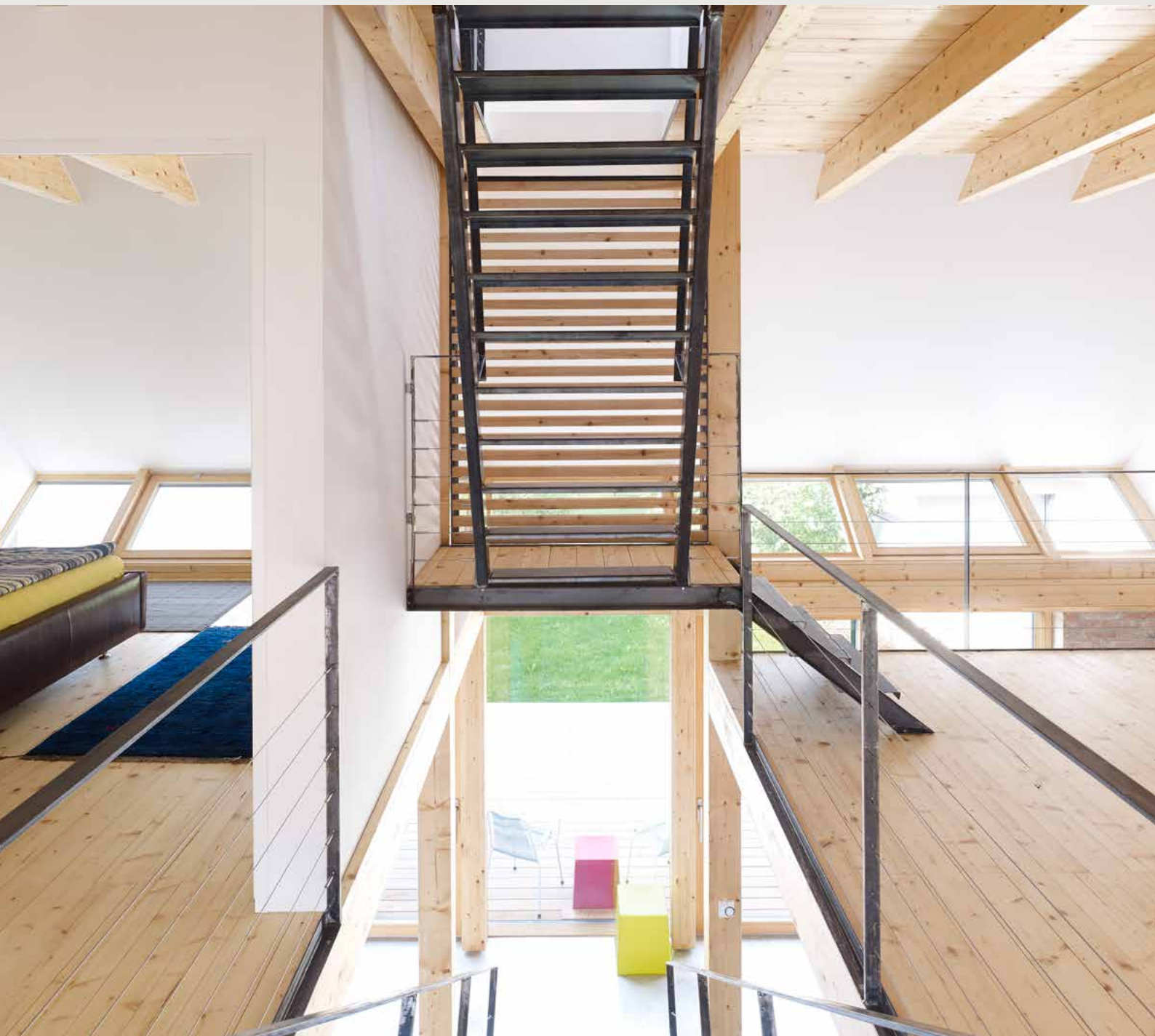
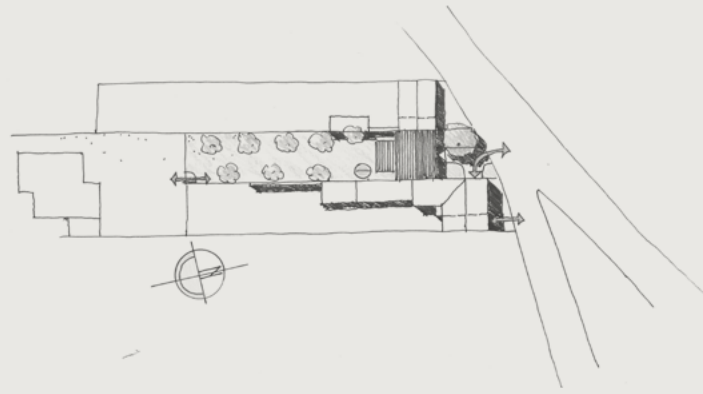


zu-haus

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# Site



Model photo

The wine village of Auersthal in the Weinviertel region is still characterised by dense and enclosed housing in the village centre, a beautiful alley lined with wine cellars and a gentle, hilly landscape. On the outskirts of the village, squeezed between the neighbouring buildings, a barn typical of that region has survived – though in bad shape, unfortunately.

The Döllinger-Tsao family had to have it demolished and subsequently to build a new home connected to the parents' home. As

they are particularly conscious building owners and very interested in architecture, they set themselves a difficult task. Various ideas, such as a wooden cube contrasting with its surroundings, were born – and abandoned.

Eventually, the Döllinger-Tsao family came across architect Martin Rührnschopf, who has already completed various projects in the surrounding area of Vienna, and is known for his sensitive approach and ecological architecture suitable for the location.

After a thorough analysis of the structure of the surroundings, various alternatives were simulated in the course of a "simultan-planning® workshop" in order to develop a solution perfectly tailored to this specific village.

"Hence," in the words of architect Rührnschopf, "it became neither a 'modern, cool box', nor an obviously modified country house with muntin bars on the windows and polystyrene profiling."

On the site of the old barn, the architect created a home that incorporates the appearance of the original farm building – but with modern characteristics.

It is harmoniously integrated into the row of houses and connected to the parents' home.

The zu-haus radiates a pleasant simplicity that has been typical of the Weinviertel region for many centuries and has shaped the cultural landscape.

The traditional functional elements of the ventilation slits and the sliding barn doors were retained and reinterpreted. The new sliding 'door' also creates the flexibility to close off the street frontage or open it up.



Old barn (was demolished)



New building





**Buildings that give more than they take**

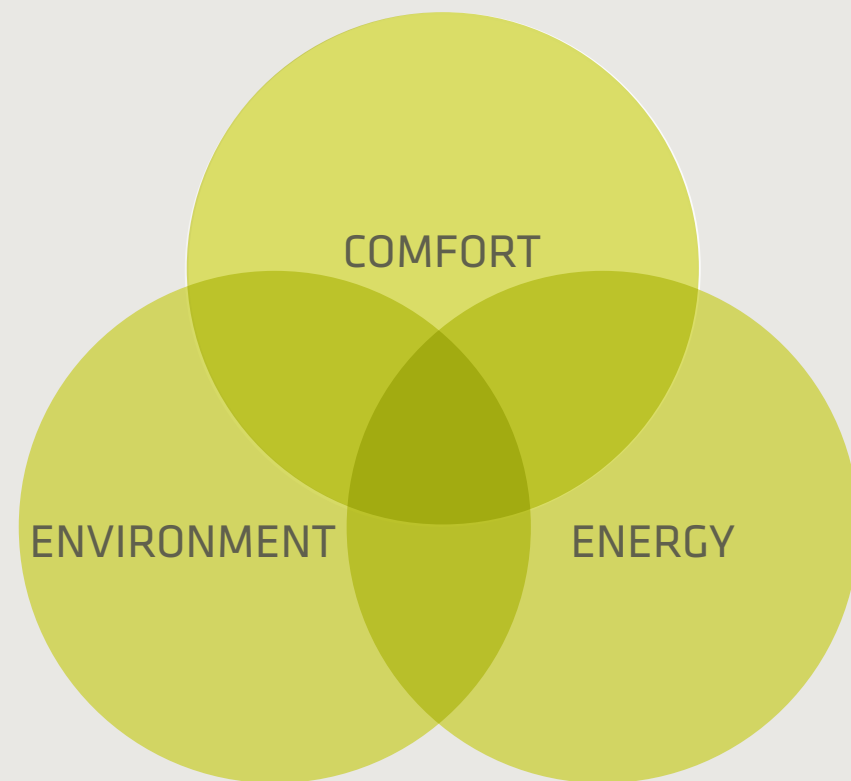
Active House is a vision of buildings that create healthier and more comfortable lives for their occupants without impacting negatively on the climate – moving us towards a cleaner, healthier and safer world.

The Active House vision defines highly ambitious long-term goals for the future building stock. The purpose of the vision is to unite interested parties

based on a balanced and holistic approach to building design and performance, and to facilitate cooperation on such activities as building projects, product development, research initiatives and performance targets that can move us further towards the vision.

The Active House principles propose a target framework for how to design

and renovate buildings that contribute positively to human health and well-being by focusing on the indoor and outdoor environment and the use of renewable energy. An Active House is evaluated on the basis of the interaction between energy consumption, indoor climate conditions and impact on the environment.



**THE ACTIVE HOUSE KEY PRINCIPLES ARE AS FOLLOWS:**



**COMFORT**

- a building that provides an indoor climate that promotes health, comfort and sense of well-being
- a building that ensures good indoor air quality, satisfactory thermal climate and appropriate visual and acoustical comfort
- a building that provides an indoor climate that is easy for occupants to control and at the same time encourages responsible environmental behaviour.



**ENERGY**

- a building that is energy efficient and easy to operate
- a building that substantially exceeds the statutory minimum in terms of energy efficiency
- a building that exploits a variety of energy sources integrated in the overall design.



**ENVIRONMENT**

- a building that exerts the minimum impact on environmental and cultural resources
- a building that avoids ecological damage
- a building that is constructed of materials that can be recycled.

[www.activehouse.info](http://www.activehouse.info)

**Philosophy of architect Martin Rührnschopf:**

“Architecture that is really sustainable can only be achieved through the right balance between functionality, aesthetics, indoor climate and energy consumption. The purpose of a holistic view and overall approach is to harmonise all relevant factors.”

The zu-haus project is thus a prime example of an Active House.

Active House is an initiative supported by the VELUX Group

# Guiding principle of the zu-haus project: simple – timeless – vibrant

Guided by the principle of "simple, timeless and vibrant", a permanent home was created, with its qualities gained through omission.

As the building deliberately opens up towards the garden, the interior and exterior space could be successfully interlaced. The neighbouring building acts as protection against wind, prying eyes and noise.

The ground floor comprises a wardrobe, a toilet, a spacious living, kitchen and dining area – all sharing the same waxed concrete surface.

The internal arrangement foregoes stairwells and unused space. The sculptural stairs are directly integrated into the living area as a design element – a single-flight staircase – and lead to the gallery floor.

There, you will find the gallery, the bedroom and the bathroom.

The top floor presents itself as an open space and serves as the daughter's hideaway, where she can play, sleep and relax. Ascending plateaus structure the living area and create communication axes – housemates can be seen from one level to another and the room becomes a place.

Generously sized sliding doors on the ground floor create a visual relation and a link to the garden. As the roof balcony is integrated into the roof, standing on it is like standing on the roof – you can gaze into the vastness of the Weinviertel region's hilly landscape and even spot the Schneeberg in the distance on a clear day.

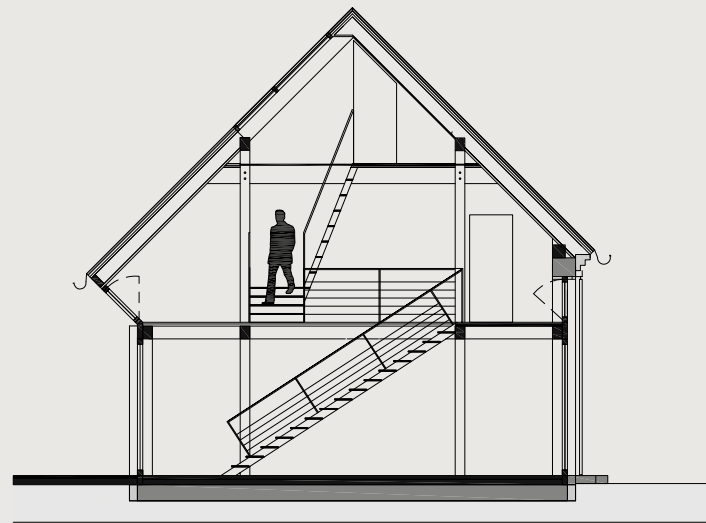


Garden view

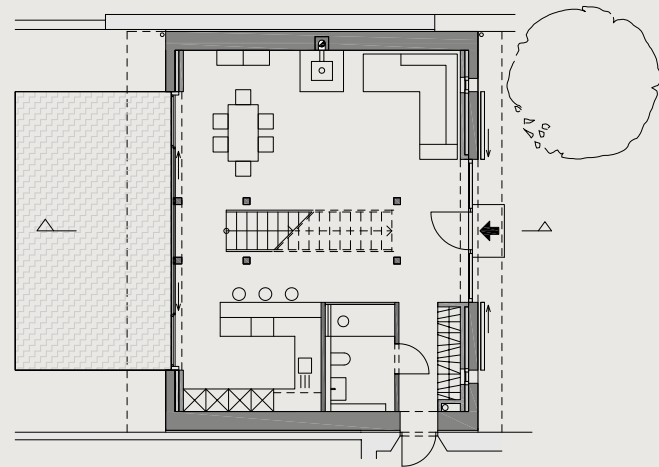


Top floor

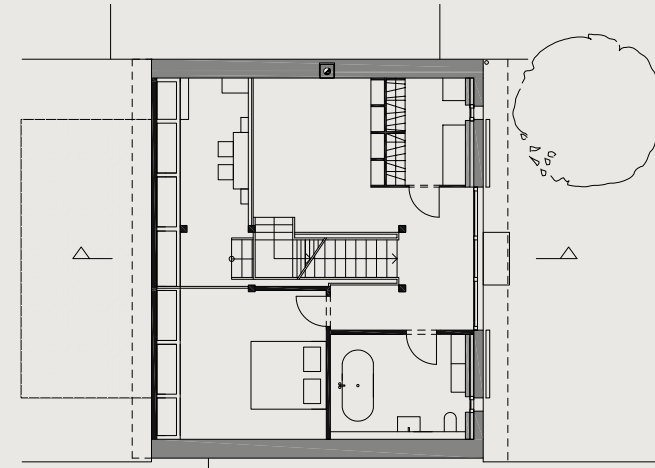




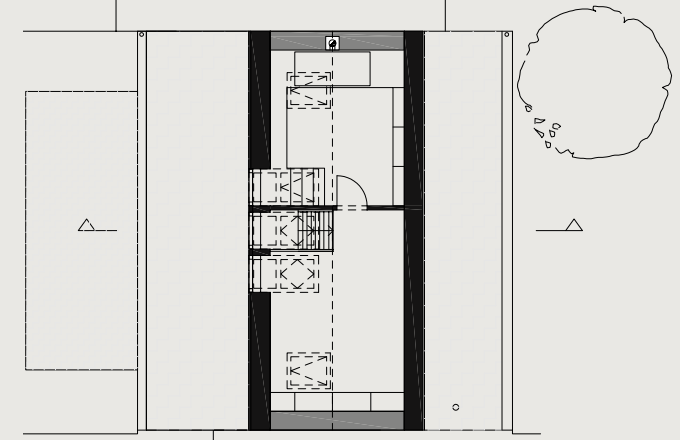
Section



Ground floor layout



Gallery floor layout



Top floor layout



△ Outdoor area  
◁ Garden view



Living area



# Daylight

The clear goal was to provide the living areas with a sufficient amount of daylight even on dull days, which are quite common in the Weinviertel region during autumn and winter when there is often fog. However, lighting is not merely guaranteed

by large-scale vertical glazing on the southern side but also by well-placed, adequate roof windows. Thanks to this deliberate use of zenith light (light from above), light can even reach the rear areas of the ground floor through the gallery floor and thus

create balanced lighting. This even lighting is one of the most important factors for the whole interior radiating generous space and creating an open and friendly impression.



Rendering via VELUX Daylight Visualizer



Reality: top floor on a sunny day

## Daylight factor:

In several countries, the daylight factor (DF) is one of the simplest and most common methods of measuring daylight. The daylight factor defines the percentage of daylight from an overcast sky that will be available indoors at a plane 85 cm above the floor.

The higher the daylight factor, the more daylight is available in the room. Rooms with an average daylight factor of 2% or more are considered adequately lit. A room or an area is considered to be really bright if the daylight factor amounts to an average of 5% or more.

Further information is available at: [www.velux.at/tageslichtplanung](http://www.velux.at/tageslichtplanung) (available in German) [www.velux.at/tageslichtplanung](http://www.velux.at/tageslichtplanung)



The evaluation shows that the daylight factor in two different rooms under the roof of zu-haus amounts to an average of 6.6% and 8.3%. This might sound rather modest – in fact, it is extraordinarily high; DIN 5034-4 recommends a daylight factor of at least 0.95% in the centre of the room.



Light coming from above – zenith light – provides three times more light on a cloudy day than light coming from the

side through vertical windows. The perfect interaction of vertical glazing and roof windows – combined with white walls and

light wooden and concrete floors – creates a fascinating lighting mood.



# Ventilation

It was the building owners' express wish not to install a mechanical ventilation system. So the architect was able to include, at the early design stages, the ideal positioning of the necessary supply and exhaust air openings in the form of facade and roof windows. As a result, the ventilation drive (chimney effect) gives maximum benefit with no energy consumption.

## Innovative ventilation concept with automated windows

Both the building owners and the architect were open to using an innovative ventilation concept with automated windows.

### Stack effect

Facade windows with concealed motors, which are completely invisible from the inside and outside, act as supply air openings. VELUX Integra® roof windows also have concealed motors and let air effectively escape upwards. Architect Rührschopf calls these ventilation openings "climate hatches". This automatic, natural ventilation system keeps technology to a minimum.

## Adequate window ventilation

During the heating period and transitional seasons, CO<sub>2</sub> sensors installed in various areas send a signal to the electric windows to let them know when to open automatically.

As a result, the various areas can easily be ventilated during the heating period, as recommended by hygiene researcher Peter Tappler of IBO Innenraumanalytik: not too much (that would be a waste of precious heating energy and would also lead to extremely dry indoor air) and not too little (for hygiene and health reasons).

## Natural Ventilative Cooling

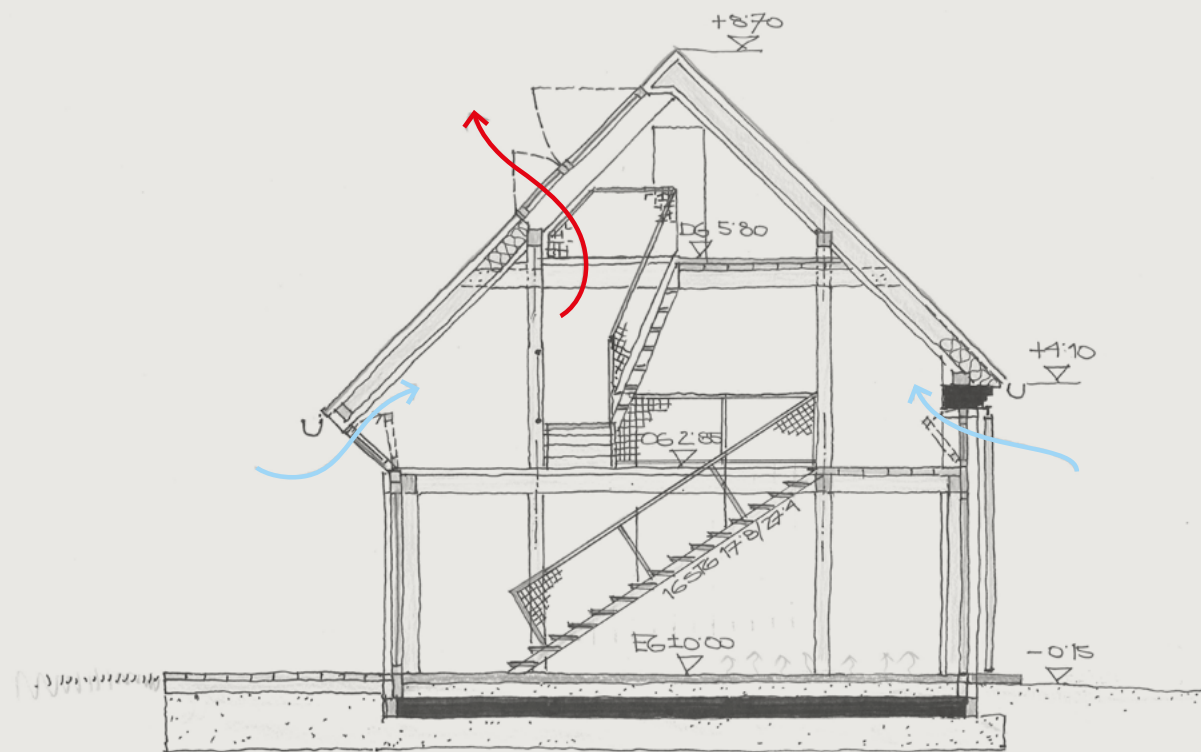
In midsummer, the CO<sub>2</sub> sensors are simply switched off and the system changes to Natural Ventilative Cooling. This uses a simple principle of physics – night time cooling by means of targeted ventilation. Regardless of whether the residents are at home or not, an integrated time switch opens the windows automatically at 10 p.m., and they remain open until 7:30 a.m., when they close again automati-

cally. At night time, Natural Ventilative Cooling helps cool down the building components that have heated up during the day. This method of window ventilation operates with no energy input – it is a passive cooling system, and makes an essential contribution to a pleasant indoor climate during summer.

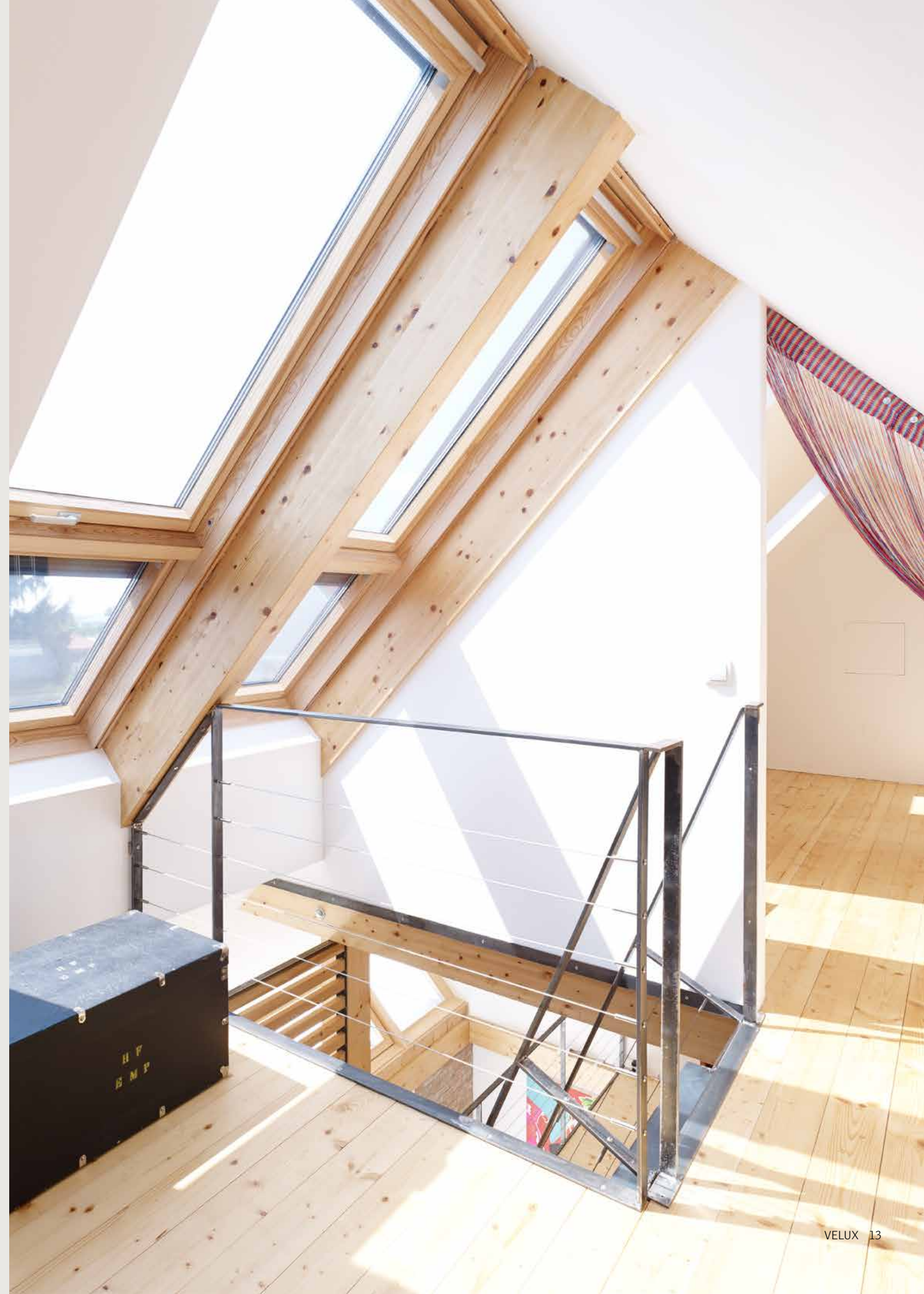
## First experiences with automatic window ventilation:

The indoor air quality showed a constant CO<sub>2</sub> concentration far below 1,000 ppm. This corresponds to the definition of a "special to high indoor air quality" according to ÖNORM EN 13779.

In summer mode, Natural Ventilative Cooling has also proved its worth, with balanced and pleasant temperatures.



Ventilation concept





# Energy

The aim of the building technology concept was to find a simple but effective technical solution – in other words, a robust, user-friendly and low-tech concept.

A building envelope with a high level of thermal insulation assures high conservation of heat. The targeted use of solar gains through the glazing on the southern side, in combination with storage mass, reduces residual heat requirements to a minimum.

Heat is supplied by an existing gas-fired condensing boiler located in the neighbouring parents' home and a wood-burning stove in the living area. The heat is distributed through low-temperature floor and wall heating (see pages 12-13).

Controlled domestic ventilation has been avoided deliberately – automatic window

ventilation is used instead (see ventilation concept, pages 12-13).

## Protection against summer heat

The massive gable walls and the concrete floors of the ground floor act as storage mass and significantly slow down the heating-up of the rooms.

Effective outdoor shading protects against excessive solar heat in midsummer. However, the rooms must not be completely darkened in this period but filled with an acceptable amount of daylight.

A very clever and effective solution is the use of a sail, which provides protection against the sun on the terrace and shades the living room. On the street side, the slats of the barn gate provide protection against the morning sun, which is quite intense

in the summer. The roof windows are equipped with translucent electric blinds that are programmed to deploy automatically on midsummer mornings.

At night, selective night ventilation via Natural Ventilative Cooling results in a significant cooling of the building components that are heated up during the day. It is thus an essential part of the concept for protection against summer heat (see page 12).

The outdoor space is also part of the energy concept. Strategic placement of deciduous trees creates natural shading – and a special micro-climate in summer months.





# Environment

Project zu-haus was seamlessly integrated into the close-density housing culture of this typical Weinviertel village.

On the inside, too, the analogy of a contemporary interpretation of a barn is continued: pillars, supporting structure, wood beam ceilings and the roof are all made of wood.

### Materials and ecology

Traditional materials were used throughout: wood, brick, iron and stone. Everything is characterised by its durable, calm and pleasant radiance.

The architect, Martin Rührnschopf, refers to this as "truthfulness", which means relying on natural materials and handcraft.

The foundation plate was insulated with foam glass gravel. The rising walls, made of cavity blocks, were plastered with lime mortar on the outside. On the inside, some of the inner wall surface was clad with the old clay bricks saved after the demolition, as a tribute to the old barn.

The floor consists of bare concrete that was smoothed during the hardening process. This procedure, including the subsequent wax treatment, produces a shining, highly resistant and natural-looking surface.

The roof was insulated with woodfibre; the interior steel components are crude steel with an oiled surface.



Living area on the ground floor

# Construction Process



Old barn



Martin Rührnschopf laying the foundation stone



Erecting of roof truss



Detail timber construction



Topping-out ceremony



Concrete finishing



### Conclusion

A low-tech concept with high residential quality was successfully created. One outstanding feature is the excellent craftsmanship, with architectural details realised to perfection.

What is also remarkable is that even the first design sketches from simultaneous planning® completely match the final blueprints.

### Structural design

This project shows that a difficult construction project that takes a holistic approach to energy, comfort and environment can definitely be realised according to Active House Standards, even when it involves an existing building.

An ingenious, simple, low-cost building technology concept that is perfectly dovetailed with the building and its architecture helps save money. So this project, despite the high quality of design and living conditions, could be realised in a very cost-effective manner. Yet again, this shows the importance of professional planning and construction supervision.

The family of three and their dog have furnished their home with a combination of old and new pieces.

And the idea of living in the countryside has become a success, thanks to a unique combination of tradition and innovation on the inside, and existing and new on the outside.



### zu-haus

**Planning and site supervision:**  
martin rührnschopf architecture,  
1130 Vienna

**Static:**  
Zwang GesmbH, Bockfließ

**Building physics:**  
Eder Bau GmbH, Zistersdorf

**Building technology concept:**  
martin rührnschopf architecture,  
1130 Vienna

**Daylight planning:**  
VELUX Österreich GmbH,  
Wolkersdorf

**Ventilation planning:**  
VELUX Österreich GmbH,  
Wolkersdorf

**Building concept:**  
Active House Standard

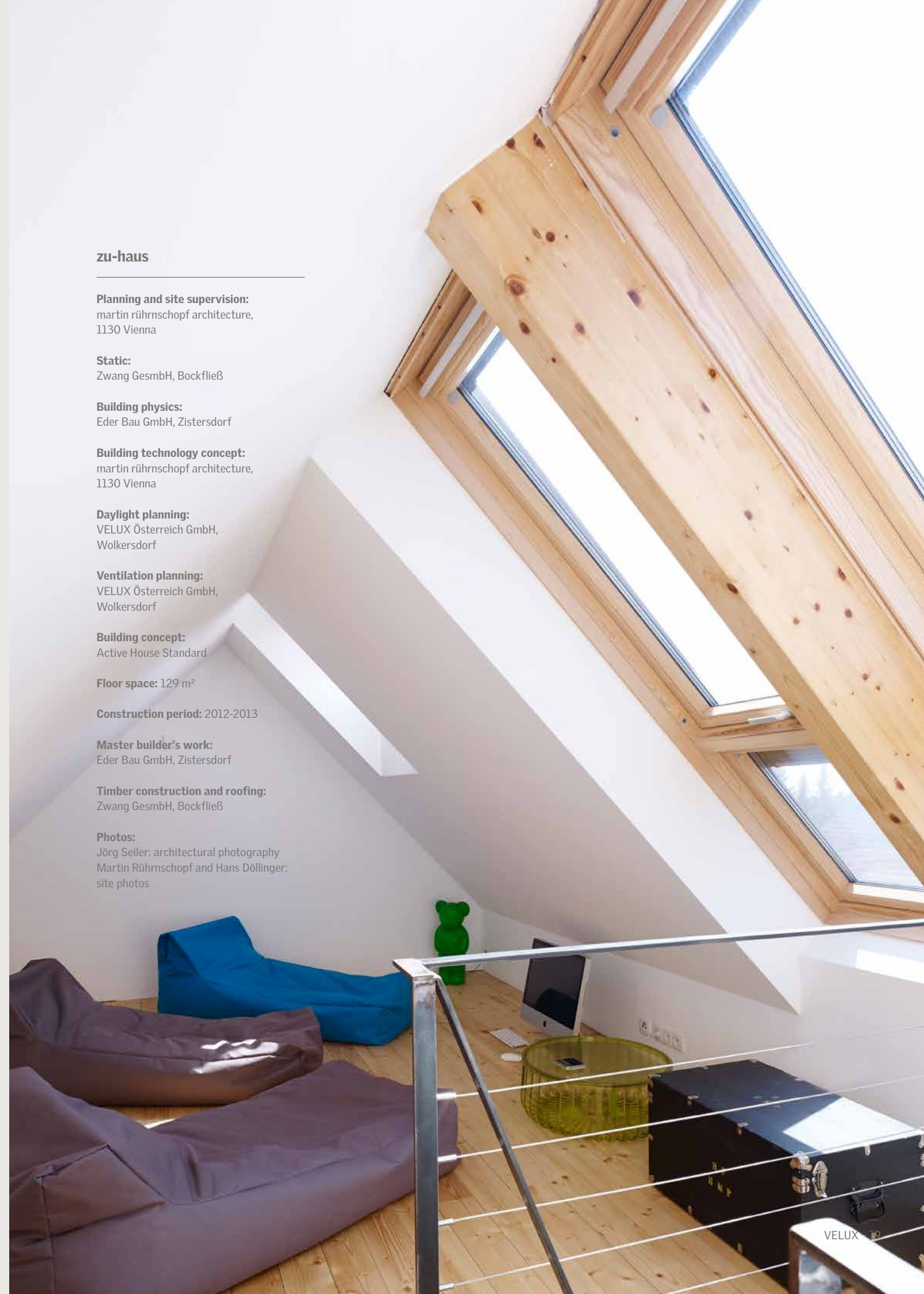
**Floor space:** 129 m<sup>2</sup>

**Construction period:** 2012-2013

**Master builder's work:**  
Eder Bau GmbH, Zistersdorf

**Timber construction and roofing:**  
Zwang GesmbH, Bockfließ

**Photos:**  
Jörg Seiler: architectural photography  
Martin Rührnschopf and Hans Döllinger:  
site photos





VELUX A/S  
Ådalsvej 99  
DK-2970 Hørsholm  
www.velux.com

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