# Troni Brien House in the mountains

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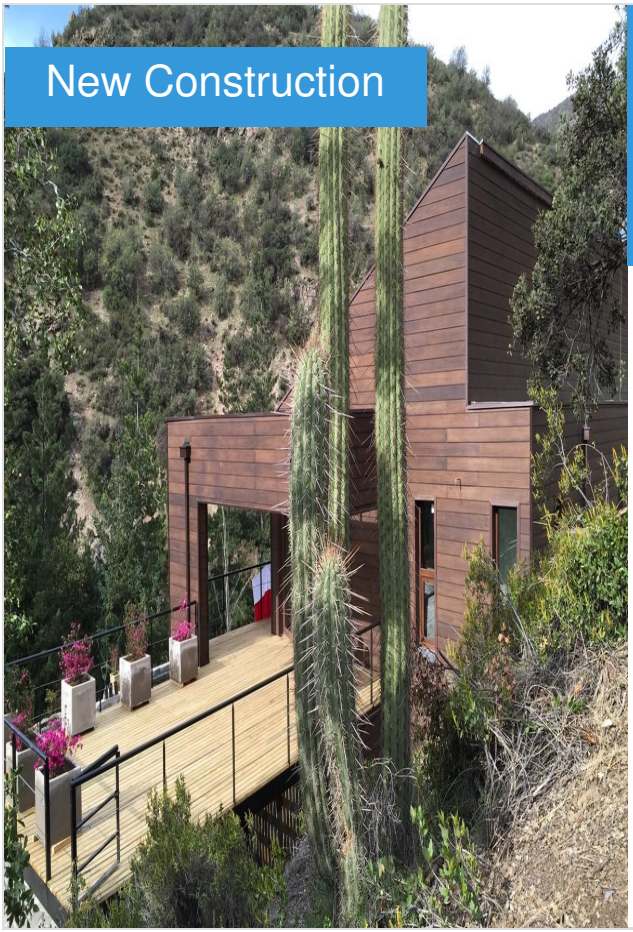


**Primary energy need :**

**88 kWhpe/m².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 m²
**Construction/refurbishment cost** : 315 000 €

**Number of Dwelling** : 1 Dwelling
**Cost/m2** : 1145.45 €/$m^2$

**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/m2. With Passivhaus requirements this house demands 15kWh/m2 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.

he design phasestarted in 2012, the construction process started in November 2013 and thehouse was completed by April 2015.

The Project development and construction process haveconstantly encountered challenges. The construction cost was an importantissue, in Chile there is only one Passivhaus certified project so theconstruction 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 additionalinternal 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

## Photo credit

Dino Troni

# Stakeholders

## Contractor

Name : Arquiambiente
Contact : contacto@arquiambiente.cl
http://www.arquiambiente.cl/

## Construction Manager

Name : Arquiambiente
Contact : contacto@arquiambiente.cl
http://www.arquiambiente.cl/

## Stakeholders

Function : Contractor

## Contracting method

General Contractor

## Type of market

**Table 'c21_belgium.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 to support you.

# Energy

## Energy consumption

Primary energy need : 88,00 kWhpe/$m^2$.year

Primary energy need for standard building : 88,00 kWhpe/$m^2$.year

Calculation method : Other

Breakdown for energy consumption : Annual heating demand : 15 kWh/m2a
Heating load : 12 W/m2

## Envelope performance

More information :
Exterior wall : U-value = 0.166 W/(m2K)
Basement floor / floor slab : U-value = 0.218 W/(m2K)
Roof : U-value = 0.085 W/(m2K)
Frame : Uf-value: 1,70W/(m²K) - U w-value = 1.43 W/(m2K)
Glazing : U g-value = 1.2 W/(m2K) - g -value = 60 %
Entrance door : U d-value = 1 W/(m2K)

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/m3 150 mm, reinforced concrete slab 100 mm.
- Roof : From bottom to top: EPS plates 30 Kg/m3 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 SICC 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 $m^2$

Built-up area : 1,00 %

## Products

### Product

ComfoAir 350

Zehnder

https://www.zehndergroup.com/en

Product category : Génie climatique, électricité / Ventilation, rafraîchissement

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 : Génie climatique, électricité / Chauffage, eau chaude

easy to install

Jolly Vario Therm

Jollytherm

https://www.jollytherm.de/

Product category : Génie climatique, électricité / Chauffage, eau chaude

easy to install

UniClima EVO 2.0 solar collectors

UniClima

Product category : Génie climatique, électricité / Chauffage, eau chaude

good performance

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Solarwatt 60P

Solarwatt

https://www.solarwatt.com

Product category : Second œuvre / Equipements électriques (courants forts/faibles)

we are getting more energy than projected


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Sunny Boy PV Inverter

SMA Technology

https://www.sma-uk.com

Product category : Second œuvre / Equipements électriques (courants forts/faibles)

good performance

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Solar-Log solar monitoring system

Solar-Log

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

Product category : Second œuvre / Equipements électriques (courants forts/faibles)

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 determinedtrough PHPP software according to all Passivhaus requirements. Additionally tocalculate the Zero Energy balance a specific consumption profile was createdaccording to the expected Family activities and renewable energy systems wereintegrated in the design.

Thesolar thermal and photovoltaic systems contributions are 5.070 [kWh/y] and12.743 [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

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