

Abstract | プロジェクト概要



Koorimoto Passive House 2022 / 郡元パッシブハウス2022

Passive House in the warm climate of southern Japan. Devices to overcome rain and heat.

Data of building | 物件データ

Year of construction 竣工年	2022	Space heating 年間暖房需要	12 kWh/(m ² a)
U-value external wall U-value 外壁	0,196 W/(m ² K)		
U-value basement U-value 床または基礎	0,318 W/(m ² K)	Primary Energy Renewable (PER) 総一次エネルギー消費量(PER)	54 kWh/(m ² a)
U-value roof U-value 屋根	0,122 W/(m ² K)	Generation of renewable Energy 再生可能エネルギーによる創エネ	0 kWh/(m ² a)
U-value window U-value 窓	1,4 W/(m ² K)	Non-renewable Primary Energy (PE) 旧基準による総一次エネルギー消費量 (PE)	108 kWh/(m ² a)
Heat recovery 換気熱交換効率	78 %	Pressurization test n ₅₀ 気密性能 n ₅₀	0,4 h ⁻¹
Special features 特記事項	A tall building stands on the east side.		

Property summary

Passive house in Miyazaki prefecture, monsoon Asia heavy rain area.

Located on the eastern edge of monsoon Asia, one of the world's heaviest rainfall regions, Japan receives an average of 1,718 mm of precipitation per year, which is about twice the world average. Miyazaki Prefecture, where this house was built, is a passive house built in an area of Japan with particularly high precipitation, and it is a passive house with an architectural style for long-lasting living that will not be defeated by rainfall, based on ideas unique to a region with high precipitation. Miyazaki Prefecture is located in a unique environment with the Pacific Ocean to the east and a mountainous region to the west, with an average annual rainfall of 2,730mm. This is about 1.5 times the annual average in Japan and 3 times the annual average in the world.

With this amount of rainfall, it is necessary to take measures to prevent leaks over time.

For this reason, insulation was laid horizontally on the horizontal structure, limiting the insulation area only to the area where people live. The roof shape is sloped to ensure a slope that promotes water flow, and the waterproofing and insulation lines are secured to create a space behind the shed. The roof is designed so that the waterproofing and insulation lines have a space in the back of the shed, where leaks can be visually checked and necessary measures can be taken over a long period of time, thus making the life of a passive house in a heavy rainfall area even more permanent.

In Miyazaki Prefecture, located at 31°41' north latitude, the thicker the foundation insulation in contact with the ground, the less heat radiation can be radiated to the ground, making it difficult to meet cooling demand. Therefore, the cooling demand must be met by contrasting solar radiation shielding with solar radiation acquisition, and by fine-tuning the thickness and materials of the soil insulation.

Therefore, a passive house to be built in southern Japan needed to be designed with a specific plan for heavy rainfall and heat, and it was also necessary to learn about the historical architectural style of the region.

物件概要

宮崎県、モンスーンアジア豪雨地帯のパッシブハウス。

世界でも豪雨地帯であるモンスーンアジアの東端に位置する日本は、年間平均1,718mmの降水量があり、これは世界平均の約2倍に相当します。

今回の住宅が建つ宮崎県は、日本の中でもとりわけ降水量の多い地域に建つパッシブハウスであり、降水量の多い地域ならではの発想で降雨に負けない末永く暮らすための建築様式を持つパッシブハウスです。宮崎県は東に太平洋、西に山岳地帯という特徴的な環境下であり、年間平均降水量は2,730mmです。これは日本における年間平均の約1.5倍、世界の年間平均の約3倍に相当する豪雨地帯です。

これほどの雨量となると経年における雨漏りを前提とした対策が必要です。

そのためこの建物は、人が暮らす範囲にのみ断熱エリアを限定して横架構造物上に断熱を水平敷設。

屋根形状は水の流れが促される勾配を担保した傾斜として、防水ラインと断熱ラインには小屋裏空間が出来るように確保しています。小屋裏に上がれば雨漏れの目視確認ができるだけでなく必要な対処が長期間できることで豪雨地帯におけるパッシブハウスの寿命を更に恒久的なものにできる工夫をしています。

北緯31°41'に位置する宮崎県の冷房需要は、地中と接する基礎断熱が分厚くなるほど地中への熱放射が出来なくなり、冷房需要を満たすことが困難になります。そのため日射遮蔽と日射取得の対比、土間断熱の厚みや素材の微調整で冷房需要を満たさなくてはなりません。

以上のことから日本南部で建築するパッシブハウスは、豪雨と暑さに対して具体的な計画をもって望む必要があり、その土地で生まれた歴史的建築様式も学び設計する必要がありました。

Responsible project participants

物件関係者

Architect 基本設計者	Yasuhiro Tanaka / Tanakahome Co., Ltd. http://tanakahome.jp
Implementation planning 実施設計者	Yasuhiro Tanaka / Tanakahome Co., Ltd. http://tanakahome.jp
Building systems 設備設計者	Ayano Kuwabata / Tanakahome Co., Ltd. http://tanakahome.jp
Structural engineering 構造設計者	-
Building physics 建築物理	Yasuhiro Tanaka / Tanakahome Co., Ltd. http://tanakahome.jp
Passive House project planning パッシブハウス・コンサルタント	Yasuhiro Tanaka / Tanakahome Co., Ltd. http://tanakahome.jp
Construction management 現場監理	Yusuke Asaoka / Tanakahome Co., Ltd. http://tanakahome.jp

Certifying body

認定機関

Passive House Japan
www.passivehouse-japan.org

Certification ID

PHデータベース ID

6969

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

Author of project documentation

本物件記録の作成者

Yasuhiro Tanaka / Tanakahome Co., Ltd.
<http://tanakahome.jp>

Date
日付

Signature
署名

21.10.2022

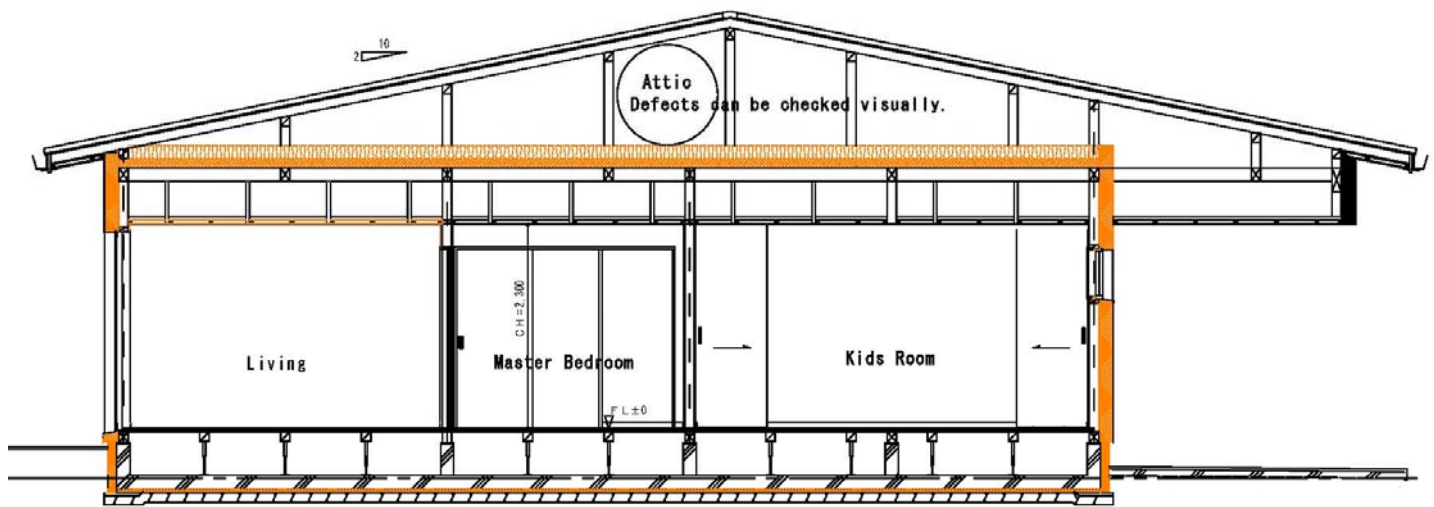
1. Exterior view 外観写真



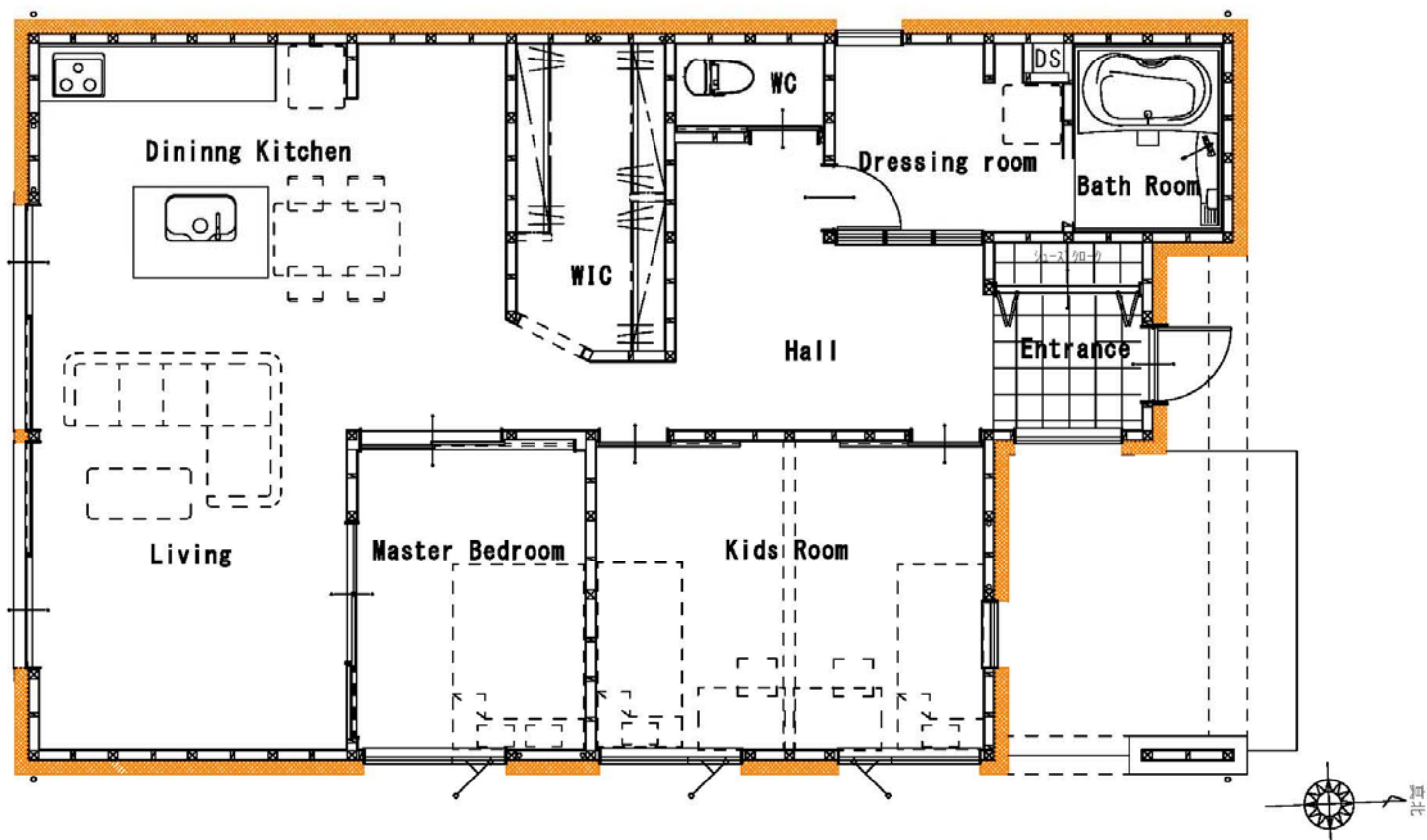
2. Interior photo 室内写真



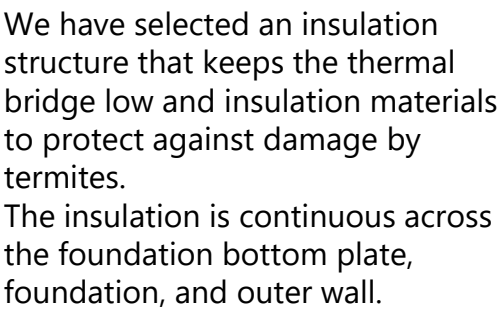
3. cross-section view 断面図



4. Ground plan 平面図

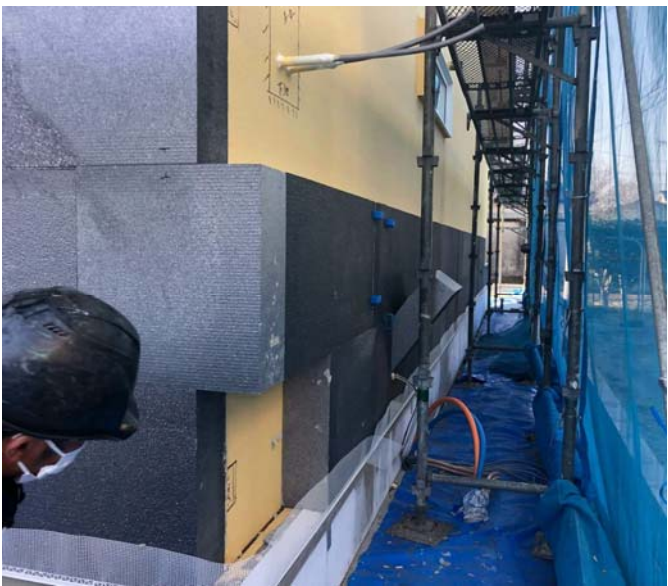
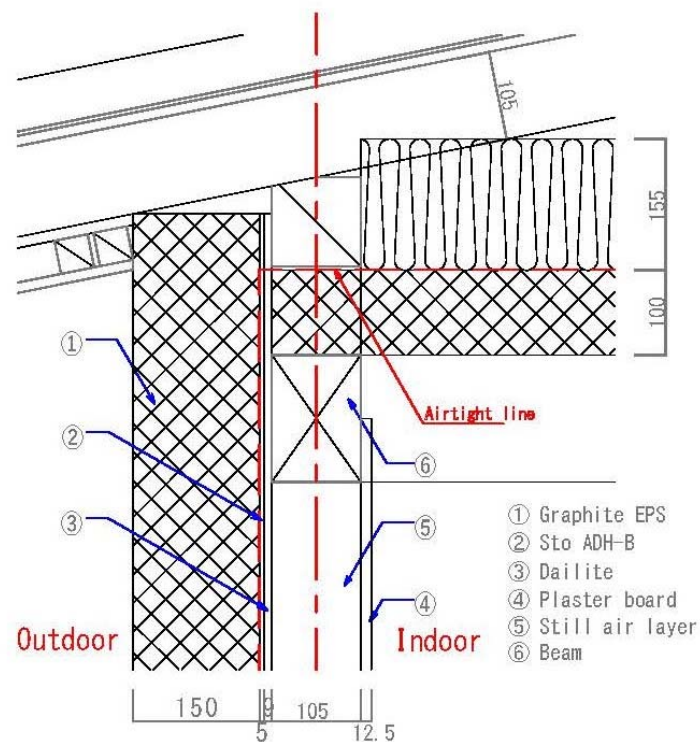


5. Floor slab construction 床（または基礎）の構成

Page | Seite

6. Exterior wall construction 外壁の構成

The insulation is continuous from the wall to the roof. Graphite EPS is 150mm, eliminating filling insulation that causes thermal bridges and realizing a passive house with only external insulation. This is an idea unique to warm climates.



部位番号

03udTanaka.wall

内断熱?

表面熱抵抗[m²K/W]

外皮の方位0.13

室内側 R_{si}0.13

外部条件0.04

屋外側 R_{se}0.04

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]
Plaster board	0.210					12.5
Air cavity	0.570	timber	0.130			105
Dailite	0.130					9
Sto ADH-B	0.660					5
Graphite EPS	0.033					150

断面1の割合83%

断面2の割合16.64%

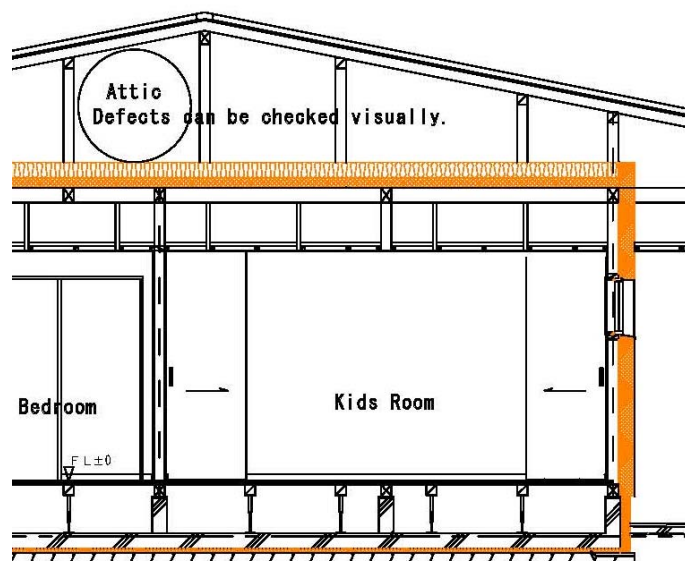
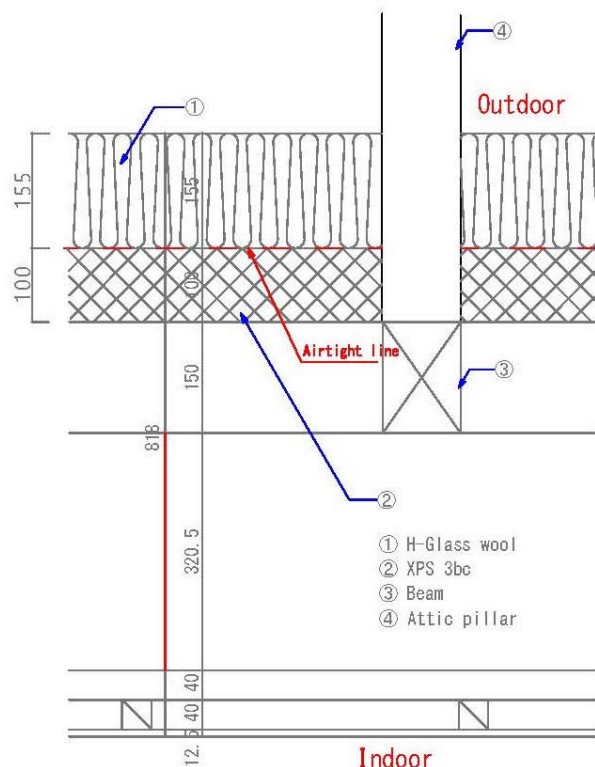
断面3の割合

合計28.2cm

U値の補正

U値: 0.196 W/(m²K)

7. Construction of the roof 屋根の構成



A 100 mm XPS is laid on the beam girder and joined with tape to create an airtight line. Place 155mm High-Grass Wool neatly on top of it. We have secured a space where the risk of rain leakage can be monitored and dealt with over the long term. In addition, energy loss is very small because the only thermal bridge generated in the girder insulation line is the attic pillar.

部位番号

02ud

Tanaka.roof.keta

内断熱?

外皮の方位 0.13

外部条件 0.13

表面熱抵抗[m²K/W]

室内側 R_{si} 0.13

屋外側 R_{se} 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)]
Plaster board	0.210				
Air cavity	3.370				
Air cavity	3.370	Timber	0.130		
XPS 3bc	0.028				
HGW	0.038				

厚み [mm]

13

401

150

100

155

断面1の割合

89%

断面2の割合

11.5%

断面3の割合

合計

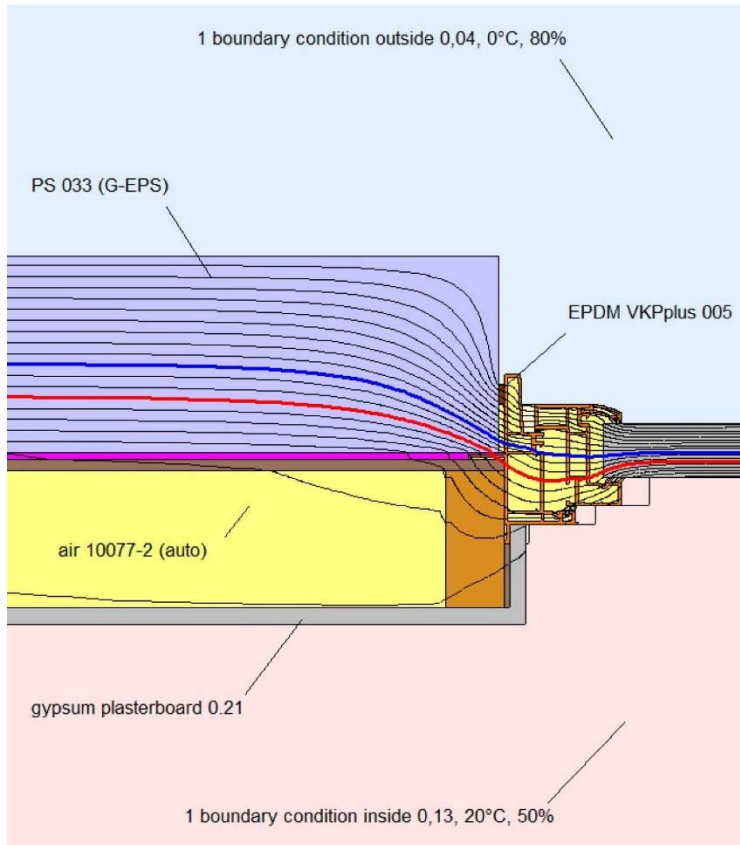
81.8

cm

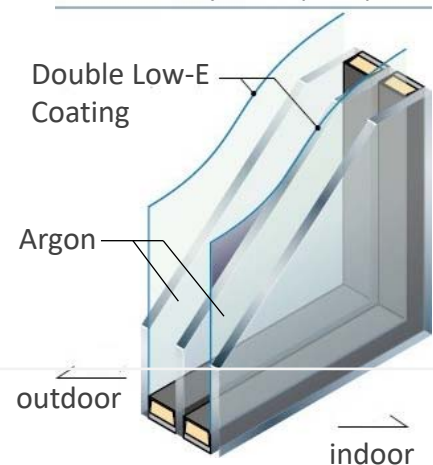
U値の補正 W/(m²K)

U値: 0.122 W/(m²K)

8. Windows and window installation 窓とその収まり図



Low-gain type
South $\eta=0.47$ (Neutral)
Others $\eta=0.30$ (Blue)

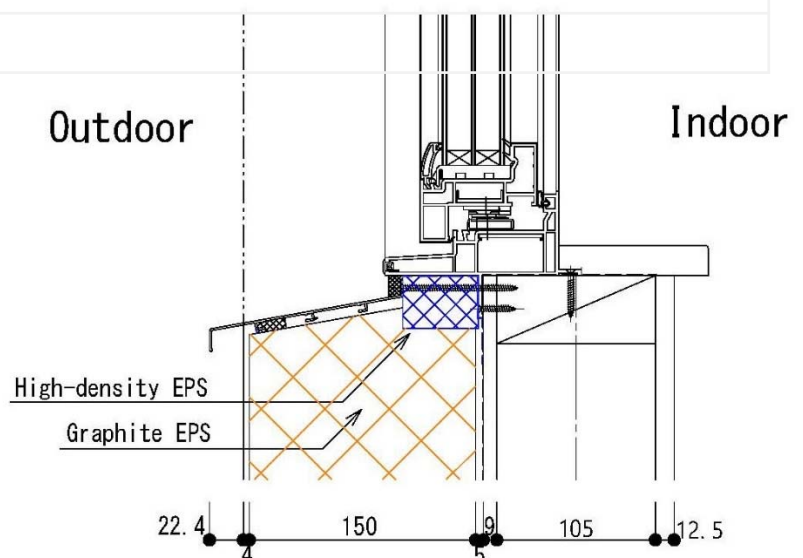


Beschreibung der Fenster (rahmen)-Konstruktion, Hersteller	YKK AP Inc.
Fabrikat Fenster (rahmen; Produktname)	APW430 ; PVC Frame
Rahmen-U-Wert U_f	1,4 W/(m ² K)
Bauart der Verglasung	Argon gas filling ; 3 16 3 16 3
Glas-U-Wert U_g	0,65 W/(m ² K)
g-Wert der Verglasung	0,50

Many Japanese windows are designed to be installed on the outside of the exterior wall to reduce rainwater intrusion. As a result, the sash drainage is installed in the center, resulting in a large thermal bridge.

This is where we turned our attention to "high-density EPS.

By using this material, the mounting position of the water drain can be moved away from the exterior wall, successfully reducing thermal bridges.



9. Description of the airtight envelope 気密測定結果

After completion of the airtight line work, airtightness measurements were taken on February 14, 2022.



Measurement	50 Pa pressure test air exchange $n_{50} \text{ h}^{-1}$
Decompression	0.33
Pressurization	0.44
Average value	0.39

Airtightness Concept

Wall: Interior wallpaper

Floor slab: concrete

Window connections: sealing tape + airtight tape used
Roof: solid insulation laid on girders. Airtight tape on joint surfaces.

Connection between painted wall and window frame: sealing tape

減圧法						
測定	1		2 (必要であれば)		3 (必要であれば)	
	Δ P	Fan Flow Q	Δ P	Fan Flow Q	Δ P	Fan Flow Q
測定点	[Pa]	[m³/h]	[Pa]	[m³/h]	[Pa]	[m³/h]
1	21	41				
2	27.4	45				
3	35.4	54				
4	42.7	63				
5	50	72				
			1	2	3	
特性値			n(1≦n≦2)		1.51	
通気性			a(m³/h・Pa ^{1/n})		5.3	
Δ P = 9.8Pa 換気量			Q9.8(m³/h)		23.8	
係数 b			b:b=0.627p ^{1/2}		0.696	
Δ P = 50Pa 換気量			Q50(m³/h)		70	
			Q50(m³/h)平均		70	
加圧法						
測定	1		2 (必要であれば)		3 (必要であれば)	
	Δ P	Fan Flow Q	Δ P	Fan Flow Q	Δ P	Fan Flow Q
測定点	[Pa]	[m³/h]	[Pa]	[m³/h]	[Pa]	[m³/h]
1	19.9	45				
2	26.8	57				
3	34.2	64				
4	41.7	79				
5	49.3	96				
			1	2	3	
特性値			n(1≦n≦2)		1.24	
通気性			a(m³/h・Pa ^{1/n})		4	
Δ P = 9.8Pa 換気量			Q9.8(m³/h)		25	
係数 b			b:b=0.627p ^{1/2}		0.692	
Δ P = 50Pa 換気量			Q50(m³/h)		93	
			Q50(m³/h)平均		93	
結果		正味風量 Vt		208.97 m³ (PHPPによる)		
	Q50	不確実性		n50	不確実性	
	m³/h	%		1/h	%	
減圧法	70			0.33		
加圧法	93			0.44		
平均	81.5			0.39		

10. Ventilation unit 換気装置

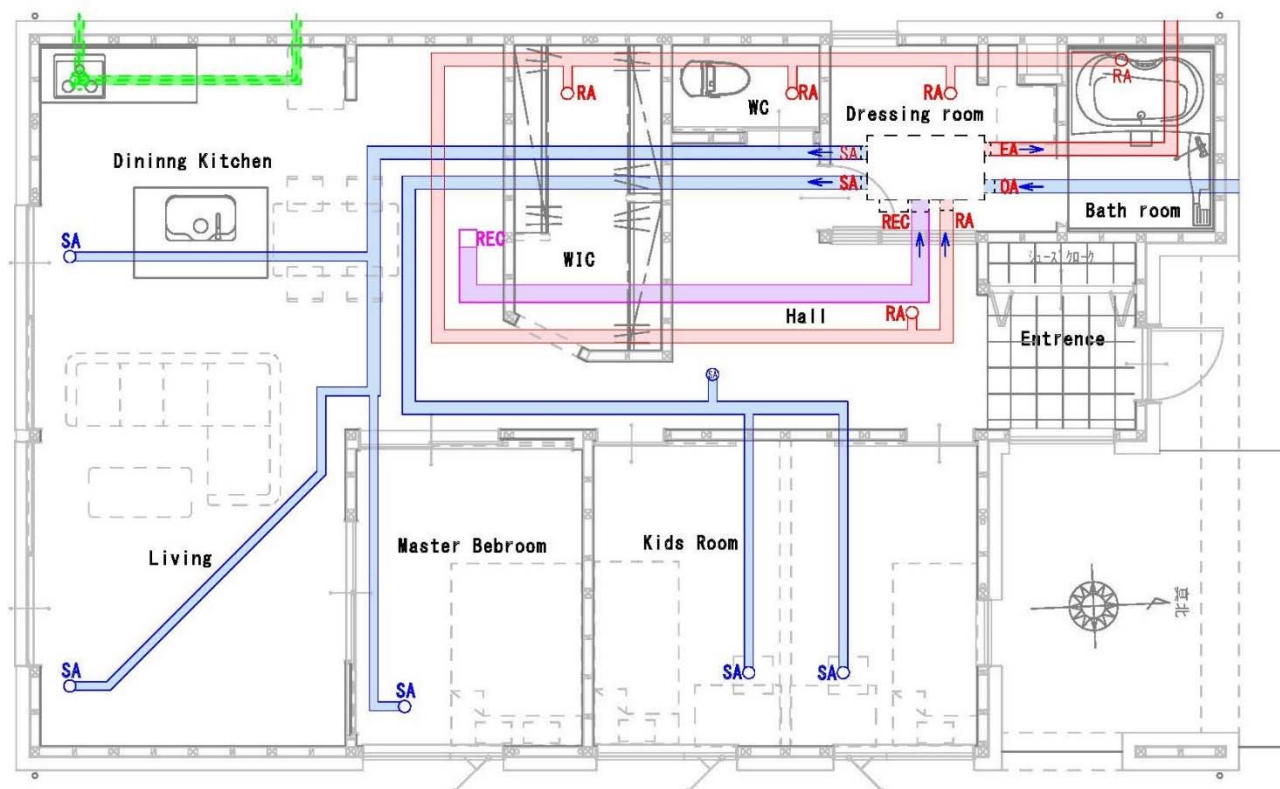
It is equipped with highly efficient latent and sensible heat exchange, and also has a mechanism for cooling, heating, and dehumidification by means of an air heat pump.

This eliminates the need for a complicated system and reduces equipment costs because a single unit has many functions.



Make ventilation system	Zehnder China, CHM200 (PHI Certified Component)
effective heat supply rate	78 %
Humidity exchange efficiency	54 %
Electrical efficiency	0,45 Wh/m ³

11. Ventilation planning duct networkダクト計画



The air supply rooms are all main rooms (blue: supply air duct): Kids room, bedroom, dining room, living room and hall.

Exhaust rooms (red: exhaust duct) are bathrooms, toilets, and Dressing rooms and halls.

REC functions as a return when using the air conditioner.

12. hot-water supply 給湯

We have adopted an air heat pump water heater that uses CO2 as a refrigerant.



Shifts peak electricity demand by controlling nighttime operation.

Annual water heating and heat retention efficiency is 3.3. (JIS C9220:2018)

In the future, we intend to consider equipment that can contribute to further reduction of environmental impact, such as combined use with solar water heaters and utilization of exhaust heat from pellet stoves.

●製品仕様書

■この仕様値は、JIS C 9220:2018 に基づいた数値です。

[システム]

形式	CHP-E37AY4
適用電力制度	時間帯別電灯型、季節別時間帯別電灯型 (通電制御型)
相数 定格電圧 定格周波数	単相 200V 50/60Hz
最大電流	17A
沸上げ温度範囲	約65℃~約90℃
年間給湯効率率 (JIS) ※1※2	3.3
電源線配線径	3.5mm ² (φ2.0) ×2芯
専用ブレーカ容量	20A
リモコン線最大延長	30m (0.3mm ²)
給水器具認証番号	9-G2-TG-36

[貯湯ユニット]

形式	CTU-E37AY4
種類	屋外形
タンク容量	370L (1缶)
缶体材質	SUS
水側最高使用圧力	290kPa (減圧弁設定圧: 260kPa)
外形寸法 (高さ×幅×奥行)	1860mm×630mm×730mm (脚高さ180mm)
質量 (製品質量/満水時質量)	60kg/430kg
外装色	DIC G-258相当、マンセルNo. 5GY8.5/0.5<近似>
消費電力	ふろ保温 65W:循環ポンプ
	凍結防止ヒータ ー
	制御用 5W
貯湯機能	おまかせ省エネ・おまかせ・使いきり・満タン・タンク満増し・今日の満増し休止
ふろ給湯機能	自動湯はり・自動保温・省エネ保温・自動たし湯・追いだし湯・さし水・高温さし湯 (追いだしスイッチ3秒押し)
設置可能最低外気温度	-10℃
固定用アンカーサイズ	M12×3本 (地上層の場合) (2階以上への据付け時はP4/14を参照)
同上用スラブ厚	150mm以上 (コンクリート圧縮強度は18MPa以上)
メンテナンススペース	前方600mm
別売品他	壁固定金具・壁固定金具補助・脚固定金具・脚カバー

[ヒートポンプユニット]

形式	CHP-YA453
外形寸法 (高さ×幅×奥行)	720mm×792mm [カバー部+92mm] ×299mm
質量	48kg
外装色	ナチュラルグレー、マンセルNo. 2.9Y7.8/1<近似>
中間期標準加熱能力/消費電力 ※3※4	4.5kW/0.970kW
中間期標準運転電流※4	6.2A
中間期標準エネルギー消費効率	4.6
冬期高負加熱能力/消費電力 ※3※5※6	4.5kW/1.500kW
ヒートポンプ運転音 (音圧レベル) ※7 (付属品※4/冬期※5)	51dB/55dB
冷媒名及び封入量	CO ₂ 0.810kg
設計圧力 (高圧/低圧)	13.3MPa/8.0MPa
設置可能最低外気温度	-10℃
固定用アンカーサイズ	M10×4本
別売品他	防雪カバー・風向板
その他	ー

12. Heating 暖房

Air heat pump supplied air heating and cooling.



zehnder

The CHM200 (Comfohome) developed by Zehnder, Inc. This product is PHI certified and features heat exchange ventilation and heating/cooling as one complete system.

It also monitors the carbon dioxide concentration in the room to create a comfortable air environment, and automatically adjusts to provide good air quality as needed.

Certificate

Certified Passive House Component
For cool, temperate climates, valid until 31 December 2022

Category: **Ventilation unit equipped with heat pump**

Manufacturer: **Zehnder (China) Indoor Climate Co., Ltd.**
Beijing One Plaza F18, Zhongshan Street 59, Tongzhou District

Product name: **CHM 200**

This certificate was awarded based on the following criteria for ventilation part:

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	$P_{\text{el}} \leq 0.45 \text{ Wh/m}^3$
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	Sound level $L_w \leq 35 \text{ dB(A)}$ not met Here $L_w = x \text{ dB(A)}$ Unit should be installed so that it is acoustically separated from living areas
Indoor air quality	Outdoor air filter at least F7 Extract air filter at least G4
Frost protection	Frost protection for the heat exchanger with continuous fresh air supply down to $\theta_{\text{outdoor air}} = -15 \text{ }^{\circ}\text{C}$

This certificate was awarded based on the following criteria for heat pump part:
(limit values for final energy consumption):

Space heating	9 kWh/(m ² y)
Space cooling (humid climate):	13 kWh/(m ² y)
Space cooling (dry climate):	11 kWh/(m ² y)

Further information can be found in the appendix of this certificate.

www.passivehouse.com

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Certified for air flow rates of

125-200 m³/h

Winter performance of ventilation

$\eta_{\text{HR,eff}}: 78 \%$
 $\eta_{\text{MR,eff}}: 54 \%$
P_{el}: 0.45 Wh/m³

Performance of heat pump

Heating
8.9 kWh/(m²y)

Cooling DRY
6.7 kWh/(m²y)

Cooling WET
8.6 kWh/(m²y)

CERTIFIED COMPONENT
Passive House Institute

1443ch02

13. Building costs 建設コスト

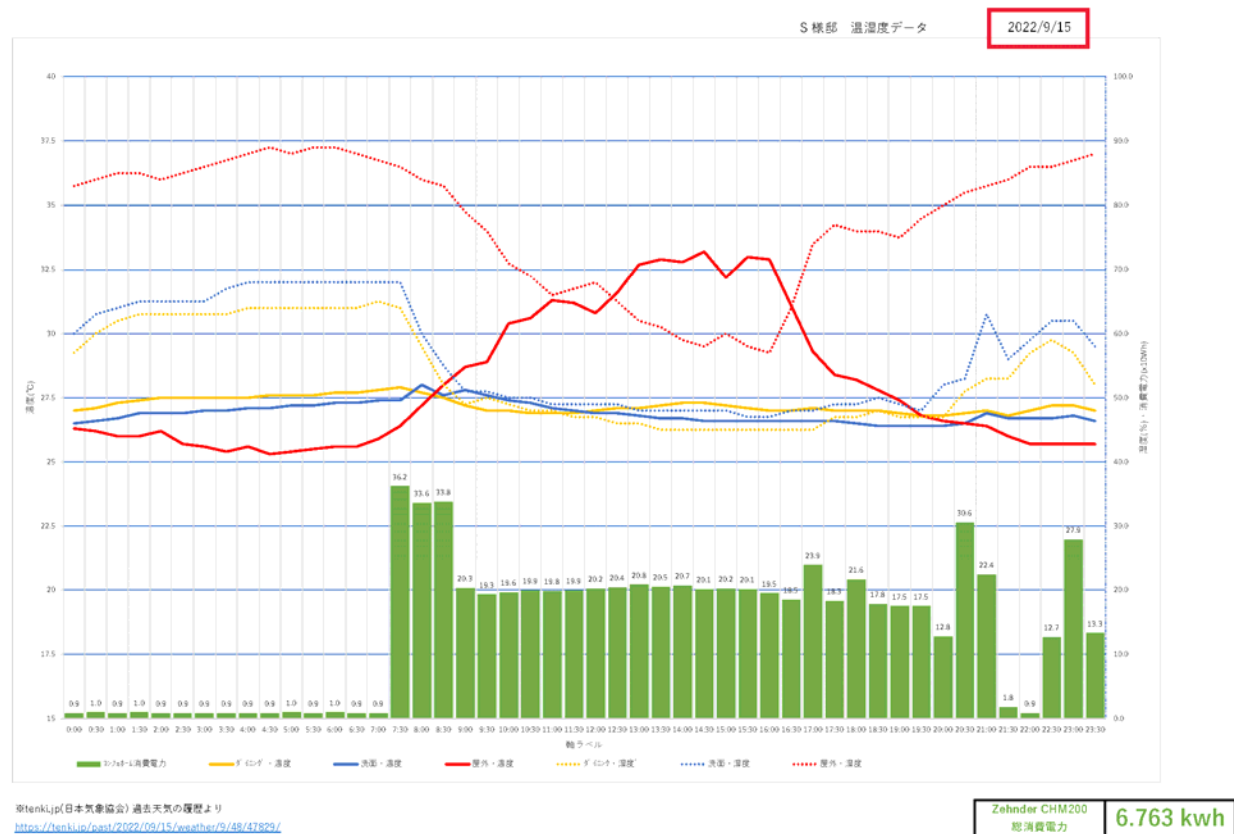
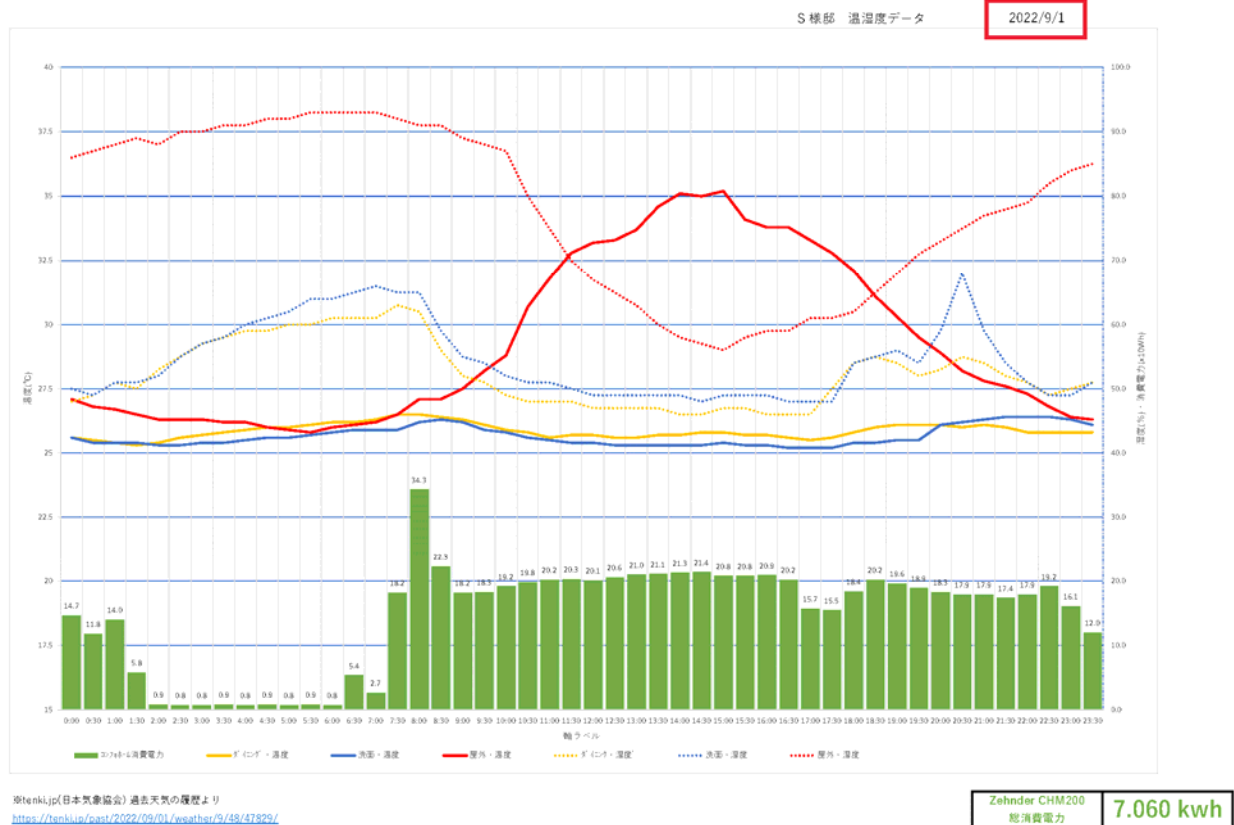
Koorimoto Passive House 2022 is located in a region with heavy rainfall and high temperatures and humidity. Building a Passive House in this region required a new approach to overcome several challenges. It was also necessary to consider a high degree of cost-consciousness, as the understanding of high thermal insulation and airtightness is not yet widespread in this region. We were able to keep costs simple by using only external insulation without filling insulation material in the insulation structure, and the construction cost was 250,000 yen/m² (including tax).

14. Literatur 参考文献

Passive House Planning Package.

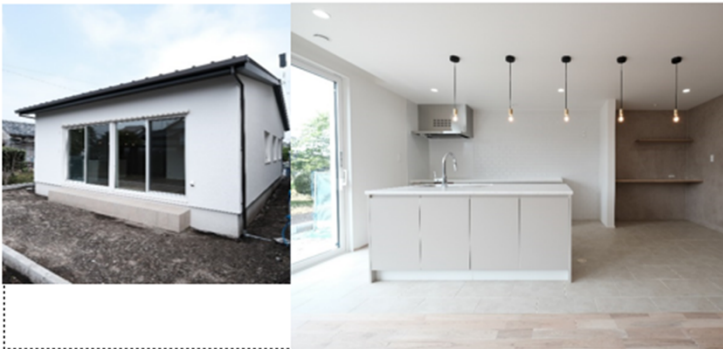
15. User's Experiences ユーザーの体験

Owner : The indoor environment is good, and the sound of airflow is low. However, the air conditioning may become over-effective at certain times of the day, so efforts are being made to adjust the amount of airflow and temperature settings.



15. PHPP-Ergebnisse 結果シート

パッシブハウス Verification



物件名:	Koorimoto Passive House		
番地・町名:	3-8-15 Koorimoto Miyakonojyo		
郵便番号/都市名:	885-0013	Miyazaki	
都道府県/国:		JP-日本	
用途:	専用住宅		
気象データ:	ud-00-JP0024a-Miyazaki		
気候区分:	5: Warm (温帯気候)	建設地の標高:	152.6 m
建築主 / クライアント:	Hirotsugu Suzuki		
番地・町名:	3016-2 Korimoto Miyakonojyo		
郵便番号/都市名:	885-0013	Miyazaki	
都道府県/国:		JP-日本	
設備設計者:	Ayano Kuwabata, Tanakahome.Co.,Ltd.		
番地・町名:	67-1 Kaminagae, Miyakonojyo		
郵便番号/都市名:	885-0042	Miyazaki	
都道府県/国:		JP-Japan	
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

設計者:	Hirotsugu Suzuki, Tanakahome.Co.,Ltd.		
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都道府県/国:		JP-日本	
エネルギーコンサルタント:	Yasuhiro Tanaka, Tanakahome.Co.,Ltd.		
番地・町名:	67-1 Kaminagae Miyakonojyo		
郵便番号/都市名:	885-0042	Miyazaki	
都道府県/国:		JP-日本	
竣工年:	2022		
ユニット数:	1		
利用者数:	2.2		

有効床面積を元に計算した建物の性能

		有効床面積 m²		基準	代替基準	すべて記入しましたか?
暖房	暖房需要 kWh/(m²a)	12.16	≤	15	-	Yes
	暖房負荷 W/m²	9.30	≤	-	10	
	年間冷房負荷	24.23	≤	24	24	
年間冷房負荷	年間冷房 & 除湿需要 kWh/(m²a)	11.05	≤	-	11	Yes
	冷房負荷 W/m²	-	≤	-	-	
	オーバーヒートの頻度 (> 25 °C) %	0	≤	10	-	
気密性能	湿度過多の頻度 (> 12 g/kg) %	0.39	≤	0.6	-	Yes
	50PA時の漏気回数 1/h	108	≤	-	-	
	旧一次エネルギー基準 (PE)	54	≤	60	60	
新一次エネルギー基準 (PER)	一次エネルギー消費量 (PER) kWh/(m²a)	0	≤	-	-	Yes
	垂直投影面積に対する再生可能エネルギー総エネルギー kWh/(m²a)		≥			

² 空欄: データ不足; -: 該当なし

ここに記載されている計算結果はPHPPの正しい入力に基づき、建物の実際の状況に即していることを証明します。

パッシブハウス クラシック?

Yes

Completion year : 2022

Koorimoto Passive House led performance by PHPP.

Design-PH was able to greatly reduce the workability.

From modeling to assigning physical property values, it is very significant that we were able to tackle the complicated work with visuals that are easy to imagine.

By establishing this series of styles, I have not only been able to see many Passive House projects from the first glance, but I have also been able to handle multiple projects.