RenovActive | VELUX®

A healthy and affordable renovation concept

Photo: Adam Mørk

How to solve the renovation challenge

The time has come to develop new, innovative ways to renovate our building stock. Half of the current dwellings in Europe were built between 1945 and 1980, and the average age of our total building stock continues to grow increasingly older. The trend is supported by data from Eurostat, that have registered a 30% decline in construction output in the EU's 28 member states since 2008. If the trend continues, 90% of our current residential properties will still be in use by the year 2050.

Low energy meets high comfort
Since the late 1990s, the VELUX Group has investigated how optimal energy efficiency can be achieved in combination with great indoor comfort and minimal environmental impact.
Our efforts have led to the construction of 25 demo buildings across Europe and North America, including six model homes that have been built according to the three Active House principles (read more on page 10):

- **Comfort:** the building should provide indoor living conditions that support the health and comfort of its inhabitants
- **Energy:** the building achieves high levels of energy efficiency
- **Environment:** the building has a minimal impact on the environment

The Model Home 2020 projects were monitored in use; scientists followed the test families on energy performance, indoor climat and well-being in general. The conclusion was that it is possible to meet 2020 legislation without compromising sustainable living, and that we have technology and products already today.

Model Home 2020 projects completed 2009-11

We have four double doors and three single doors, which means that we can almost drag the garden into the house.

Dorfstetter Family, Austria

Within the last two years, none of us were ever really sick. Normally everyone has at least once in a year been ill.

Oldendorf Family, Germany

Test families

A number of test families agreed to live for a full year in the Active House demo buildings, recording not only their energy consumption and other indoor parameters, but also their personal experiences. This documentation has provided us with vital information on comfort, energy and environment, and also helped us to understand how daylight and fresh air can facilitate a healthy and comfortable indoor environment. The point of departure for the RenovActive concept is the solid knowledge base from the Model Home 2020 learnings.

The light in the house is impressive [...] and there's no need for electric lights during the daytime.

Kristensen Family, Denmark

The RenovActive concept

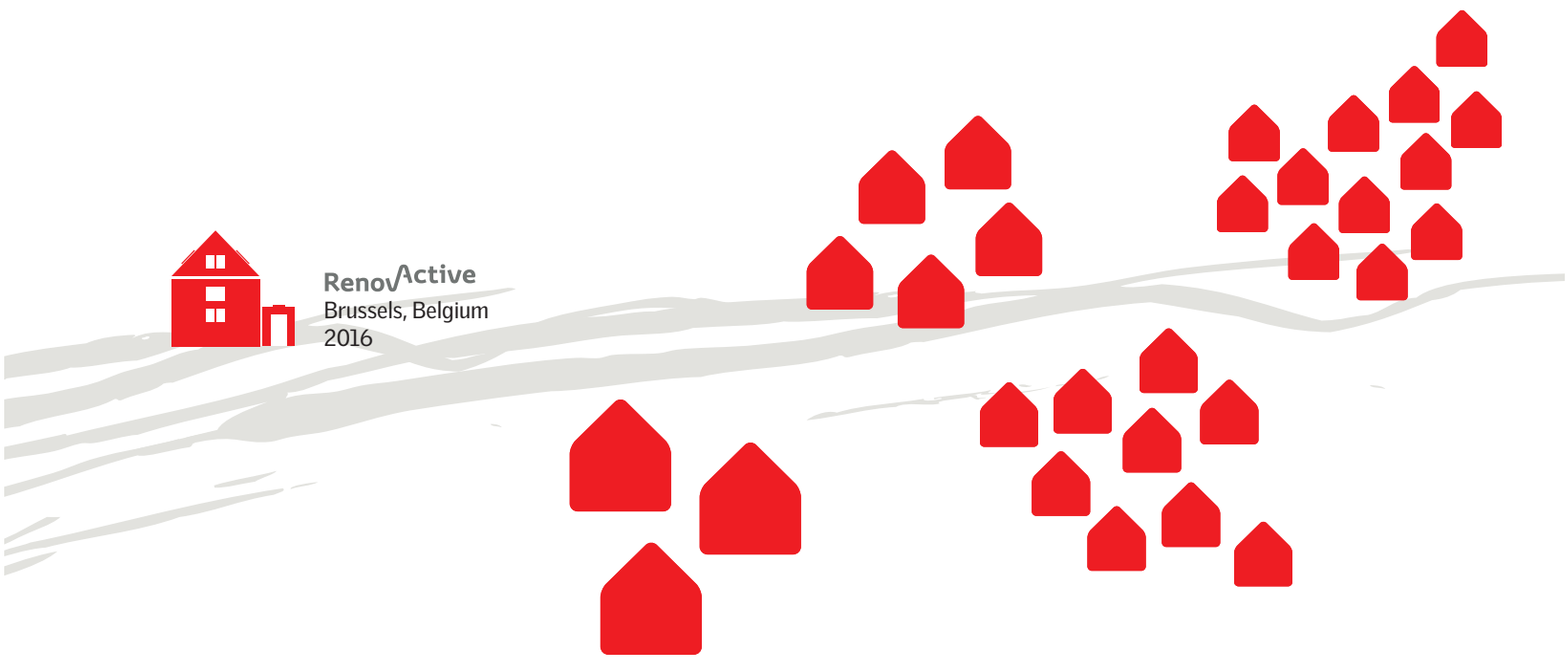
Affordable, easy to reproduce and scalable – these were the main criteria set up for the RenovActive project in Anderlecht, Belgium. The aim of the renovation project was to test the Active House principles in social housing and single-family homes where cost, comfort and energy efficiency have to go hand in hand.

The main goal of RenovActive is to prove the financial viability of Active House renovation in social housing schemes across Europe. The estimated renovation costs associated with RenovActive met the tight budget framework of social housing in Brussels and the requirements set up in the Energy Performance of Buildings (EPB) standard.

Dividing the concept into seven individual building elements makes it possible to create an exact match between the financial plan of the project and the different requirements of the housing company.

The affordability is based on the proven quality of each element as well as the different solutions' ability to be reproduced, allowing economies of scale to take effect.

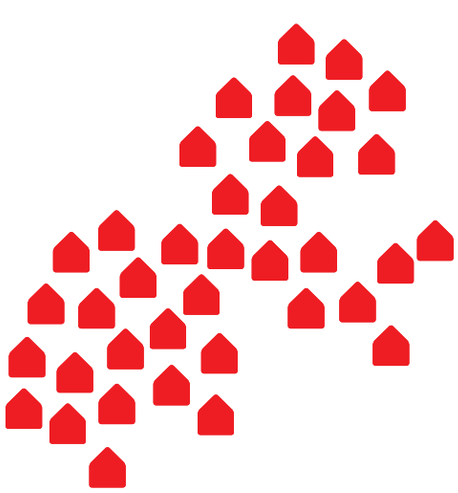
Renovation
Active House | Affordable | Reproducible



From prototype to stereotype

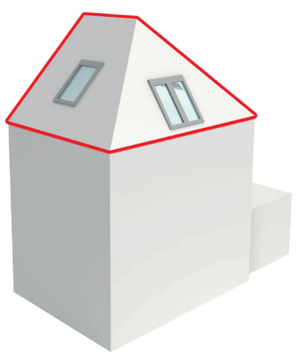
Following the completion of the first RenovActive project in May 2016, 86 houses in the Bon Air community will be renovated, inspired by RenovActive elements.

Learn more on page 26.



Seven elements for affordable climate renovation

The RenovActive Concept bases on the Active House principles; the seven most applicable and cost-effective solutions for renovation. Each part consists of a building element that is created to give existing buildings the ability to perform on the same level as newly built houses. Depending on the existing building design and renovation budget, the different elements can be implemented to increase the level of daylight, improve ventilation, strengthen the climate envelope and expand the living space through densification or extension. The concept's modularity adapts to each house typology.



1

Attic conversion

Growing from within

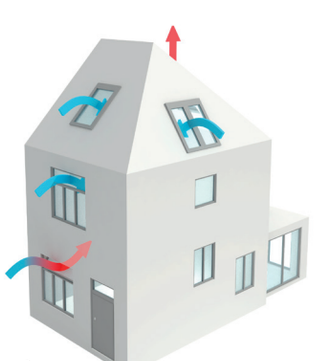
Utilizing the upper floor's potential; this first densification element identifies idle areas and converts them into first class living areas. For an attic conversion the space is designed with daylight in mind, creating more space with plenty of natural lighting, improved ventilation and heat control.

4

Dynamic sunscreening

3rd skin

A dynamic envelope is vital to ensure good indoor comfort with pleasant temperatures day and night as well as during all seasons, particularly in the shoulder seasons. Dynamic external sun screening, e.g. awning blinds, reduces solar heating during summer.



5

Hybrid ventilation system

Hybrid respiration

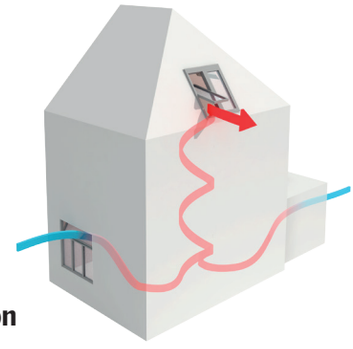
The hybrid ventilation system combines mechanical and natural ventilation with automated windows and heating. During the summer, windows and stairwell are used to provide natural cooling in the building, e.g. using the stack effect for efficient air replacement. During the winter, mechanical ventilation helps to maintain good indoor air quality and reduce the risk of draught.

2

Increased window area

Daylight treatment

Large façade and roof windows increase the level, and in particular the quality, of daylight. A balanced distribution of windows ensures a pleasant and bright indoor environment with plenty of daylight in every room and on every floor.

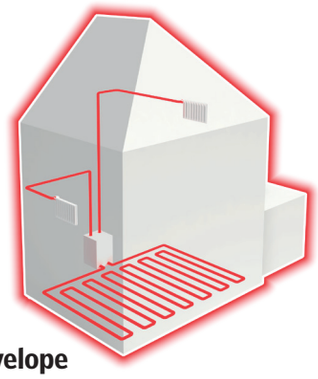


3

Staircase shaft for daylight & ventilation

Respiratory channel

An open stairwell guarantees enhanced daylight distribution and efficient airing via the stack effect. Daylight is distributed to all floors and central rooms of the home. Furthermore, the stack effect helps to expel humid exhaust air through the roof windows at the top of the staircase, while clean air fills the home via open doors and windows.

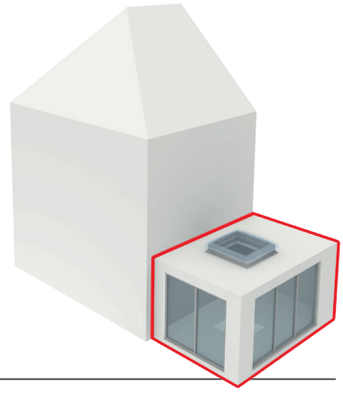


6

Improved thermal envelope

Envelope

The thermal envelope consists of a façade climate shield and a modern heating system, optimizing energy performance and thermal indoor comfort. Work on the façade comprises extra surface insulation, a new roof construction and new windows all around. The upgraded heating system includes floor heating as well as modern radiators on upstairs levels.



7

Building extension

New life space

Building an extension adds precious square meters to the home and creates room for extra people. An extension is subject to the size of the plot and surrounding terrain.

RenovActive – the first of many

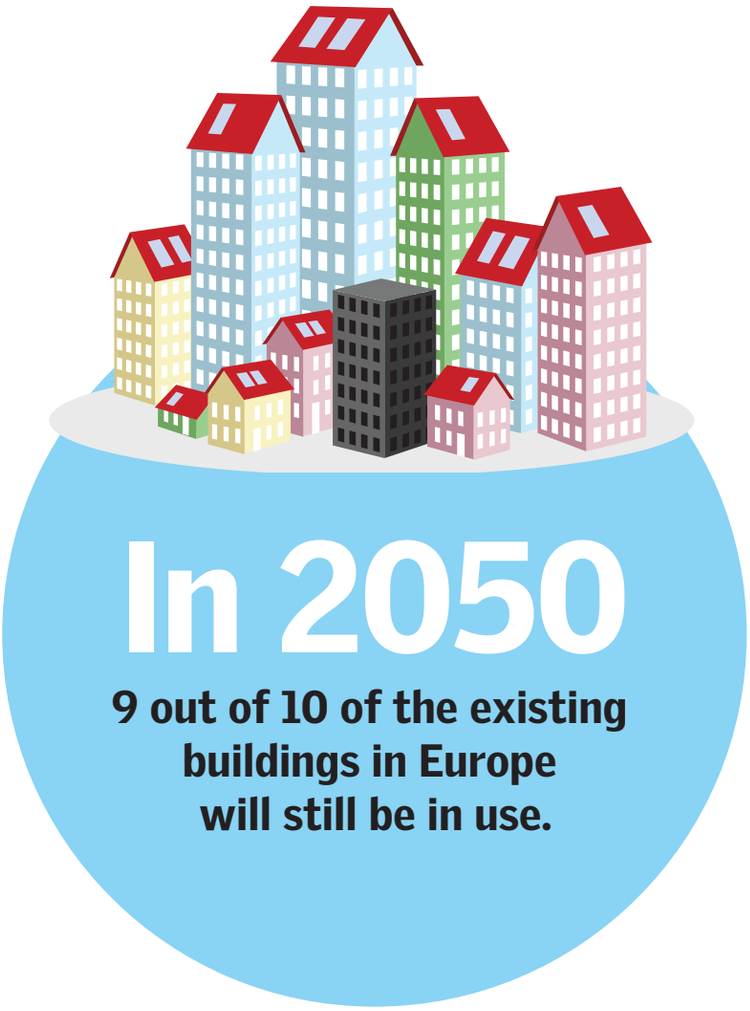
Studies show that around 80 million Europeans live in damp and unhealthy buildings, reducing the inhabitants' level of wellbeing. High humidity, insufficient insulation and rooms with limited daylight - all of these factors are known to increase the risk of allergies, cause illness and lead to mental discontent. As the consequences can be quite severe, the effort to raise the quality of European buildings has become more important than ever. For example, a balanced indoor environment with less humidity and more ventilation lowers the risk of asthma by 50%. Good daylight is also known to improve the inhabitants' mental wellbeing, optimise sleep patterns and even strengthen their ability to perform at work or school.

An example to follow

In cooperation with Le Foyer Anderlechtois, a social housing company in Belgium, the VELUX Group took up the challenge of transforming an old dilapidated building into a contemporary home, based on the Active House principles. The semidetached building was originally built in the 1920s and is situated on the outskirts of Brussels, in the Bon Air neighbourhood of Anderlecht.

The purpose of the project was to create the first of its kind; an all-out example of the RenovActive concept, making full use of all seven elements to create a bigger and healthier home for the tenants. Following the project's completion, the house has become a template for 86 similar renovation projects in the community.
The purpose of reusing the concept is to improve the tenants' health and wellbeing. However, from the social housing company's perspective, it is also to test whether such a concept can be deemed viable and replicable within a limited budget.

Renovation + Active House
= RenovActive!



Developing the buildings of tomorrow isn't something we dream about. It's what we do today.

Affordability tested

When it comes to encouraging housing companies across Europe to take up the challenge, affordability is key.

The RenovActive House in Belgium reflects costs for a "stereotype" building – in this case an average for 30-50 renovated houses – which is how the Social Housing Association budget framework is defined.

The RenovActive concept stays beneath the budgetary framework of the Brussels social housing budget allocation for renovation.

The prices are based on an offer by a Belgian contractor.

Main targets

The following targets were laid down to make the RenovActive House in Belgium a valid success. All targets were met by the completion of the project:

- **Indoor climate:** The house should offer high daylight levels, protection against overheating and good indoor air quality via a direct demand-control operation
- **Affordability:** The renovation (incl. all technical equipment) should be executed within a budget in line with that of Le Foyer Anderlechtois
- **Reproducibility:** The concept should be based on existing technologies and materials
- **Energy performance:** The primary energy use should comply with the strict Brussels EPB (Energy Performance of Buildings) legislation

activehouse.INFO
NETWORK AND KNOWLEDGE SHARING

The before renovation radar reflects an uninhabited house with leaky windows.

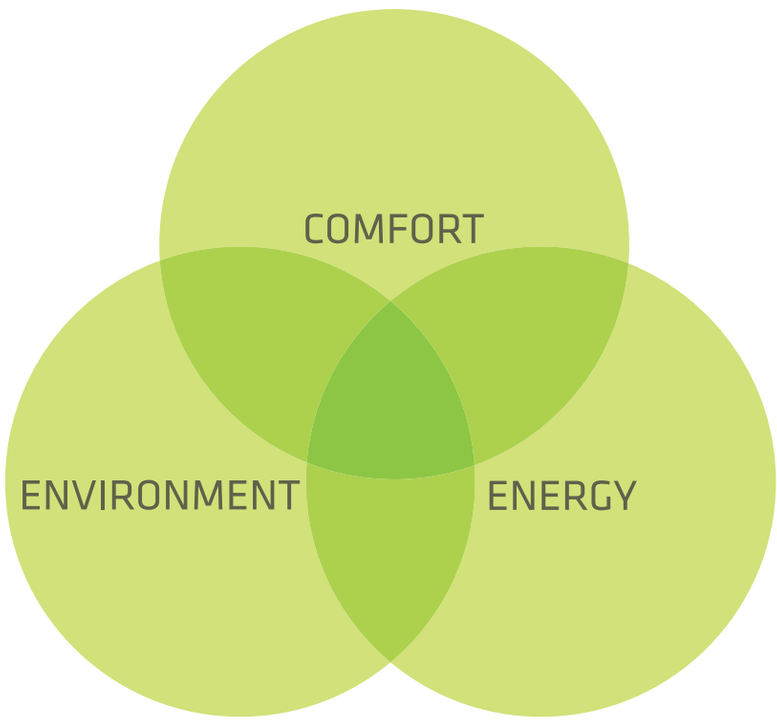
Active House

The purpose of the Active House vision is to set long-term goals for the future building stock and to unite interested parties around a balanced and holistic approach to building design and performance. Translated into everyday ventures, the aim is to bring researchers, developers, architects and public authorities together on projects like the RenovActive House to evaluate the Active House concept, generate new ideas and help define best practise scenarios for future projects.

An Active House is evaluated according to the building's energy consumption, indoor climate conditions and impact on the environment. Read more: Activehouse.info

The Active House label is a worldwide quality stamp for comfortable and sustainable buildings. It advices on elements that are important to humans life and living in their home. The Active House label can be issued to buildings that has been evaluated in accordance with the Active House specifications and meet the minimum demands for indoor comfort, energy efficiency and environment.

activehouse



Comfort
An Active House creates healthier and more comfortable indoor conditions with a generous supply of daylight and fresh air.

Energy
An Active House is energy-efficient and prioritises renewable energy sources which are integrated into the building or collected from nearby energy systems.

Environment
An Active House interacts positively with the local and global environment, focusing on the use of resources and the overall environmental impact throughout its life cycle.

Health

The Active House vision was created to ensure that homeowners and tenants can achieve healthier and more comfortable living conditions with a minimal impact on the environment.

The purpose of the Active House vision is to set long-term goals for the future building stock and to unite interested parties around a balanced and holistic approach to building design and performance. Translated into everyday ventures, the aim is to bring researchers, developers, architects and public authorities together on projects like the RenovActive House to evaluate the Active House concept, generate new ideas and help define best practise scenarios for future projects.

An Active House is evaluated according to the building's energy consumption, indoor climate conditions and impact on the environment.

Affordability

Financial accessibility is the hallmark of the RenovActive concept. In relation to the Bon Air property, the main priority was to propose a financially affordable climate renovation project. Choices made for the renovation concept were based on the budgetary framework of social housing organisations in Brussels and requirements established under the Energy Performance of Buildings (EPB). Based on the known costs of 50 similar renovations, reproducing a RenovActive solution is within the social housing budget framework for reproduction.

While the project is fully financed by the VELUX Group, building material manufacturers have shared their expertise and kindly provided materials. The standard rate for these materials was taken into account to determine the final cost of the renovation.

Reproducibility

RenovActive intends to be a renovation concept that can be applied directly to existing buildings throughout Europe on a large scale. The renovation concept is developed for a three-façade house, but can be easily transferred to two façade buildings. The reproducible elements can be applied to both renovation and new-build projects.

Construction techniques and materials were carefully chosen to make the concept reproducible in as many homes as possible. Furthermore, the concept is scalable, which means that individual elements from the concept can be picked and applied independently, the level and quality of daylight, e.g. the dynamic sunscreening, the hybrid ventilation system and the attic conversion.

The RenovActive House was designed by Antwerp-based architectural firm ONO architectuur. As lead architect, Jonas Lindekens played a vital part in creating the architectural and technical blueprint for the RenovActive House, in close cooperation with experts from Le Foyer Anderlechtois and the VELUX Group.

Beating several applicants, ONO architectuur won the competition to upgrade the semi-detached house in Bon Air, Anderlecht. In this interview, Jonas Lindekens explains what spurred their involvement and how working with the Active House principles has made the company change its perspective, in terms of combining energy efficiency with home comfort.

Active House = more freedom and more balanced choices

Interview: Jonas Lindekens, architect at ONO architectuur

"We were immediately interested in the project. At the time, we were completing a passive house project, and we felt unsure about how to compare the data requirements for this project with those of the Active House. After that, it quickly became an independent alternative, encouraging straightforward action in relation to comfort and energy. We thought that it was a really interesting approach.

"The house is located in a garden city on the outskirts of Brussels, where there are other examples of really beautiful garden cities. The area has a lot of charm, but misses the particular qualities of the other garden cities. This particular project offered the opportunity to reinstate some of the qualities lost over the past decades – so we saw it as an opportunity to improve this beautiful area.

"We wanted to give the house a floor area for contemporary living, and we needed to include the attic to increase usable space. We looked for a location to have the staircase, but we could only make the top floor accessible from the centre. Fortunately, it was in the darkest part of the house, so the staircase could actually help light up the house in its entirety.

"I think the staircase, which acts as a light and ventilation shaft in combination with the automatic windows, is quite a unique solution. They work together, and one wouldn't perform without the other. We wouldn't be able to maximise daylight if it wasn't for the staircase, and the combination creates a nice atmosphere with light from two directions. The same goes for ventilation. The window on top of the staircase wouldn't perform in terms of ventilation if it weren't for the automated windows in the façade.

> Active houses allow for a better balance between the multiple goals in a design

"There has been an urge to create passive houses over recent years but sadly the focus on achieving calculated numbers sometimes prevents making logical overall decisions. Active houses allow for a better balance between the multiple goals in a design. That was a lesson we learned during this project – that we can reach very high standards in terms of energy consumption, comfort and life quality without too many limitations. I think this is the way we need to go in the future.

In 2013, the VELUX Group and the social housing company, Le Foyer Anderlechtois decided to form a partnership to renovate a house according to the Active House principles. The actual renovation started in 2015 and was completed in May 2016.

General Manager, Bruno Lahousse, has overseen the project and aligned the RenovActive vision to the company's key performance indicators. In this interview, Bruno Lahousse explains how introducing health as a guiding parameter is about to set the agenda in the social housing community.

Focus on health and emissions changed the agenda

Interview: Bruno Lahousse, GM at Le Foyer Anderlechtois

"One of our biggest challenges was to innovate our approach. We introduced a proposal for the project, and normally these things are analysed from a technical and administrative point of view. But this time, we needed to assess the environmental impact and that was new to us.

As a social housing company, one of our obligations is to achieve social objectives which are defined by key performance indicators. One of these indicators commits our company to take occupational costs into consideration, which in this case is rent and heating combined. Furthermore, we have committed ourselves to seek solutions that lower CO_2 emissions from our communities. Inspired by the approach of the VELUX Model Home initiative in terms of energy use, we agreed that we needed to do something in order to reduce CO_2 emissions.

Some years ago we started to focus on air quality and water quality in our houses. These issues remain a challenge due to the humidity in indoor environments. Ground water penetrates the foundation of houses and human activities generate condensation, which makes houses unhealthy. For many years we've been looking for extraction systems to eliminate the problem, but now we hope that we have found a proper response.

Our aim is to provide healthy homes for our tenants. But as all of these houses were built in the 1920s, the technical knowledge at the time wasn't very advanced. The ground water level in the Brussels area is quite high, so humidity is a known problem. With the improved natural and hybrid ventilation solutions in the RenovActive House, we are very close to solving this challenge.

Our aim is to provide healthy homes for our tenants.

Replicability was also very important. We have a total of 225 houses that are similar to the one that we are now opening to the public. And we have already allocated funds to renovate 86 of these houses, which should be finished by the end of 2018.

With the RenovActive project we hope to convince stakeholders to get involved in a new way. The authorities that handle the building permits are invited to modify their requirements and focus more on the quality of human living. Too often, they focus on administrative and architectural aspects – the actual living conditions are not always taken into account."

A flexible concept that ensures affordable climate renovation

Seven replicable elements

The RenovActive House includes all of the main replicable elements that constitute the RenovActive concept. All of the elements are implemented as separate units of products and solutions, and optimise essential home performance parameters in relation to energy, comfort and indoor environment – the three pillars of the Active House concept. This flexibility and inherent scalability makes it possible to tailor every project and match its respective budget.

Photo: Adam Mørk

Photo: Adam Mørk

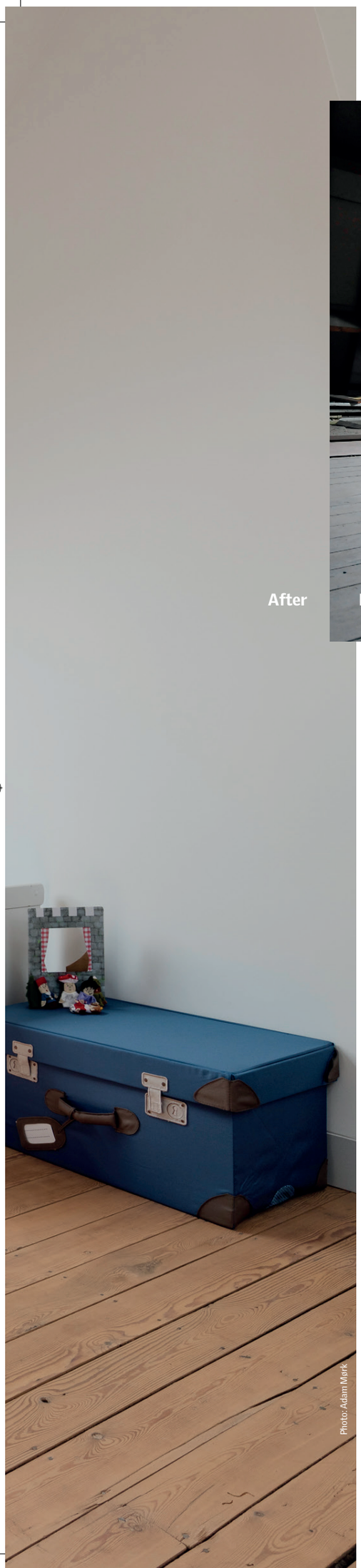
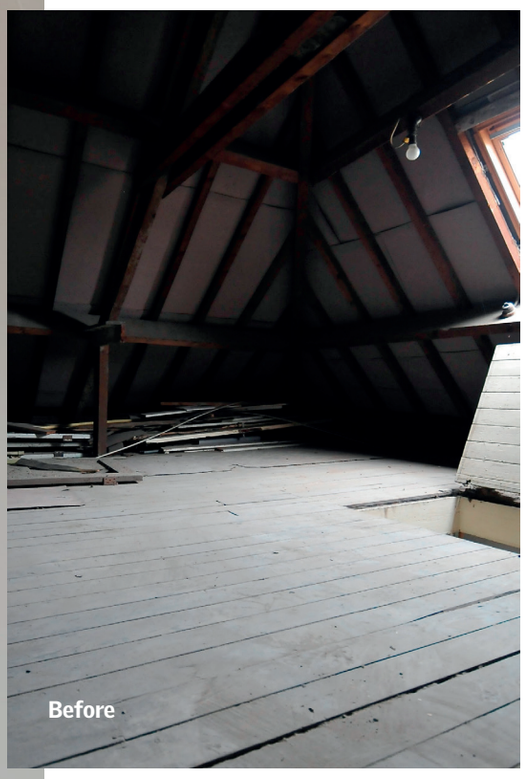
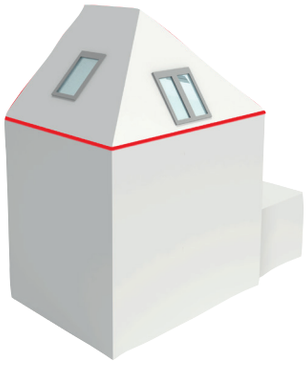


Photo: Adam Mørk



After

Before



1

Attic conversion

Growing from within

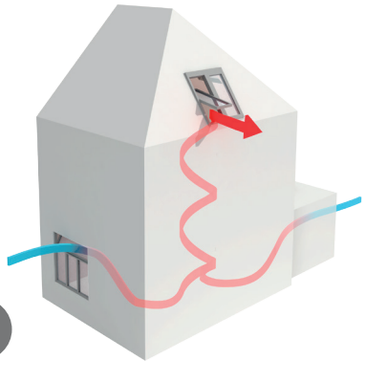
- The attic is converted into 12,5m^2 quality living space, using roof windows to ensure plenty of daylight and ventilation. The attic is connected to the home via a newly constructed open stairwell.

2

Increased window area

Daylight treatment

- A balanced distribution of windows ensures a pleasant and bright indoor environment with plenty of daylight in every room and on every floor.



3

Staircase shaft for daylight & ventilation

Respiratory channel

- An open stairwell guarantees enhanced daylight distribution to all floors and central rooms of the home.
- The stack effect ensures efficient airing through open roof windows and doors.

4

Dynamic sunscreening

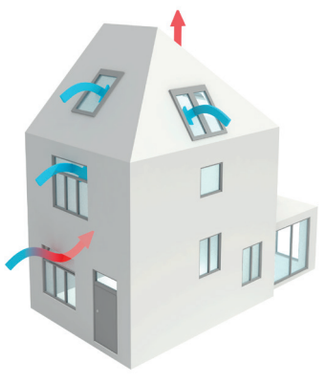
3rd skin

- Dynamic external sun screening reduces solar heating during summer and helps to maintain good indoor thermal comfort.

After

Before

Photo: Adam Mørk

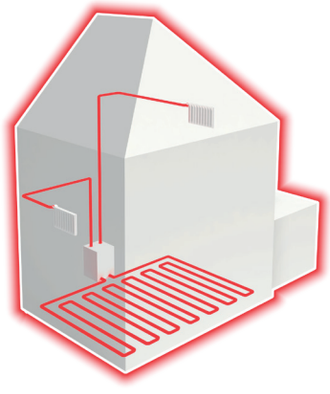


5

Hybrid ventilation system

Hybrid respiration

- During the summer, windows and stairwell are used to provide natural cooling in the building, e.g. using the stack effect for efficient air replacement.
- During the winter, mechanical ventilation helps to maintain good indoor air quality and reduce the risk of draughts.

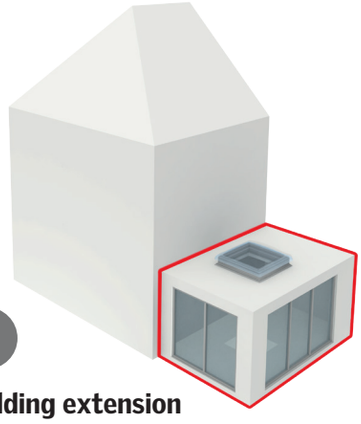


6

Improved thermal envelope

Envelope

- New facade insulation, a new roof construction and new windows all around ensure reduced energy consumption and optimal indoor comfort.
- New floor heating on the ground floor as well as modern radiators on the 1st and 2nd floors provides superb indoor comfort and greater energy efficiency.



7

Building extension

New life space

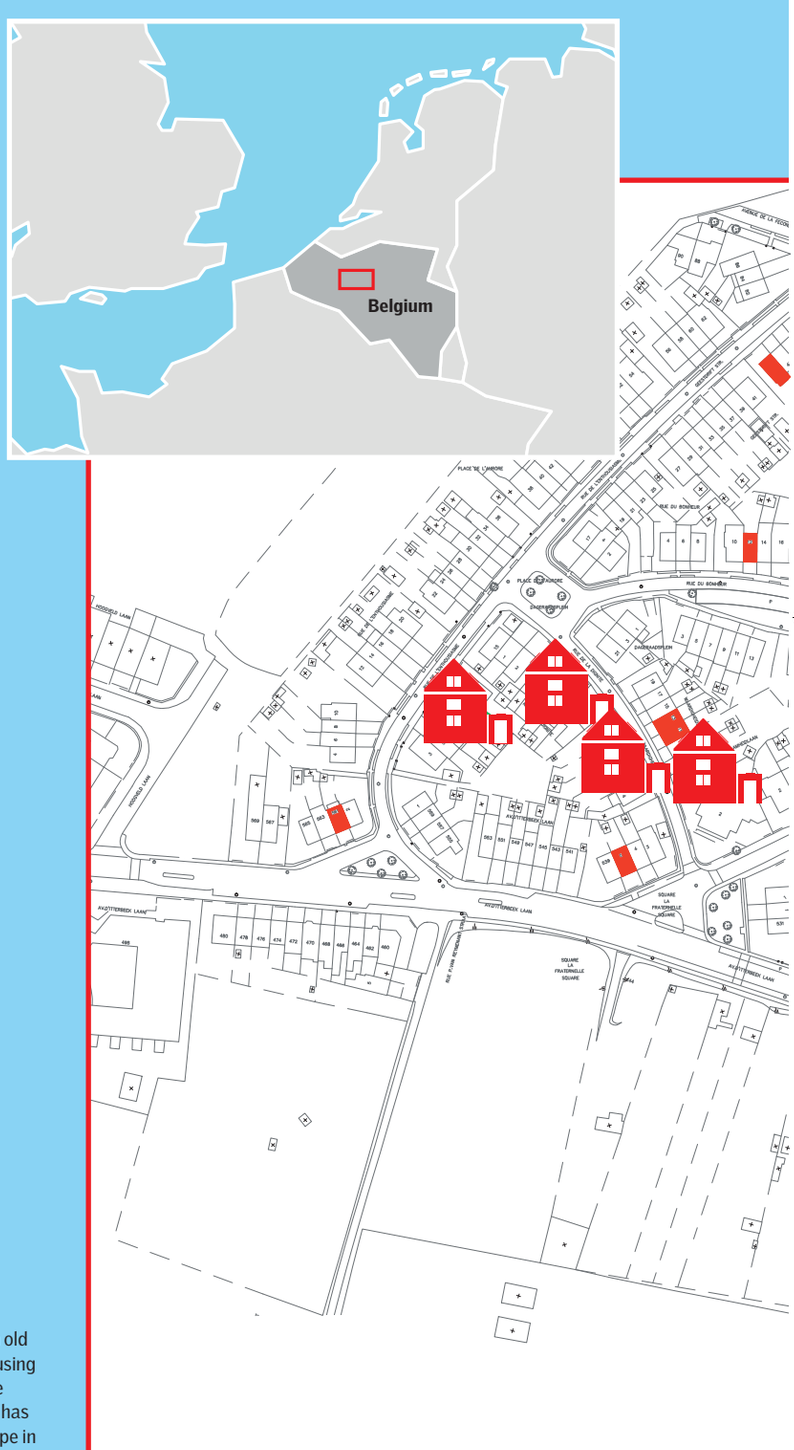
- The extension measures 15m² and creates additional living space on the ground floor to accommodate a family of five people.

Photo: Adam Mørk

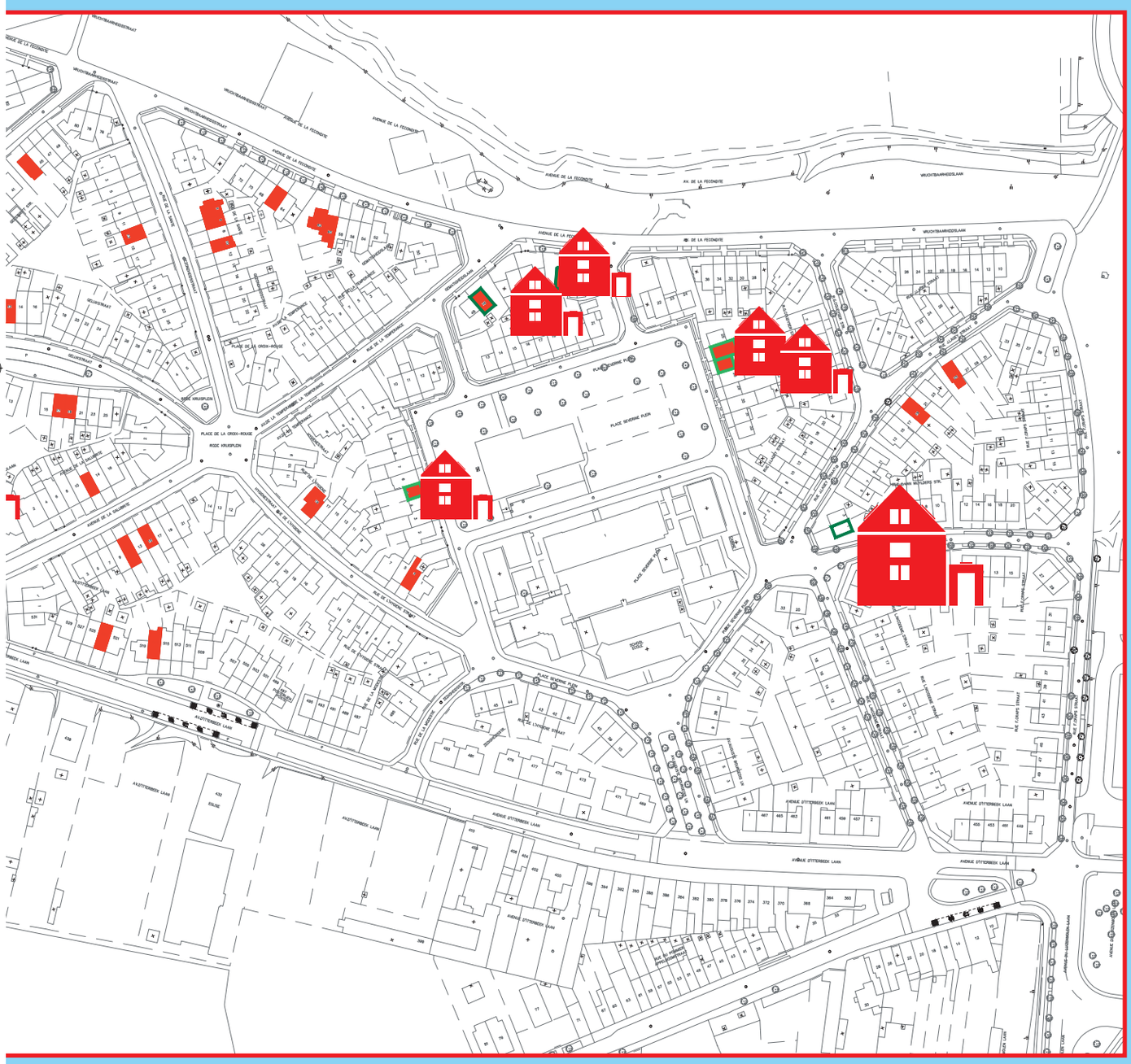
From one to many – the RenovActive House is spearheading a trend

When the RenovActive House is handed over to its first tenants in May 2017, the concept is being replicated in the surrounding Bon Air community. Following the inauguration of the first house in May 2016, the authorities gave permission to implement the renovation concept in 86 similar homes, owned by Le Foyer Anderlechtois.

The majority of these homes will experience exactly the same transformation, including the construction of a central staircase with automated roof windows at the top, a better inclusion of daylight, improved insulation and an intelligent hybrid ventilation system, combining natural and mechanical ventilation.



The Bon Air district is located in an old garden city and contains public housing as well as a large number of private properties. Le Foyer Anderlechtois has 225 houses of the same building type in the area.

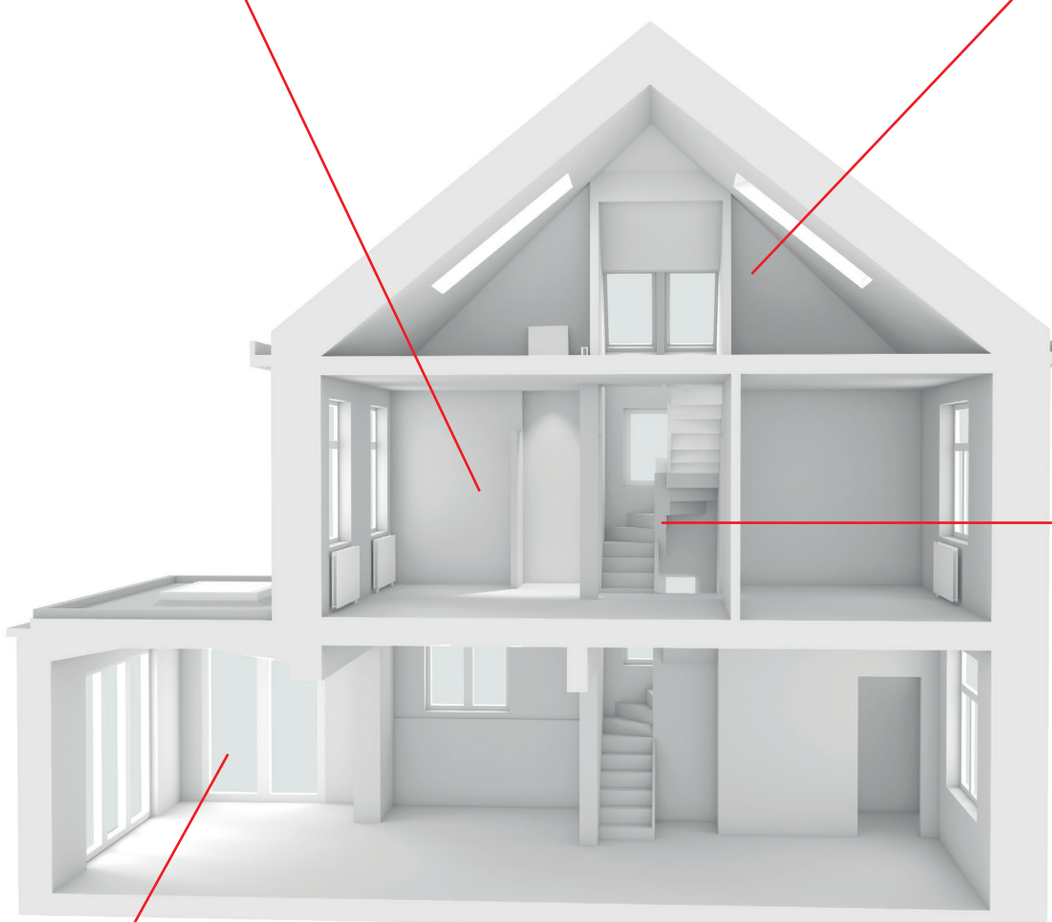


VELUX products and solutions

Room for bathing

Sun tunnel (rigid tunnel)
Type:
TWR 0K14 2010 – dimensions: diameter 35cm
Type:
ZTB 0K14 2002

Kit for Sun tunnel
Type:
ZTL 014L



Room for dining

VELUX INTEGRA®
Electrically – opening plane flat glas roof window
Type:
CVP 100150 0673Q – dimensions: 100 cm x 150 cm + Flat glass – Type: ISD 2093 – double glazing.

VELUX INTEGRA® electric pleated blind for flat roof window
Type:
FMG 100150 1016 – white, translucent blind.

Attic for playing

VELUX roof window
Type:
GPL SK10 2066 – interior finish in white painted wood – dimensions: 114 cm x 160 cm – triple glazing.

Blackout energy blind
Type:
FHC SK10 1045 – white blackout energy blind with double pleated cloth increases comfort during cold nights.

Self-regulating ventilation unit with increased flow rate
Type:
ZZZ 214K P (prototype for 3-layer pane)

VELUX INTEGRA® electric roof window
Type:
GGL SK10 207021 – interior finish in white painted wood – dimensions: 114 cm x 160 cm – double glazing.

VELUX INTEGRA® electric awning blind
Type:
MML SK10 5060

Flashings for recessed and insulated installation
Type:
EDJ SK10 2000 – corrugated roofing materials

Vapour barrier collar
Type :
BBX SK10 0000

Manually operated DUO blind
Type:
DFD SK10 4571 – blue blackout blind with white, daylight softening pleated blind.

Connecting staircase

2 VELUX INTEGRA® electric roof windows (twin installation)
Type:
GGL MK08 207021 – interior finish in white painted wood– dimensions: 78 cm x 140 cm – double glazing.

Multi flashing for recessed and insulated installation
Type:
EKJ MK08 0001E & EKJ MK08 0003 – corrugated roofing materials

Insulating frame
Type:
BDX MK08 2000F

Vapour barrier collar
Type:
BBX MK08 0000

2 VELUX INTEGRA® electric pleated blinds
Type:
FML MK08 1016

VELUX INTEGRA® electric awning blinds
Type:
MML MK08 5060

Product partners

GLASSOLUTIONS SAINT-GOBAIN

Saint-Gobain Glass Solutions has supplied double glazing windows (type SGG CLIMAPLUS XN SWS) and triple glazing windows (type SGG CLIMATOP XN SWS). These two glazing types combine excellent energy efficiency with a very high level of light transmission. The CLIMATOP type also reduces the direct entry of sunlight and prevents overheating during sunny days.
A foiled, warm edge spacer minimises the risk of thermal bridging and improves insulation performance.

weber SAINT-GOBAIN

Weber has supported the construction of the exterior insulation and provided plaster to insulate the existing bricks (plaster type Webertherm B100 WDVS).

LAYOUT Don't proofreed

ADFORS SAINT-GOBAIN

Adfors has provided Vertex wall reinforcement products for the building's external and internal rendered and plastered facades. Thanks to an impact resistant design, the fibreglass product protects against cracking and ensures improved longevity of the façade.

somfy®

Somfy has installed a SUNEA io motor that allows awning and solar blinds to be easily controlled from a distance.

Wienerberger
Building Material Solutions

The existing Koramic Tempête Tiles 44 from Wienerberger on the roof were kept. Structures built with Koramic clay roof tiles can easily reach a lifespan of 150 years.

kvik®

Kvik is a Danish brand designing kitchens that are both affordable and very qualitative. Kvik believes that everybody should be able to equip his or her own dwelling with superb Danish design.
The kitchen model is Senti – a kitchen completely without handles. Drawers and doors can be opened and closed with a gentle push.

The worktop is a white Kvik Touch – a strong and practical laminate with a special surface that makes it easy to clean and to repair minor scratches. The one side of the kitchen is designed as a working space with a large underglued sink and a cooking section. The base cabinets are Kvik's XXL cabinets with extra depth.

ISOVER has provided insulation for the roof, floor and walls. Insulation is done with glass wool, type Isoconfort 32, in combination with Vario KM duplex (vapour control/air barrier in polyamide), Vario KB1 (extra wide self-adhesive tape), Vario double Fit and Vario Stos (flexible, extra strong EPDM membrane for airtightness).

Gyproc has delivered SoundBlocboards that have a higher density core than standard plasterboard. The boards are designed for use in Gyproc wall and partition systems that require advanced sound insulation. In combination with the Metal Stud SoundBloc profiles the SoundBloc system offers the highest level of sound insulation. In addition, SoundBloc is a thin drywall solution, which is easy to install.

De Kringwinkel is a network of second hand stores in Flanders, Belgium. By collecting reusable goods and selling them in 131 local stores, the company helps to reduce the garbage belt and sustain 5,000 jobs for unskilled workers. The RenovActive House was decorated with furniture and items from De Kringwinkel, in order to emphasise the sustainable and affordable character of the RenoActive project.

Grundfos has installed a RWR Smartflo SQE 3-40 Masterpump to enable the collection, filtering and re-use of rainwater.

Creating healthy spaces

Renson provided a demand-driven C+ ventilation system that combines the continuous flow of fresh air through Invisivent® self-regulating ventilation ducts with the mechanical extraction of air via the Healthbox® central extraction fan. Living areas have Invisivent® window ventilators with built-in pre-heating, while dynamic sensors analyse the air that is extracted from the bedrooms and other rooms with high moisture levels. The analysis checks for CO_2 or moisture and/or volatile organic compounds. More ventilation is provided in the rooms where people are most often present, optimising air quality for each zone.
The compact sun blind system, Miniscreen® 100 with cable guides, helps to prevent solar heating.

VELUX A/S
Ådalsvej 99
2970 Hørsholm
+45 45164000
www.velux.com/renovactive

Bringing light to life™

VELUX®

Follow the project at www.velux.com/renovactive