

## Troni Brien House in the mountains

by Arquiambiente Ltda / 2019-06-04 00:52:00 / Internacional / 4459 / EN



New Construction

Primary energy need :

**88** kWhpe/m<sup>2</sup>.year

(Calculation method : Other )

### ENERGY CONSUMPTION

*Economical building*

*Building*

< 50 **A**

51 à 90 **B**

91 à 150 **C**

151 à 230 **D**

231 à 330 **E**

331 à 450 **F**

> 450 **G**

*Energy-intensive building*

**Building Type** : Terraced Individual housing

**Construction Year** : 2014

**Delivery year** : 2015

**Address 1 - street** : Camino a Farellones 40601 Lo Barnechea 76900 SANTIAGO, Chile

**Climate zone** : [Csa] Interior Mediterranean - Mild with dry, hot summer.

**Net Floor Area** : 275 m<sup>2</sup> Superficie útil

**Construction/refurbishment cost** : 315 000 €

Cost/m<sup>2</sup> : 1145.45 €/m<sup>2</sup>

Certifications :



Proposed by :



## General information

**Troni-Brien House is a single family project with particular clients which were looking to live in a Zero Energy House, therefore the right standard to design with was Passivhaus. In Chile, normal housing heating demands about 150 to 200 kWh/m<sup>2</sup>. With Passivhaus requirements this house demands 15kWh/m<sup>2</sup> per year.**

Troni House is located in the mountain range of Santiago, Chile called Farellones. It's a rural area 1350 mamsl with a climate of warm summers and cold winters, with snow and temperatures below 0°C.

The building is facing north with large windows to enjoy the view and solar gains in winter, protected by eaves which provide shade and prevent overheating in summer.

The design phase started in 2012, the construction process started in November 2013 and the house was completed by April 2015.

The Project development and construction process have constantly encountered challenges. The construction cost was an important issue, in Chile there is only one Passivhaus certified project so the construction technical requirements are far from standard, and the site difficult access increased the problem. Including all systems the construction of the project is around 40% more expensive than a traditional house in Chile.

In order to ease the materials transport to the site, the project was designed with light weight SIP panels, and an additional internal steel structure was needed for seismic requirements.

The construction materials and systems were mostly covered by imported products available in Chile, only sealing air tight products were brought from Germany.

## See more details about this project

[https://passivehouse-database.org/index.php?lang=en#d\\_4591](https://passivehouse-database.org/index.php?lang=en#d_4591)

## Photo credit

Dino Troni

## Stakeholders

### Contractor

Name : Arquiamiente

Contact : [contacto@arquiamiente.cl](mailto:contacto@arquiamiente.cl)

<http://www.arquiamiente.cl/>

### Construction Manager

Name : Arquiamiente

Contact : [contacto@arquiamiente.cl](mailto:contacto@arquiamiente.cl)

<http://www.arquiamiente.cl/>

### Stakeholders

Function : Contractor

### Contracting method

General Contractor

### Type of market

**Table 'c21\_spain.rex\_market\_type' doesn't exist**

### Building users opinion

The house is performing completely within expectations and we are extremely grateful to all of you for the way in which you have contributed to realize a pioneer house in Chile in terms of sustainability and energy use.

- The interior temperature stays between 20 and 23 degrees regardless of the cold or external

heat. Better than expected

- The performance of the Photovoltaic solar panels is very good. We are producing more photovoltaic energy than projected.
- The mechanical ventilation system has been a great discovery. Air quality and sleep improve significantly. Floating dust is drastically reduced.
- The passive solar design lets in the sun in the day in winter and not in summer. The solar angles on the terraces work as designed.
- We are happy to see that everything works as planned.
- We consider our civil and Christian duty to promote the use of renewable and sustainable energies and systems. If you need to take the house as an example with potential clients, testimonies, articles, etc., we will support you.

## Energy

### Energy consumption

Primary energy need : 88,00 kWhpe/m<sup>2</sup>.year

Primary energy need for standard building : 88,00 kWhpe/m<sup>2</sup>.year

Calculation method : Other

Breakdown for energy consumption : Annual heating demand : 15 kWh/m<sup>2</sup>a

Heating load : 12 W/m<sup>2</sup>

### Envelope performance

More information :

Exterior wall : U-value = 0.166 W/(m<sup>2</sup>K)

Basement floor / floor slab : U-value = 0.218 W/(m<sup>2</sup>K)

Roof : U-value = 0.085 W/(m<sup>2</sup>K)

Frame : U<sub>f</sub>-value: 1,70W/(m<sup>2</sup>K) - U<sub>w</sub>-value = 1.43 W/(m<sup>2</sup>K)

Glazing : U<sub>g</sub>-value = 1.2 W/(m<sup>2</sup>K) - g -value = 60 %

Entrance door : U<sub>d</sub>-value = 1 W/(m<sup>2</sup>K)

Thermal envelope description :

- Exterior wall : From inside to outside: Gypsum plasterboard plate 15 mm, wooden partition filled with glass wool 50 mm, SIP-Panel OSB-OSB 210 mm, fiber cement siding.
- Basement floor / floor slab : From top to bottom: Wooden pavement, concrete slab 50 mm, EPS plates 30Kg/m<sup>3</sup> 150 mm, reinforced concrete slab 100 mm.
- Roof : From bottom to top: EPS plates 30 Kg/m<sup>3</sup> 120 mm, OSB plate 11 mm, roof framing made with I-Joist rafters and filled with glass wool 240 mm, secondary roof framing made with wooden joists and filled with glass wool 100 mm, 11 mm OSB plate, ventilated roof with Techshield OSB plate.

- Frame : Kömmerling, Marco PVC Eurodur 3S  
PVC Frame
- Glazing : Transparent double glazed glass with Low-E coating, argon gas fill and aluminum spacers.
- Entrance door : Wooden structure insulated with glass wool. Windows with transparent double glazed glass with Low-E coating, argon gas fill and aluminum spacers.

Indicator : n50

Air Tightness Value : 1,90

## More information

Consumptions are calculated according to PHPP (passiv'haus)

## Renewables & systems

### Systems

Heating system :

- Electric floor heating

Hot water system :

- Individual gas boiler
- Solar Thermal

Cooling system :

- No cooling system

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Solar Thermal

Renewable energy production : 100,00 %

Other information on HVAC :

Ventilation

Zehnder, ComfoAir 350

Integrated cross-counterflow heat exchanger ventilation unit.

eff. specif. HRE: 82%

Heating installation

Electrical sheets floor Jolly Fenix Floor and Jolly Fenix Term.

Domestic hot water

UniClima EVO 2.0 solar collectors, W2 Solar SICCC 300 liters storage tank, UniClima solar hydraulic kit . Auxiliary gas water heater.

Photovoltaic installation: Solarwatt 60P 250 Wp solarmodules, SMA Technology Sunny Boy PV Inverter, Solar-Log solar monitoring system.

Average annual generation: 9.445 kWh/a

100% of the electricity demand and 76% of the hot water demand it is projected.

## Environment

### Urban environment

The house is located on an artificial terrace carved into the hill in the mountain range of Santiago, in a rural area at 1350 meters high.

Land plot area : 22 900,00 m<sup>2</sup>

Built-up area : 1,00 %

## Products

### Product

ComfoAir 350

Zehnder

<https://www.zehndergroup.com/en>

Product category : Table 'c21\_spain.innov\_category' doesn't exist SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '19'

Integrated cross-counterflow heat exchanger ventilation unit.

eff. specif. HRE: 82%

easy to install and friendly control



Jolly Fenix Floor

Jollytherm

<https://www.jollytherm.de/>

Product category : Table

```
'c21_spain.innov_category' doesn't exist
SELECT one.innov_category AS
current,two.innov_category AS
parentFROM innov_category AS
oneINNER JOIN innov_category AS two
ON one.parent_id = two.idWHERE
one.state=1AND one.id = '18'
```

easy to install



Jolly Vario Therm

Jollytherm

<https://www.jollytherm.de/>

Product category : Table

```
'c21_spain.innov_category' doesn't exist
SELECT one.innov_category AS
current,two.innov_category AS
parentFROM innov_category AS
oneINNER JOIN innov_category AS two
ON one.parent_id = two.idWHERE
one.state=1AND one.id = '18'
```

easy to install





---

## UniClima EVO 2.0 solar collectors

UniClima

**Product category :** Table 'c21\_spain.innov\_category' doesn't exist  
SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '18'

good performance

---

## Solarwatt 60P

Solarwatt

<https://www.solarwatt.com>

**Product category :** Table 'c21\_spain.innov\_category' doesn't exist  
SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '31'

we are getting more energy than projected



---

## Sunny Boy PV Inverter

SMA Technology

<https://www.sma-uk.com>

**Product category :** Table 'c21\_spain.innov\_category' doesn't exist  
SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '31'

good performance



---

## Solar-Log solar monitoring system

Solar-Log

<https://www.solar-log.com/en/>

**Product category :** Table 'c21\_spain.innov\_category' doesn't exist  
SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS



oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '31'

very useful to teach children

## Costs

### Construction and exploitation costs

Total cost of the building : 315 000 €

## Contest

### Reasons for participating in the competition(s)

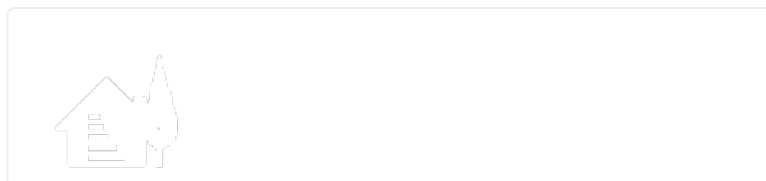
The house is located on an artificial terrace carved into the hill, joining it and facing north, taking advantage of exceptional sunlight conditions and privileged views of the valley.

These conditions required to project a north facade with large windows to enjoy the view and solar gains in winter, protected by eaves which provide shade and prevent overheating in summer. Besides a large sun roof that covers 100% of the electricity demand and a surplus of electrical energy is injected into the public electricity network. 76% of the hot water demand it is projected.

The energy demand and consumption were determined through PHPP software according to all Passivhaus requirements. Additionally to calculate the Zero Energy balance a specific consumption profile was created according to the expected Family activities and renewable energy systems were integrated in the design.

The solar thermal and photovoltaic systems contributions are 5.070 [kWh/y] and 12.743 [kWh/y] correspondingly, based on calculations performed with Dr. Valentin Energie Software GmbH.

### Building candidate in the category





**Energy & Temperate Climates**



**Health & Comfort**



**Users' Choice**