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# Sunlighthouse

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**VELUX®**

MODEL HOME 2020





**Address**  
Grenzgasse 9, 3013 Pressbaum, Austria

**Photos of Sunlighthouse**  
Adam Mørk

**Illustrations of Sunlighthouse**  
HEIN-TROY Architekten

**Other photos and illustrations**  
The VELUX Group



### Objective and competition

The vision was to build a carbon-neutral house with exciting and appealing architecture focusing on the sloping roof. The challenge was to find the balance between energy efficiency and daylight architecture. The architectural concept was found in a competition between nine young up-and-coming architects already well known for exceptional architecture.

### Architectural concept

The winner of the architectural design competition was HEIN-TROY Architekten. Their architectural design responds perfectly to the difficult conditions of the plot: a very steep and leafy slope, in partial shade, facing south-east towards the Vienna woods. The kitchen and living areas are gathered around a protected, high-quality outdoor living area facing south-west.

### Scientific project

The whole design phase was a process of integrated planning. The project is supported by scientific partners Donau-Universität Krems and IBO (Austrian Institute for Healthy and Ecological Building). These two scientific partners have carried out:

- structural physical calculations
- ecological evaluations
- energy optimisations
- daylight evaluations
- concept for home automation



A long and slim building to suit the narrow plot. The house stretches towards the sun and is the perfect solution for the less-than-perfect site conditions for solar architecture.

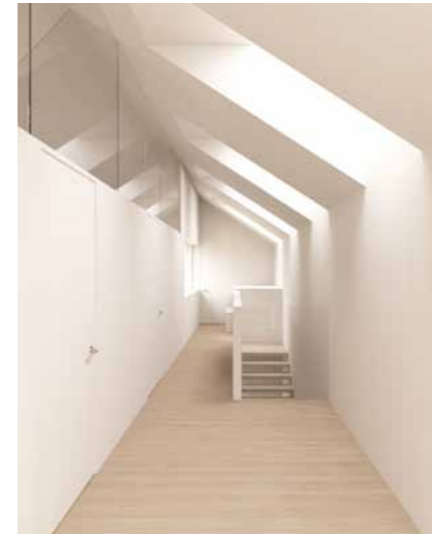
Follow the project at [www.velux.com/modelhome2020](http://www.velux.com/modelhome2020)



Daylight simulation with physical model in daylight laboratory performed by Arch. DI Gregor Radinger, Donau-Universität Krems.



Daylight simulation with physical model.



Daylight simulation with VELUX Daylight Visualizer 2.



Actual daylight conditions in Sunlighthouse.

**Daylight visualisations**  
 To ensure that Sunlighthouse meets daylight quality expectations, the levels were evaluated and defined via model studies in a light laboratory and simulations in VELUX Daylight Visualizer 2, a software tool for daylighting design and analysis. For more details and download, visit [www.velux.com/viz](http://www.velux.com/viz)

## Daylight

The use of daylight has been maximised to ensure the health and well-being of the residents. Donau-Universität Krems evaluated the daylight conditions digitally and with the use of a model under an artificial sky to arrive at an average daylight factor (according to DIN 5034-4) of at least 5 % for all living and working spaces. This ensures balanced daylight levels through-out the two floors and minimises the need for artificial light.

The location of the windows was planned strategically to give the best view, maximum passive solar gain and the most efficient natural ventilation – and to emphasise the character of the house.

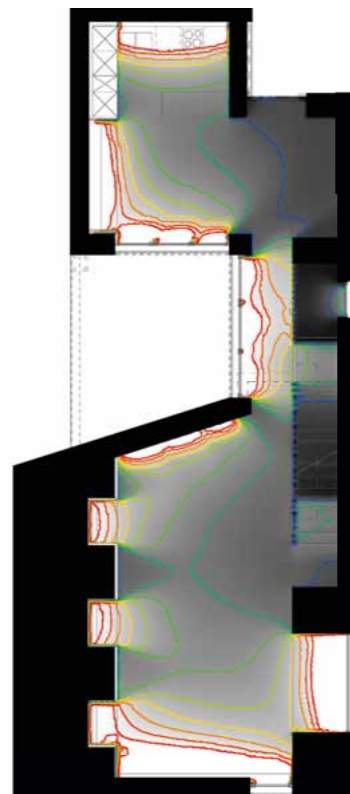
Shadows cast by the nearby mountain have been countered in the living room by roof windows positioned high up, which allows light to fall into the depths of the room.

The total window area is equivalent to some 36 % of the floor area.

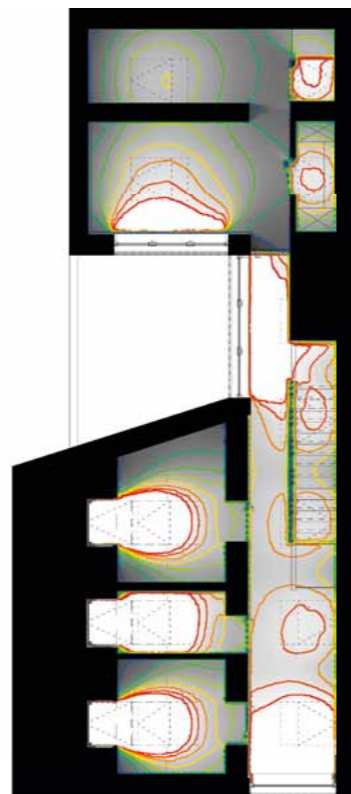
### Direct daylight

The effect of direct daylight on our health is well known. DIN 5034 part 1 recommends at least one hour of direct daylight in the winter months.

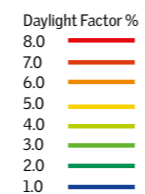
The light evaluation of Donau-Universität Krems shows that there will be five hours of direct sunlight in the living area on the shortest day of the year.



Ground floor



First floor



## Energy concept

### Energy design

The prime objective of Sunlighthouse was to reduce overall energy consumption (particularly primary energy) to a minimum without sacrificing living comfort. The features contributing to a positive energy balance include:

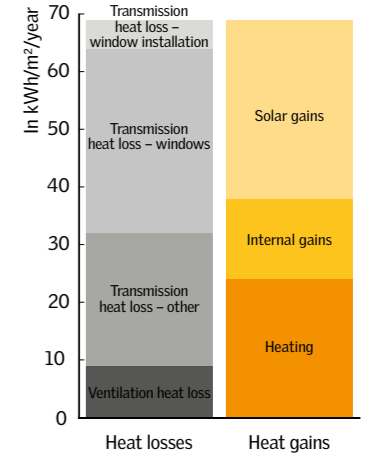
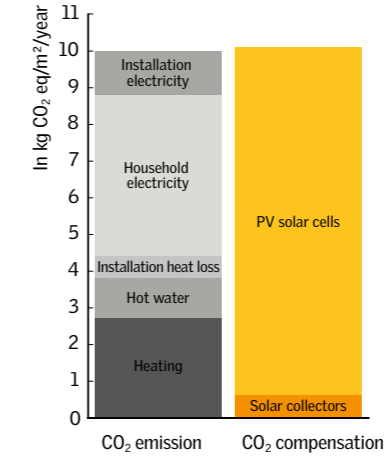
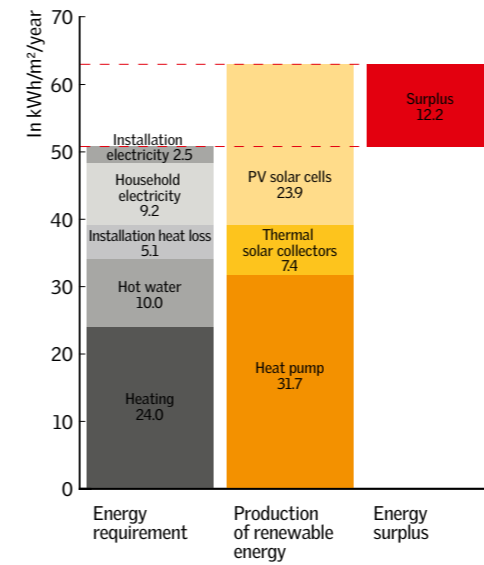
- a highly efficient brine/water heat pump
- thermal solar collectors for the production of domestic hot water
- a PV solar cell system for generating electricity
- highly energy-efficient household appliances

With its PV solar cells, thermal solar collectors and the geothermal heat exchanger (brine), the house will use nothing but renewable energy.

### Ventilation

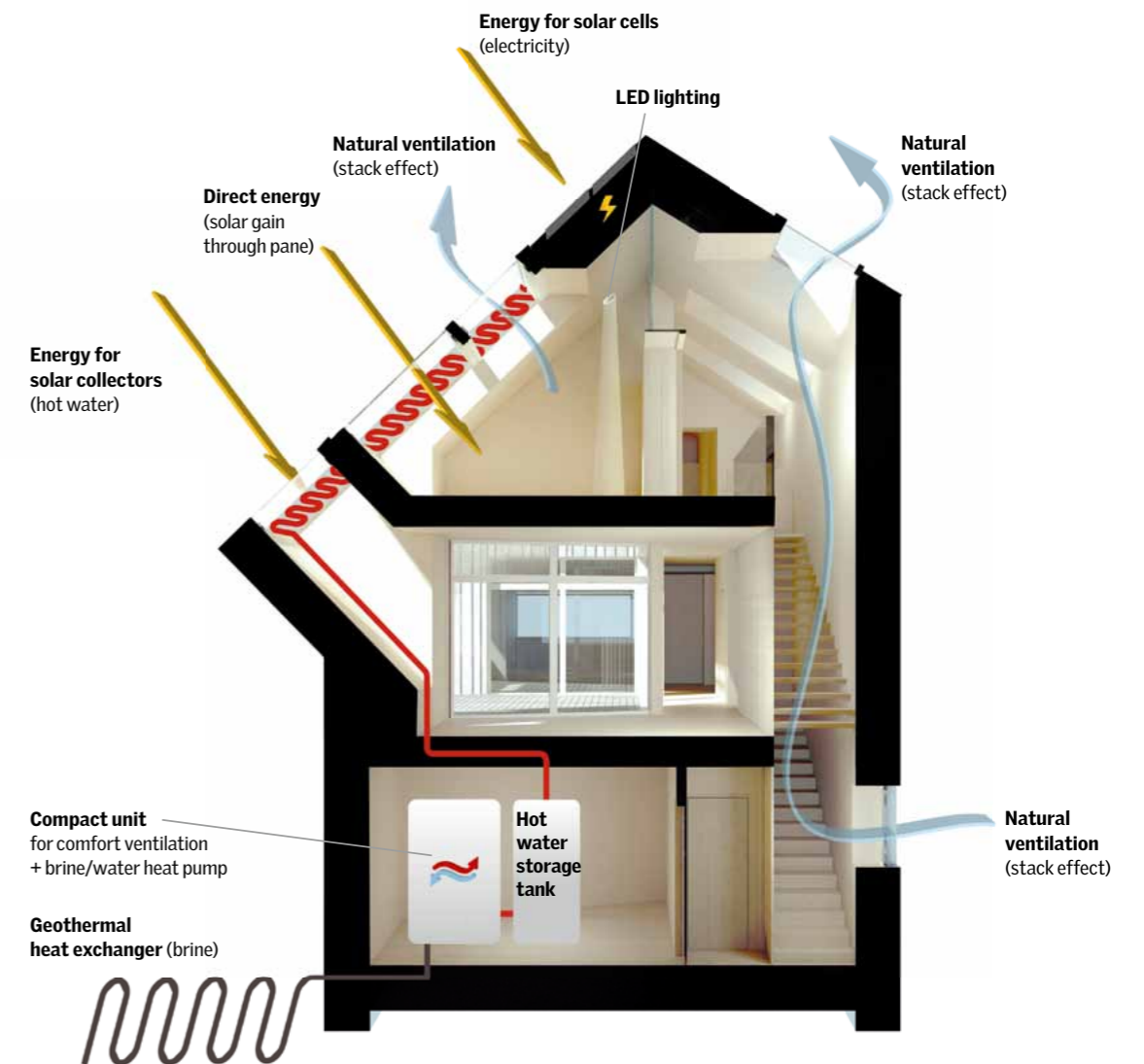
Intelligent control of windows will provide primary ventilation in spring, summer and autumn. In winter, this will be supplemented with mechanical ventilation with heat recovery. A comfortable summer indoor climate will be achieved by making use of the stack effect, night cooling and awning blinds on the windows. No energy is used for cooling.

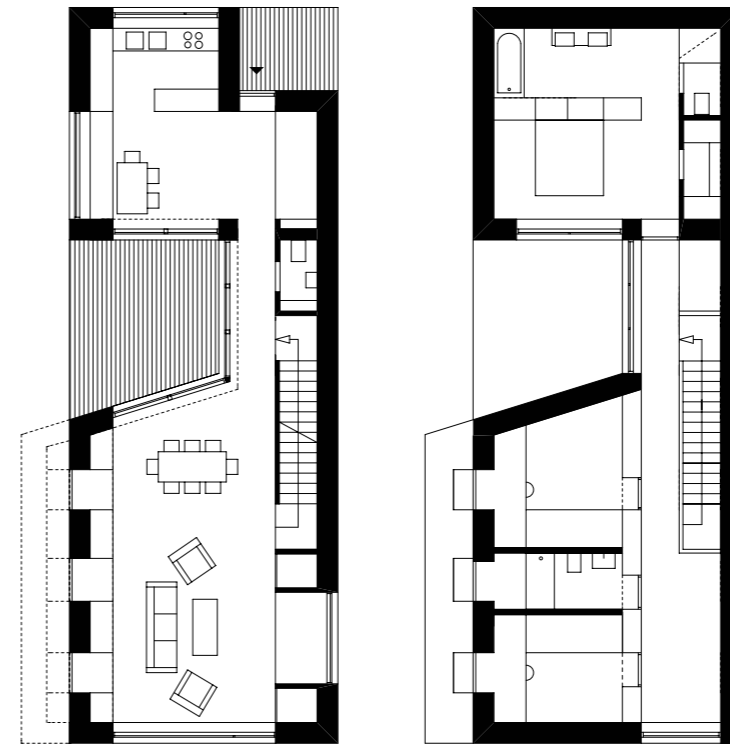
Sunlighthouse produces an annual energy surplus of 12.2 kWh/m<sup>2</sup>/year.



Calculation of energy performance and production has been made according to national standards.

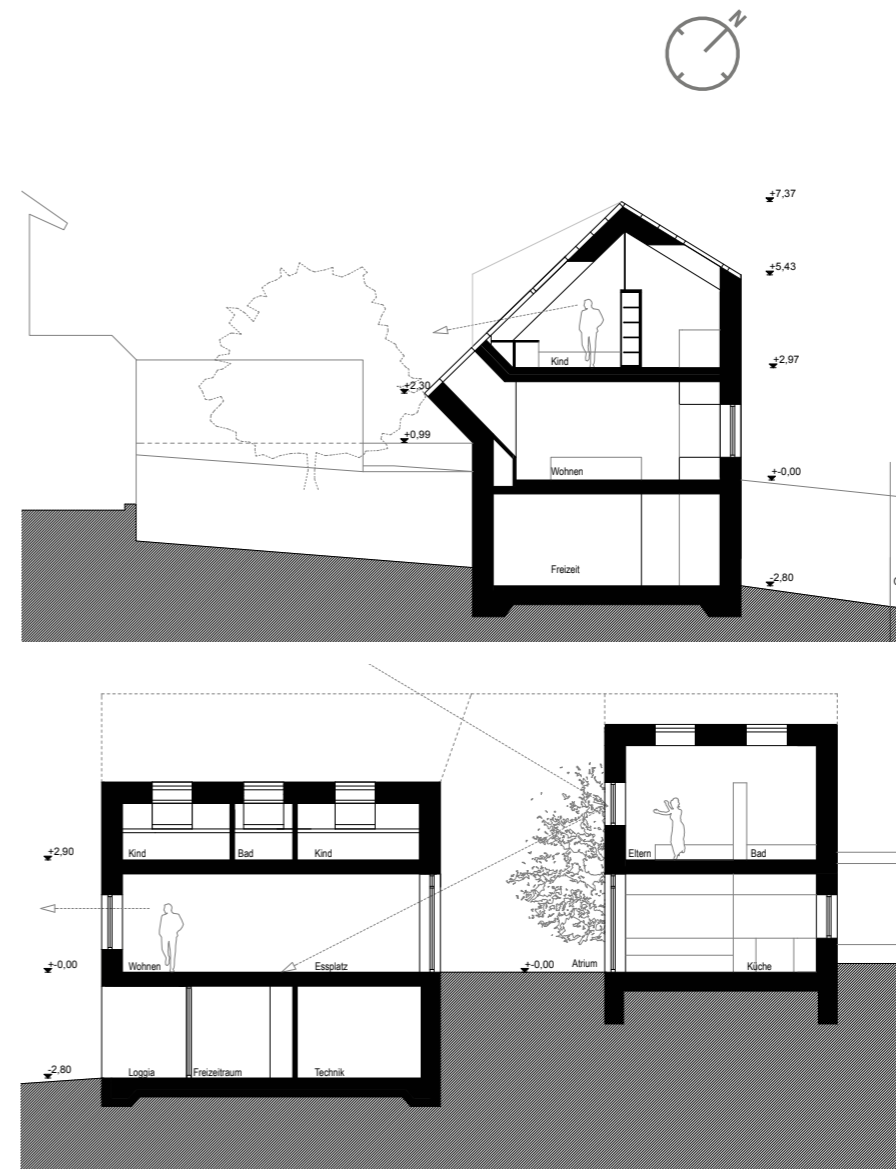
Balance between heat loss and gain.





Ground floor

First floor



**Prizes and mentions**

**National Award of Environment & Energy Technology**

Sunlighthouse won the Austrian National Award of Environment & Energy Technology 2010 in the category "special awards". The award was given for the outstanding innovative content, the degree of novelty and market potential, and the market position already achieved.

**Fourth prize in Active Architecture**

HEIN-TROY Architekten won fourth prize for the project Sunlighthouse in the international architecture award 2010 entitled Active Architecture organised by Fiandre.

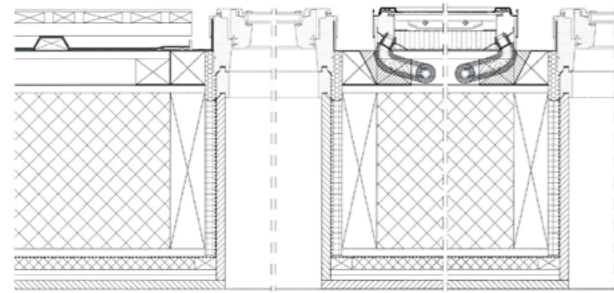
**Austrian PR Award**

Every year, the Austrian PR association PRVA honours the best three PR cases with the "Best Practice" Award. In March 2011, VELUX Austria, together with its PR agency senft&partner, was awarded for its work on promoting VELUX Sunlighthouse.

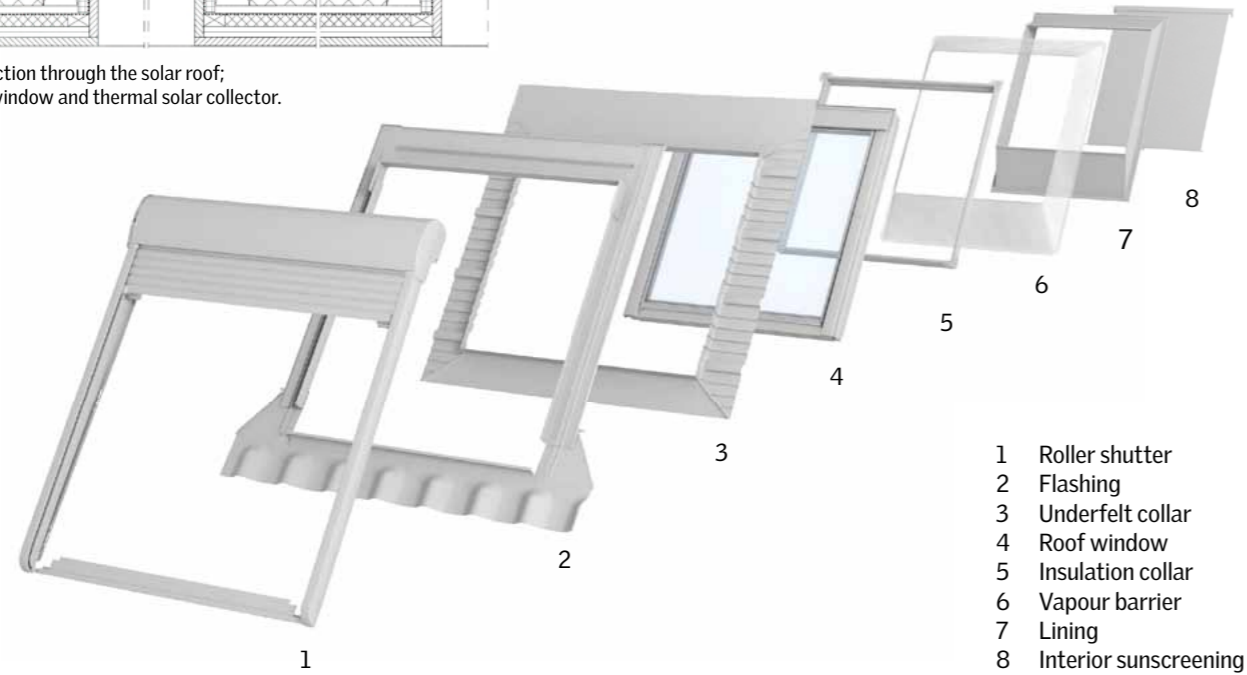
**Timber Construction Award**

In June 2011, Sunlighthouse was awarded the Timber Construction Award of Vorarlberg by an international jury. The award has highest reputation the Austrian building industry and this year the theme was "healthy timber". Apart from the building's outstanding architecture and workmanship, the jury referred to the increasing relevance of timber for sustainability and well-being, and went on to emphasise the fact that Sunlighthouse combines an unobtrusive form of construction with an exciting experience of space and daylight.

# System solution



Horizontal section through the solar roof; VELUX roof window and thermal solar collector.



- 1 Roller shutter
- 2 Flashing
- 3 Underfelt collar
- 4 Roof window
- 5 Insulation collar
- 6 Vapour barrier
- 7 Lining
- 8 Interior sunscreening

## Figures

The chart shows the technical characteristics of the VELUX roof windows in relation to heat loss, passive solar gain and daylight.

### Roof windows with pane --65

U <sub>w</sub> (Heat loss U-value window)	1.1 W/m <sup>2</sup> K
U <sub>g</sub> (Heat loss U-value pane)	0.7 W/m <sup>2</sup> K
g (Solar gain g-value)	0.48
τ (Light transmittance)	0.68

### VELFAC facade windows

U <sub>w</sub> (Heat loss U-value window)	0.76 W/m <sup>2</sup> K
U <sub>g</sub> (Heat loss U-value pane)	0.47 W/m <sup>2</sup> K
g (Solar gain g-value)	0.46

### Outer walls

U (Heat loss U-value)	0.13 W/m <sup>2</sup> K	(395 mm insulation)
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### Roof

U (Heat loss U-value)	0.12 W/m <sup>2</sup> K	(540 mm insulation)
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### Floor slab

U (Heat loss U-value)	0.12 W/m <sup>2</sup> K	(500 mm insulation)
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### Fenestration

Glass area	72 m <sup>2</sup>
Net floor area	201 m <sup>2</sup>
The glass area is equivalent to 36 % of the net floor area.	

Project owner: The VELUX Group  
 Architects: HEIN-TROY Architekten  
 Donau-Universität Krems,  
 Department für Bauen  
 und Umwelt  
 Österreichisches Institut für  
 Baubiologie und -Ökologie

### Walk-in closet

- 1 low-energy centre-pivot window with white polyurethane finish 114 × 118 cm
- 1 frame extension
- 1 underfelt collar
- 1 vapour barrier
- 1 flashings
- 1 solar window operator
- 1 solar blackout blind
- 1 solar awning blind

### Home office

- 1 low-energy centre-pivot window with white polyurethane finish 114 × 118 cm
- 1 frame extension
- 1 underfelt collar
- 1 vapour barrier
- 1 flashings
- 1 solar window operator
- 1 solar blackout blind
- 1 solar awning blind

### Staircase/corridor

- 2 low-energy centre-pivot windows with white polyurethane finish 114 × 118 cm
- 2 frame extensions
- 2 underfelt collars
- 2 vapour barriers
- 2 flashings
- 2 solar window operators
- 2 solar blackout blinds
- 2 solar awning blind

### Children's play area

- 2 low-energy centre-pivot windows with white polyurethane finish 114 × 118 cm
- 2 frame extensions
- 2 underfelt collars
- 2 vapour barriers
- 2 flashings
- 2 solar window operators
- 2 solar blackout blinds
- 2 solar awning blind

### WC

- 1 low-energy centre-pivot window with white polyurethane finish 114 × 118 cm
- 1 frame extension
- 1 underfelt collar
- 1 vapour barrier
- 1 flashings
- 1 solar window operator
- 1 solar blackout blind
- 1 solar awning blind

### Children's room 2

- 1 low-energy centre-pivot wooden window, white paint finish 114 × 160 cm
- 1 low-energy centre-pivot wooden window, white paint finish 114 × 118 cm
- 2 frame extensions
- 2 underfelt collars
- 2 vapour barriers
- 1 combi flashing
- 2 solar window operators
- 2 solar blackout blinds
- 2 solar awning blind

### Bathroom

- 1 low-energy centre-pivot window with white polyurethane finish 114 × 118 cm
- 1 frame extension
- 1 underfelt collar
- 1 vapour barrier
- 1 flashings
- 1 solar window operator
- 1 solar blackout blind
- 1 solar awning blind

### Thermal solar energy

- 6 solar collectors (4 114 × 118 cm and 2 114 × 140 cm) installed with combi flashing incl. flex-tubes and sealing collars

### Master bedroom

- 1 low-energy centre-pivot window with white polyurethane finish 114 × 118 cm
- 1 frame extension
- 1 underfelt collar
- 1 vapour barrier
- 1 flashings
- 1 solar window operator
- 1 solar blackout blind
- 1 solar awning blind

### Children's room 1

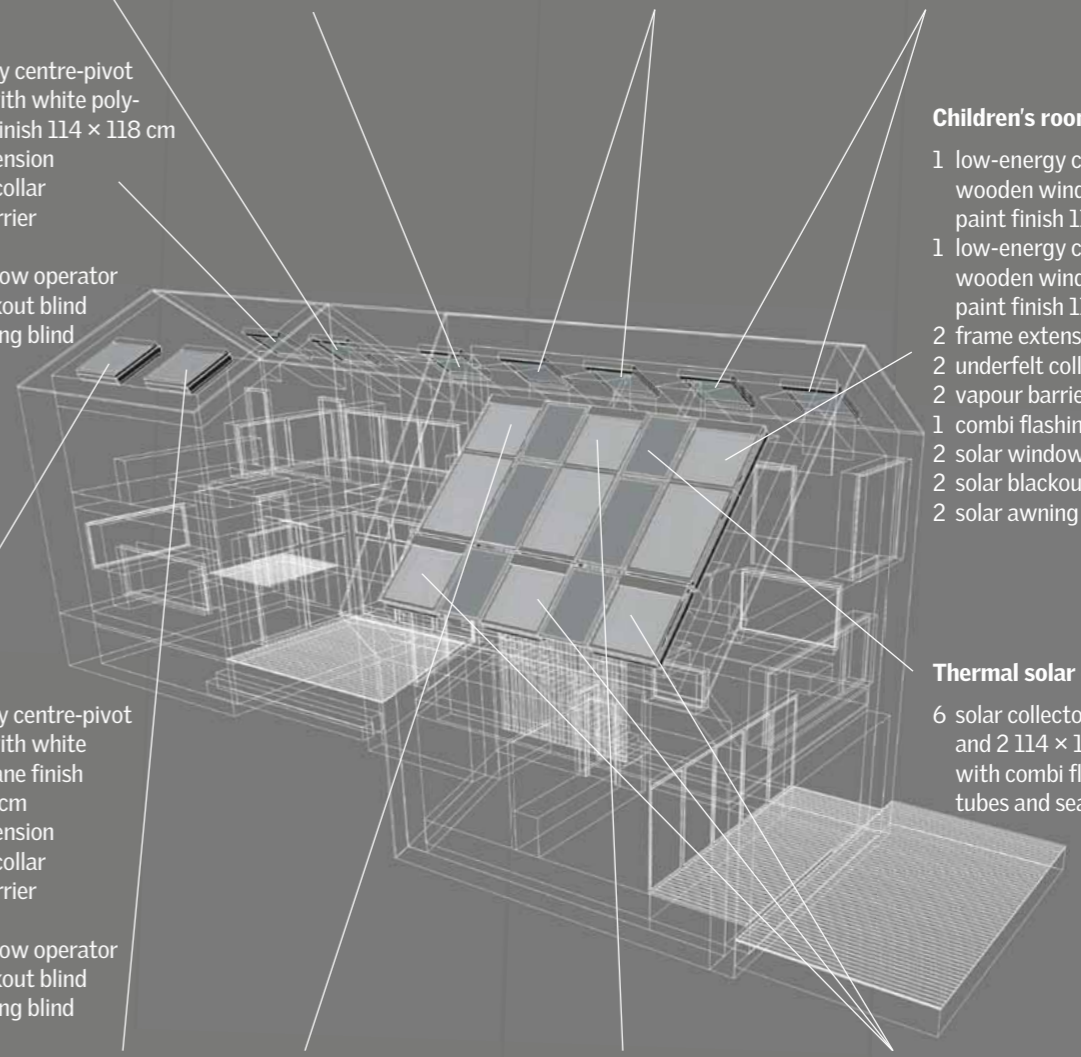
- 1 low-energy centre-pivot wooden window, white paint finish 114 × 160 cm
- 1 low-energy centre-pivot wooden window, white paint finish 114 × 118 cm
- 2 frame extensions
- 2 underfelt collars
- 2 vapour barriers
- 1 combi flashing
- 2 solar window operators
- 2 solar blackout blinds
- 2 solar awning blind

### Children's bathroom

- 2 low-energy centre-pivot windows with white polyurethane finish 114 × 140 cm
- 2 frame extensions
- 2 underfelt collars
- 2 vapour barriers
- 1 combi flashing
- 2 solar window operators
- 2 solar blackout blinds
- 2 solar awning blind

### Living room

- 3 low-energy centre-pivot windows with white polyurethane finish 114 × 140 cm
- 3 frame extensions
- 3 underfelt collars
- 3 vapour barriers
- 1 combi flashing
- 3 solar window operators
- 3 solar blinds
- 3 solar awning blinds



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*Bringing light to life™*

**VELUX®**

Follow the project at  
[www.velux.com/modelhome2020](http://www.velux.com/modelhome2020)