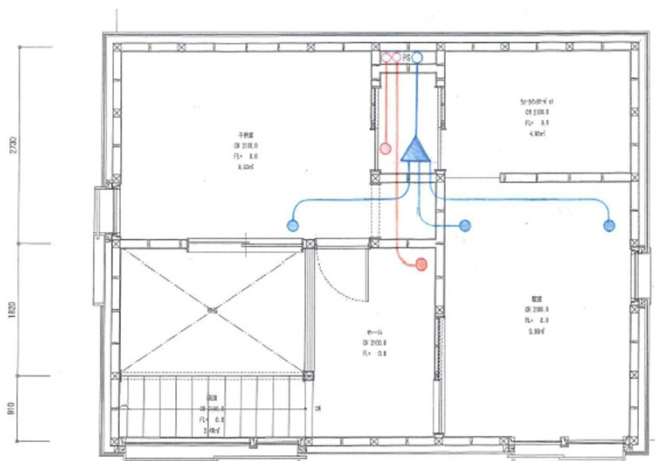
The kitchen, dining room, living room, master bedroom, and children's room are air supply rooms (the blue line is the duct route)

return air chamber

There are 2 toilets, a washroom, and the 2nd floor hall is used as an exhaust room.

ventilation path

Fresh air sent to the supply air chamber is collected in the return air chamber through door undercuts, etc., and returned to the heat exchanger via the exhaust duct (the red line is the duct route).



## 12. Wärmeversorgung 熱供給

A heat pump water heater (CO2 refrigerant) is used to send hot water to each facility. The system is also linked to a photovoltaic power generation system to reduce electricity consumption.



Heating and cooling is provided by a heat pump air conditioner. This system works in conjunction with the ventilation system to deliver cooled and heated fresh air to each room.



## 13. Baukosten 建設コスト

The deep eaves design has both advantages and disadvantages as a passive design, and the cost of building the house is higher because of these advantages. Taking these factors into account, the cost of this house was about 30% higher than a typical house construction. However, we consider this an acceptable cost because it allows the homeowner to make the most of their individuality while reducing future energy costs.

## 14. Literatur 参考文献

- Passive House Planning Package



15. PHPP-Ergebnisse 結果シート

パッシブハウス Verification



設計者:	PASSIVESCAPE Archibuild
番地・町名:	4-1-35 nakamuneoka, Shiki
郵便番号/都市名:	353-0002 Saitama
都道府県/国:	JP-日本
エネルギーコンサルタント:	ArchiAtelierMA Corp.
番地・町名:	3-35-8-105 Kanamecho, Toshima
郵便番号/都市名:	171-0043 Tokyo
都道府県/国:	JP-日本
竣工年:	2022
ユニット数:	1
利用者数:	2.0

物件名:	Shiki Passive House		
番地・町名:	Shiki		
郵便番号/都市名:	Saitama		
都道府県/国:	JP-日本		
用途:	一戸建ての住宅		
気象データ:	ud--02-JP0001b-Tokyo		
気候区分:	4: Warm temperate (温帯建設地の標高:	5.6 m	
建築主 / クライアント:	Takamichi Yoda		
番地・町名:	Shiki		
郵便番号/都市名:	Saitama		
都道府県/国:	JP-日本		
設備設計者:	ECOMO Co., Ltd.		
番地・町名:	2-14-6 Midiricho, takasaki		
郵便番号/都市名:	370-0073	Gunma	
都道府県/国:	JP-日本		
認定機関:	Passive House Japan		
番地・町名:	2-2-2 Ohmachi, Kamakura		
郵便番号/都市名:	248-0007	Kanagawa	
都道府県/国:	JP-日本		
冬の室内温度設定 [°C]:	20.0	夏の室内温度設定 [°C]:	25.0
暖房期の内部発熱量 (IHG) [W/m²]:	2.7	冷房期の内部発熱量 (IHG) [W/m²]:	2.7
蓄熱性能 [Wh/K per m² TFA]:	84	冷房設備の有無:	x

有効床面積を元に計算した建物の性能

		基準	代替基準	すべて記入しましたか
暖房	有効床面積 m²	77.0		
	暖房需要 kWh/(m²a)	9	15	Yes
	暖房負荷 W/m²	8	-	10
年間冷房負荷	年間冷房&除湿需要 kWh/(m²a)	22	22	Yes
	冷房負荷 W/m²	12	-	11
	オーバーヒートの頻度 (> 25 °C) %	-	-	-
気密性能	湿度過多の頻度 (> 12 g/kg) %	0	10	Yes
	50PA時の漏気回数 1/h	0.3	0.6	Yes
旧一次エネルギー基準 (PE)	消費量 (PE) kWh/(m²a)	127	-	-
	一次エネルギー消費量 (PER) kWh/(m²a)	62	60	62
	垂直投影面積に対する再生可能エネルギー総工本量 kWh/(m²a)	75	-	2

² 空欄: データ不足; -: 該当なし

16.Available Research Material