activehouse

HEALTHY BUILDINGS FOR PEOPLE AND PLANET

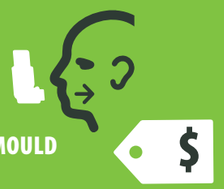
People spend up to 90% of their time indoors in urban areas.

Promoting actions for healthy indoor air (IAIAQ), 2011

Considering how indoor air quality, daylight and the thermal environment affect productivity, health and well-being, it is essential to design buildings that facilitates comfort as well as sustainability.

Buildings that follow Active House principals will do exactly that; create a healthier and more comfortable home for their occupants with a minimal climate impact.

A US study estimated the **cost of asthma induced by DAMPNESS AND MOULD IN HOMES** at

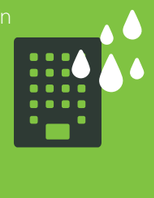


USD 3.5 BILLION per year

Public health and economic impact of dampness and mold. Mudarri D, Fisk WJ, 2007

84 000 000

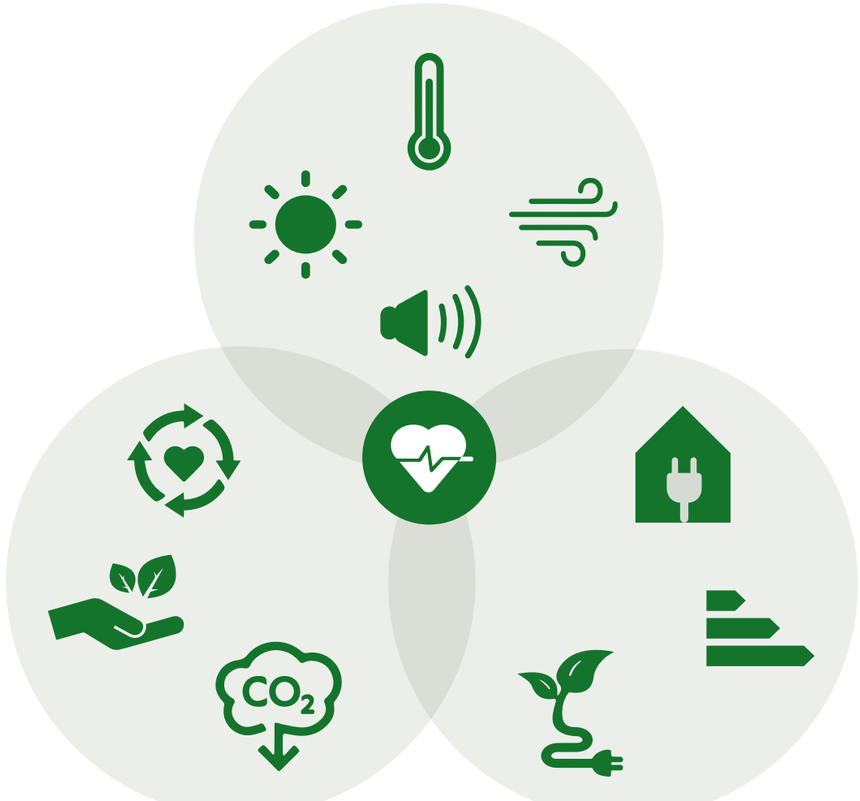
Europeans live in **DAMP AND UNHEALTHY BUILDINGS**



Healthy Homes Barometer 2017, Fraunhofer IBP 2017

40% **People more likely to have asthma** when they live in a **DAMP OR MOULDY HOME**

Fraunhofer IBP 2017



Active House sets the user at the centre.

An Active House is a building that offers a healthier and comfortable indoor climate for the occupants without negative impact on the climate – measured in terms of energy, fresh water consumption and the use of sustainable materials. This is a holistic approach to building design that has been adopted in the construction industry and amongst planners and designers. The principles have been tested, and current specifications are based on real data, not just estimates.

Setting the user at the centre means to quantify the parameters which matter most to users, with a minimal footprint on the planet.

Healthy Buildings for People & Planet

CONTENT

AUSTRIA
BELARUS
BELGIUM
BULGARIA
CANADA
CHINA
DENMARK
GERMANY
HUNGARY
ITALY
LITHUANIA
MALAYSIA
NORWAY
POLAND
PORTUGAL
RUSSIA
SLOVENIA
THE NETHERLANDS
UKRAINE
UNITED KINGDOM
USA

107 ACTIVE HOUSES IN 23 COUNTRIES

20 FULLY LABELED

The Active House – Comfort, Energy, Environment – were defined in 2011, by a global group of likeminded visionary leaders, who strongly believed in a holistic approach to building design. Since then, the principles and specifications have been applied to numerous building types: single-family and multi-family residential, social housing, offices, schools and more. Projects have been undertaken in various climate zones and encompass new constructions as well as retrofits. The first 30 demonstration projects were monitored on results and experiences, tried and tested by the actual users. The results and testimonies revealed the many positive effects of adhering to the principals, creating homes that are reassuringly efficient and very comfortable all seasons and for generations of use.

The Active House label was launched in 2016, and verifiers were trained to educate and guide planners & designers with the ambition to create buildings which are healthy for people & planet.

What **motivates** Europeans to renovate their homes:

73%
TO IMPROVE well-being,

75%
TO SAVE energy costs

Healthy Homes Barometer 2016
VELUX

Buildings can **IMPROVE productivity and performance** by as much as **12.5%** or **REDUCE** them by as much as **17.0%**

Carnegie Mellon/CBPD Building Investment Decision Support (BIDS), 'High Performance Buildings,' 2004 and 2012

There is a **GLOBAL POTENTIAL for energy savings of 50-90%** in existing and new buildings
International Energy Agency, 2014

Active House benefitting all stakeholders

Initially an **Active House** draws on the knowledge derived from older buildings, but it also use passive technologies such as natural ventilation and solar gains in combination with quality craftsmanship. The goal is to create a building that looks beyond energy performance, incorporating comfort aspects such as air quality, heating, and daylight; in other words to make it more accommodating as well as habitable.

The vision of **Active House** is to make residents the centre of attention. The concept offers a range of benefits for developers, architects and real-estate professionals, but in the end it's the health and comfort of the residents that are used to measure the success of an Active House.

ACTIVE HOUSE: Hous am Venusgarten, Austria
PHOTO: Jörg Seiler

ACTIVE HOUSE: Hous am Venusgarten, Austria
PHOTO: Jörg Seiler

Benefits for developers and builders constructing Active House buildings

FEEDBACK LOOP
Developers focus on the user in a holistic way through the building design, and can gain feedback once people occupy the building

SUSTAINABILITY
Buildings are sustainable ecosystems in themselves, and should be healthy for the planet and people, supporting health and well-being, and enhancing productivity and quality of life

KNOWLEDGE-SHARING
Global international leading edge

HOUSE MODELLING
and stimulating reports from an early stage of design

Access to **LIKE-MINDED SUPPLIERS**
and manufacturers with the same goals

INCREASED SALE VALUE

SUPPORT PROVIDED BY THE ACTIVE HOUSE ALLIANCE:
open-source educational and support material available and visibility of the projects. Smart thought out design program that is easy to follow

The products, technology and competences are **AVAILABLE OR AT HAND**

Being part of a dedicated **NETWORK OF PROFESSIONALS**

THIRD-PARTY VERIFICATION
of the house design by an external engineer / expert

Benefits for the users / occupants

COMPREHENSIVE COMFORT
including thermal and visual comfort, health, daylight and well-being

Increased **PRODUCTIVITY**
at work and learning made easier for children

FRESHER AIR
which equals better sleep

Energy and water **SAVINGS**

Increased **MARKET VALUE**

SUSTAINABLE-LIVING
empowering users to make informed choices for how to live sustainable

MORE NATURAL LIGHT
Daylight shower daily to stay healthy and high performance in work, life and play

EASY MANAGEMENT
of the building's functions

THIRD-PARTY VERIFICATION
of the house design by an external engineer / expert

Active House buildings demonstrate that the vision of comfortable and low-energy buildings can be achieved in an effective and reproducible way. The Alliance facilitates cooperation between all interested parties and supports developers in their journey towards the Active House label.

How to get the Active House label

The **Active House Alliance** offers a toolbox to support building professionals that want to explore the possibilities.

A guide to the label is available, with a step-by-step introduction to the process.

LABEL

The **Active House label** is a worldwide quality stamp of assurance for comfortable and sustainable buildings, evaluated in accordance with the Active House specifications and meeting the minimum requirements for comfort, energy efficiency and the environment. You do not need to be an Active House member to get the label.

1. **Learn about the parameters**
Identify the design based on the Active House concept, the nine parameters and the qualitative questions.

2. **Determine the levels of the project**
Decide with the client the ambition of the project - which level to obtain.

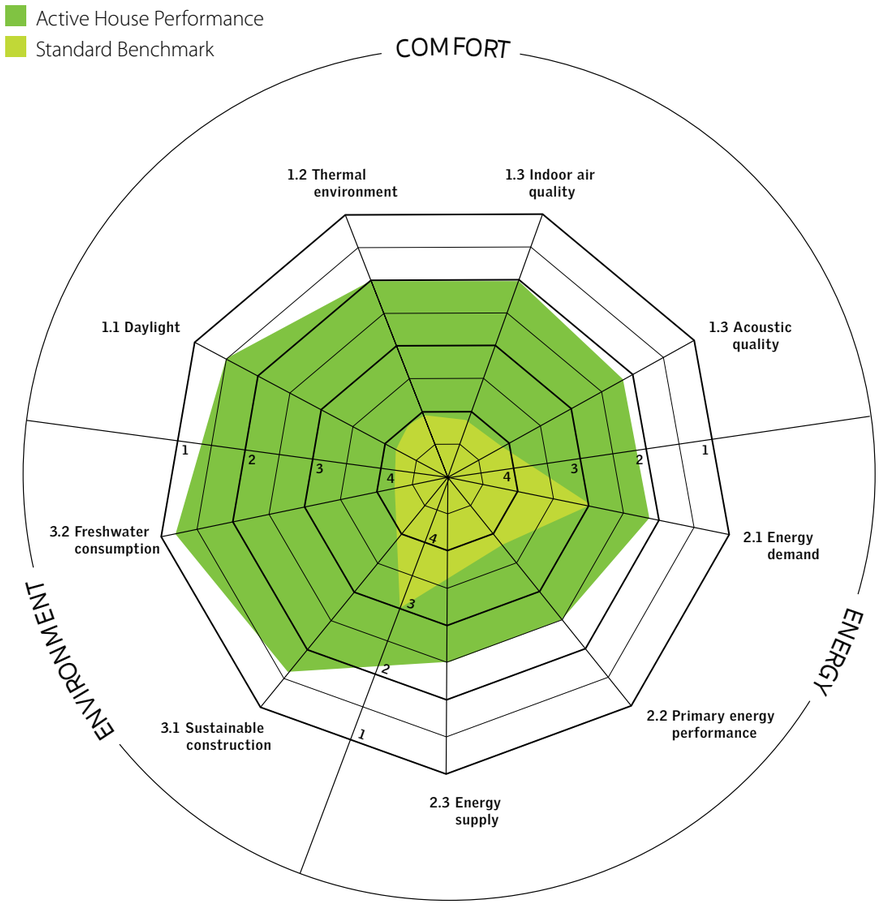
3. **Tools and measurements methods**
Use the approved tools to evaluate your project in accordance with the current standard for the individual parameters.

4. **Generate data**
Calculate the levels for all nine parameters in accordance with the current standard and answer the qualitative questions.

5. **Enter data for the project**
Enter your data in the Active House tool and calculate the radar.

6. **Procedure for approval of the project**
Submit your report to the Active House Alliance to obtain the right to use the label.

7. **Obtain and use the label**
After approval you receive a diploma and can use the Active House label to promote the specific project.



In order to be labelled an **Active House**, the performance of the house will have to be assessed based on the **Active House calculation**. The results should include a balanced focus on daylight, thermal comfort, indoor air quality, energy and water use, as well as a lifecycle analysis of the building material.

The Active House radar shows the building performance based on calculated and measured data. Energy calculations are based on national building codes.

- **Training** is offered in the format of webinars and case studies, videos and a regular newsletter.
- **Additional resources:** specification book, guidelines, and more are available for download on the website.
- **Award:** builders, developers, architects and other real-estate professionals can submit their sustainable building projects, which will be evaluated based on the Active House vision. The winner will be awarded with an Active House label and presented on the website as well as during events.
- **Networking material:** a list of verifiers is available, and a list of certified and recommended products will be available soon.
- **Membership:** members can participate in internal workshops and knowledge-sharing activities, training activities regarding specifications, as well as in the development of the Alliance.

CASE: ACTIVE HOUSE CENTENNIAL PARK

Architectural and technological design team:
Superkul, HomeCAD, HVAC Designs, Building Knowledge, Quail Engineering, Home Technology, VELUX Denmark, Great Gulf

Location:
Toronto, Ontario, Canada

Project type:
New construction – Mass production style, low-rise construction, sub-division

Use: Single-detached residential house

Client:
Private home-owners
– First inhabitants: the Ibbotson family, testing the house for a 6-month period

Year: 2016

The first labelled Active House in the World

“THE ACTIVE HOUSE VISION DEFINES HIGHLY AMBITIOUS LONG-TERM GOALS FOR FUTURE SUSTAINABLE HOMES BUILT BY GREAT GULF AND PROOF WE CAN MAKE A SIGNIFICANT IMPACT ON THE OCCUPANT’S WELLBEING WITH A HOLISTIC APPROACH TO DESIGN, ECONOMICS, AND QUALITY OF LIFE”

Tad Putyra,
President at Great Gulf Low Rise. Toronto, Canada

COMFORT

The Ibbotson family lives at the Active House Centennial Park. During the monitoring period they discovered a number of exciting things.

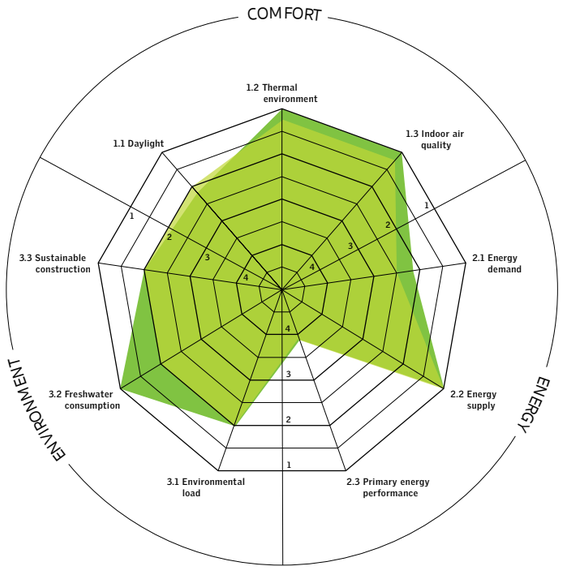
- The air quality sensor that monitors the CO_2 levels throughout the home registered “high quality” 95% of the time. The average score for American homes is less than 50%, according to the US Department of Energy Health’s home review of High Performance Homes.
- The installation of an innovative Energy Recovery Ventilation unit ensured that fresh air circulation was maximised throughout the house.
- The thermal performance analysis showed that on the coldest days (-10 to -15°C) there were no more than a 3-4°C difference between the walls, windows and room temperature. The minimal disparity ensured that the Ibbotson children could play right next to the windows without feeling uncomfortable.
- An onsite daylight analysis revealed that some rooms performed well over the levels, projected in the preliminary daylight analysis. Contrary to the virtual model, which considered the worst-case scenario, the neighbour’s roofline did not block the light.

ENERGY

The first goal was to employ passive systems to reduce the energy load of the house. This was accomplished by using the Huber Wall System and Rockwool Insulation. Rockwool also improves thermal comfort and increase the air-tightness of the building.

- A number of main floor windows were combined with VELUX skylights to create a cross ventilating "stack effect".
- The mechanical systems and appliances of the house were chosen with great care. The Lennox equipment was selected based on its energy efficiency as well as its user-friendliness. For evening and ad hoc lighting throughout the house, LED was chosen for its minimal power consumption.
- Even with nearly twice as many heat days during the summer of 2016, then modelled by the Hot 2000 software, Active House Centennial Park only used 50% of the air conditioning load compared to a similar home in the neighbourhood. As this was a production-built home, the house was designed to accommodate future renewable energy installations, e.g. a Tesla Powerwall battery back-up system.
- A further decision was made to purchase on-grid renewable energy and natural gas for the home.

Tested Performance
Designed Performance



ENVIRONMENT

The wood structure of Active House Centennial Park was manufactured at the H+ME Technology facility, a subsidiary company of Great Gulf with CNC equipment.

- This house was built to stand the test of time and allow for true recycling of many of the home's components.
- After the Life Cycle Analysis modelling was completed, it was noted that 89.5% of the material used for the construction of the house had recycled content, and over 75% of the construction waste was diverted for recycling.

ACTIVE HOUSE & GREAT GULF - PARTNERS IN INNOVATION

The story behind the partnership

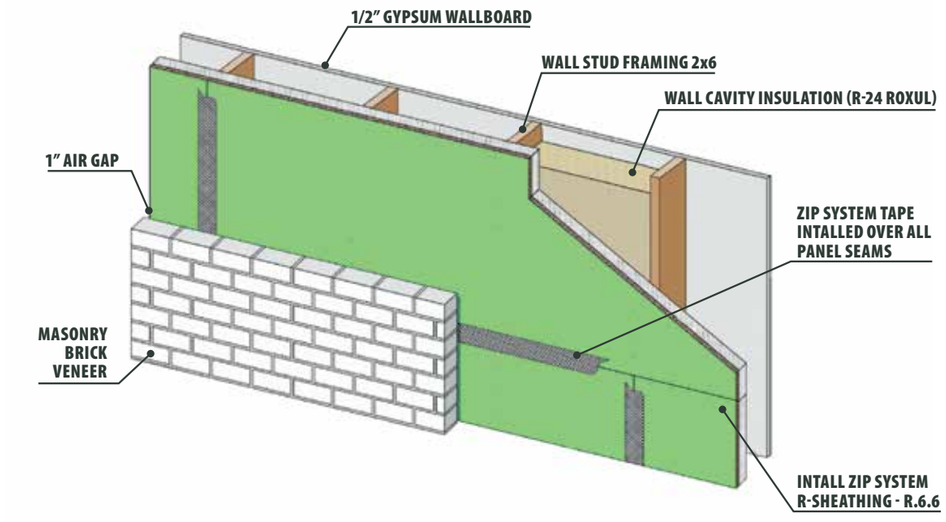
When Tad Putyra first discovered the Active House vision on a European flight, he realised that this approach was missing from the North-American Market. As president of Great Gulf, COO of Great Gulf Low rise and President of H+me Technology, he especially noted the focus on the homeowner's comfort.

After connecting with the Active House team in Europe, Great Gulf now sits on the Board of Advisory Committee as well as on the Board of Directors and has participated in the launch of the Alliance in Canada. Architects and mechanical engineers have received new training and education. The Active House principles, until then mainly based on European standards, were adapted to other markets.

"ACTIVE HOUSE CENTENNIAL PARK WAS DEVELOPED IN COLLABORATION WITH THE VELUX GROUP, ACTIVE HOUSE ALLIANCE (EUROPE AND CANADA), ROXUL - ROCKWOOL EU AND THE DANISH TECHNICAL INSTITUTE , TO STRENGTHEN KNOWLEDGE-SHARING. WE ARE NOW DEVELOPING A TESTING AND MONITORING FACILITY IN ONTARIO FOR MECHANICAL SYSTEMS WHERE WE WILL INCLUDE AN ACTIVE HOUSE TO CREATE THE NEXT GENERATION OF PROTOTYPE FOR HEALTHY-LIVING."

Great Gulf Executive Director
Sustainability & Building Science
Shaun Joffe

ACTIVE HOUSE CENTENNIAL PARK WALL CROSS SECTION



CASE: LANGFANG

Design:
Building Industry Architects
COWI energy concept,
TERAO technology concept,
Eco-laborator interior design

Location:
China, Heibei province
Project type:
New construction

Use:
Workplace of 54 employees.

Client:
Headquarters VELUX China

Year: 2013

COMFORT

Water, air and daylight are basic elements in the architecture of VELUX Langfang Office. Combined with state-of-the-art technology, they create a building with optimal working conditions and minimal environmental impact. The building was intended to function as a showcase for optimal indoor climate, energy efficiency and the benefits of VELUX products: daylight and natural ventilation.

Aymeric Novel is engineer and was responsible for the heating, ventilation and air conditioning system (HVAC) in the VELUX Langfang Office. He underlines the importance of using architecture as a tool for energy efficiency. "The facade design is critical for low energy buildings. You need to find the best balance for heating, cooling and lighting needs," he says.

Henrik Norlander Smith is architect at the VELUX Group, and he concurs. "It requires a clever facade design, in terms of fenestration, to achieve the right balance between passive solar heating in the winter, solar shading in the summer, daylight harvest and natural ventilation."

Early in the design process it was decided that the building should be compact, with the mass centered around an atrium.

"A compact building has advantages in relation to construction as well as energy efficiency. The trapezoid shape offers a more dynamic look than most office towers, and it creates a better inflow of light through the roof windows", says Henrik Norlander Smith.

Langfang is the headquarters of VELUX China but is also a show case for Active House, where tours and seminars are held for Architects, Developers, Government, Engineers, Professors, Dealers, Students and Customers.

Visitors in 6 years **15000 +**

Corporate visitors in 6 years **1000 +**

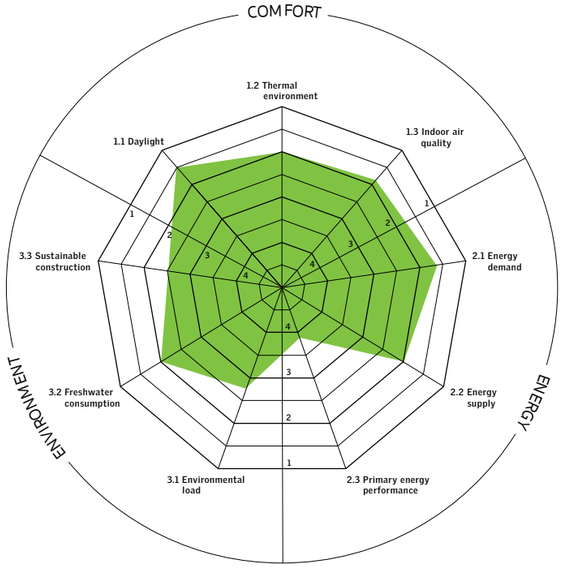
ENERGY

Obtaining the good results of VELUX Langfang Office has required a conscientious effort.

- The TABS system consists of an embedded network of water pipes in the mid-plane of all concrete slabs. Combined with a ground source heat pump and an outdoor air unit with variable volume, the system provides pleasant, energy-efficient heating.
- An airtight and highly insulated envelope limits heat loss. Rockwool insulation thickness is 250 mm in the floor, 200 mm in the roof and 150 mm in the walls.
- Extensive use of roof windows and facade windows.
- Thermal solar collectors are used to heat domestic water.
- Awning blinds protects against solar heating and reduce the need for air conditioning.
- A heat pump extracts energy from the ground under the building.

> ACTIVE HOUSE:
> BY THE PEOPLE,
> FOR THE PEOPLE,
> OF THE PEOPLE

Zhao JinYan
Active House Academic Society, China.



ENVIRONMENT

To ensure a comfortable indoor climate, VELUX Langfang Office is equipped with:

- A TABS system (Thermal Active Building System), which uses radiant heating and cooling to improve the indoor comfort. TABS has proven to be a very popular feature amongst the occupants.
- Ventilation control is operated according to CO_2 levels, adapting the fresh air flow-rate to the density and number of people and their activities.
- Extensive use of roof windows and facade windows provide plenty of daylight, minimising the need for artificial light, and allowing fast, natural ventilation to act as free cooling in the hot season.

CASE: VELUXlab

Architectural team:
Atelier2 – Valentina Gallotti,
Prof. Marco Imperadori
– Politecnico di Milano

Location:
Milano, Italy

Project type:
Refurbishment

Use:
Office

Client:
Politecnico di Milano and VELUX Italia

Year: 2012

Atika pavillon in Bilbao 2006
Architect:
Javier Aja Cantalejo, ACXT

PHOTO: MARCO BOSSI

PHOTO: MARCO BOSSI

PHOTO: MARCO BOSSI

VELUXlab is the first Italian NZEB located in a University campus and the first Italian Active House certified as-built.

It is an innovative laboratory of Politecnico di Milano, an active building prototype for continuous tests and experiments on buildings' behavior, and a cognitive building able to retrieved data from sensors equipment and transfer it as information and knowledge to the final users, thanks to live dashboards of big data and BIM-based platforms.

COMFORT

The retrofit design maintains the original shape of the building, initially conceived by VELUX as a model home for the Mediterranean climates. A small South facing patio is accessible from all the rooms, whose pitched roofs guarantee a self-shading be-havior in summer, solar gains in winter, and maximize natural cross ventilation during the middle seasons, and a plenty of daylight, through 15 skylights. The indoor spaces achieve, therefore, high levels of indoor visual comfort, with the Daylight Factor evaluation that reach up to 6%.

In the extreme seasons, the remotely controlled opening/closing of windows is scheduled to turn itself off, in order to obtain an adiabatic envelope, while the CO_2 sensors activate the ventilating system, and a LED self-dimmerable lighting system integrates the light supply if needed.

Finally, the retrofitted envelope has implemented the original structure through a multi-layered construction system, according to the outcomes of energetic simulation and resulting in an excellent thermal and acoustic behavior. A new green roof has been installed as the ultimate layer on the top of the building, to reduce the impact of the heat wave during the hottest seasons.

> VELUXLAB IS THE FIRST ITALIAN ACTIVE HOUSE AND IT IS LOCATED IN POLITECNICO DI MILANO. IT IS AN "ACTIVE LAB" AS THE USERS ARE PART OF A CONTINOUS EXPERIMENT, LIVING AND INTERACTING WITH THE SPACE AROUND THEM, COSTANTLY MEASURED BY DIFFERENT KIND OF SENSORS. WE CAN SAY THAT VELUXLAB IS A REAL, EXISTING "COGNITIVE BUILDING" ABLE TO GIVE INSTANT INFORMATIONS TO THE USERS ABOUT INVISIBLE PHYSICAL PHENOMENA LIKE ENERGY, SOUND, VOC, PM 2.5, AND SO ON OR TO REACT AND BALANCE THE INNER ENVIRONMENT WITH THE OUTER NATURAL SOURCES FOR DAYLIGHT AND VENTILATION.

Marco Imperadori
Politecnico di Milano,
Italy

PHOTO: MARCO BOSSI

ENERGY

The building design was conceived to answer instantly to climate changes and to naturally achieve indoor well-being, with the help of the mechanical system just in ex-treme seasons. It is equipped with an HVAC system, with heat recovery (90%), air-water heat pump (7kWhp) and 3 solar panels with a 160 liters' boiler for the domestic hot water supply. In order to partly cover the electric demand with renewable sources, a 2kWp PV system has been install over the ventilated roof. The final energy demand is 11.9kWh/m^{2}y.

The efficient performances of the building's system are every year confirmed by the wireless sensors network monitoring system, that validates the building as a very smart and active center of research.

ENVIRONMENT

The positive environmental footprint of the building depends on the use of innovative and recycled/ recyclable materials, such as the recycled glass cladding panels of the ventilated facades. Moreover, the Life Cycle Assessment has been performed for all the building elements, validating the building sustainability.

PHOTO: MARCO BOSSI

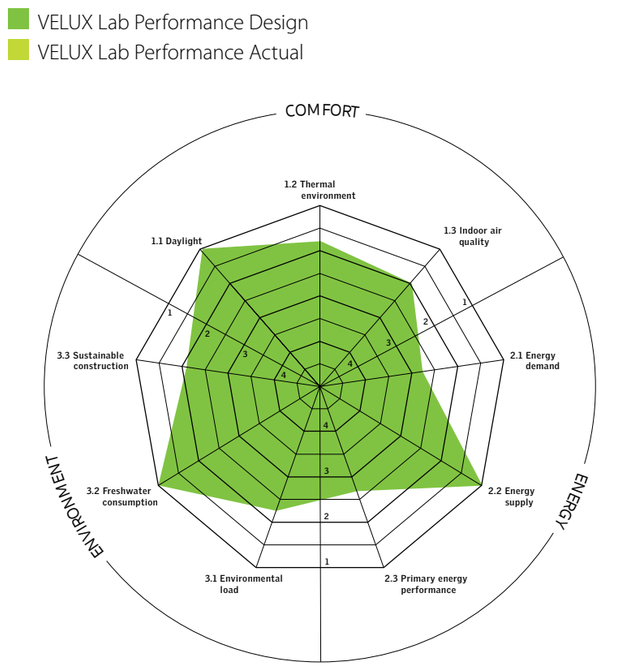
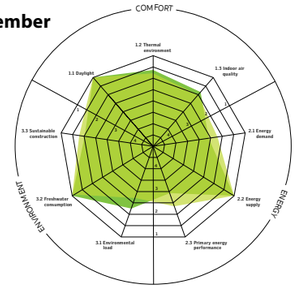
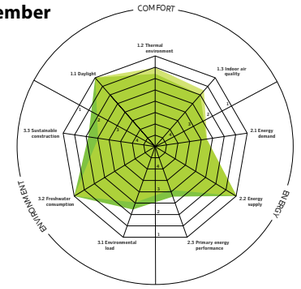


PHOTO: MARCO BOSSI

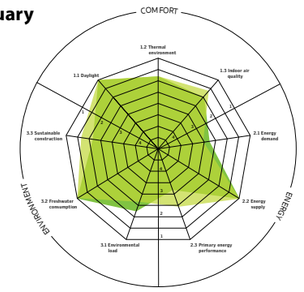
November



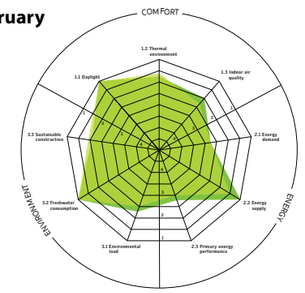
December



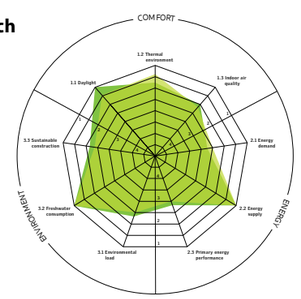
January



February



March



CASE: FUTURA HOME

Architectural team:
KFS BOLIGBYG A/S

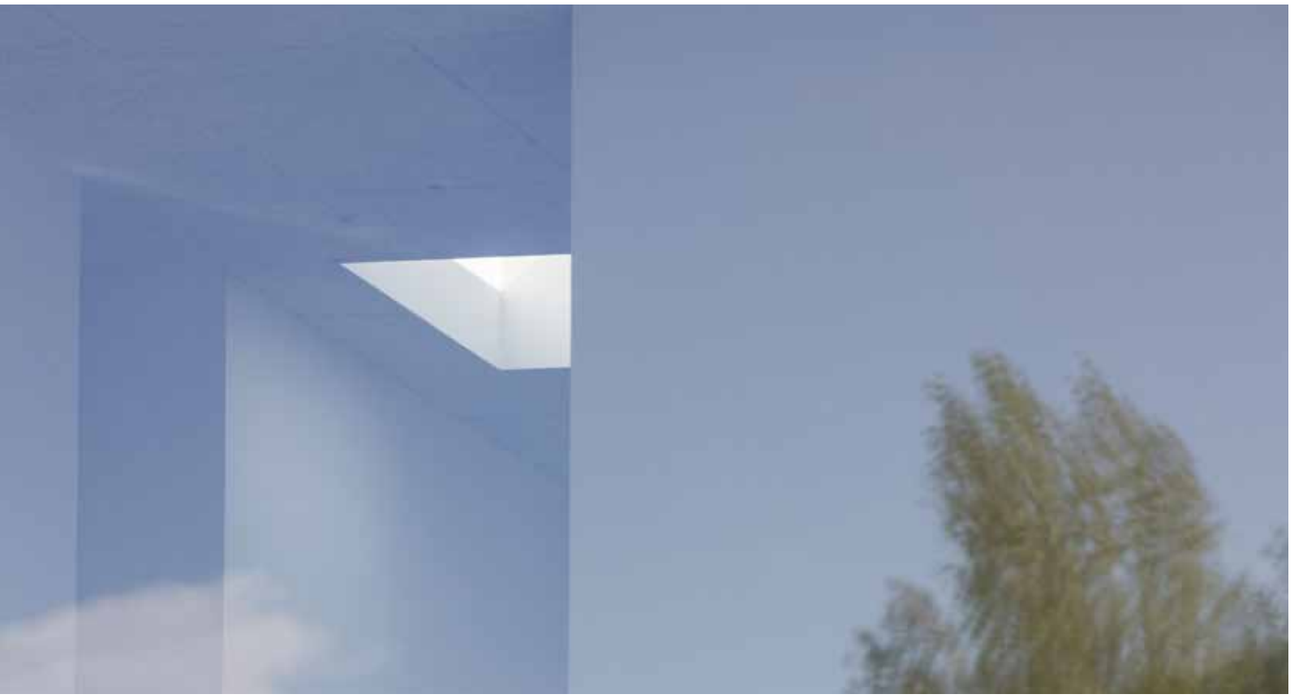
Location:
Denmark, Solbjerg

Project type:
New construction

Use:
Single residential house 184,3 m^2

Client:
KFS BoligByg A/S

Year: 2017



“WE OFTEN USE THE ACTIVE HOUSE PARAMETERS AS A KIND OF A DESIGN GUIDE. THERE IS A GOOD BALANCE FOR ALL STAKEHOLDERS AND WE LOVE THE LONG TERM THINKING. IT IS TIME TO CARE TAKE FOR THE NEXT GENERATIONS, AND THE END COSTUMER IS FINALLY READY FOR THAT TOO. MONEY ISN’T THE ISSUE ANYMORE – BUT TAKING CARE OF OUR PLANET IS THE BIGGEST CHALLENGE.”

Ditte Maria Kollerup
CEO, KFS Boligbyg

COMFORT

The Futura Home Active House is a single-family house, located south of Aarhus, Denmark. Key features such as the orientation of the building and a bold internal design makes the home ideal for a comfortable and balanced life indoors.

- The roof is raised towards the North and West, allowing high facades to hold significant fenestration. The orientation of the large window-sections in combination with skylights, placed in the centre of the building, ensure plenty of pleasant indirect lighting and an excellent daylight factor.
- Minimum fenestration towards the south minimises the risk of excessive solar heating in the main rooms.
- Great ceiling heights in the main rooms combined with mechanical ventilation ensure a clean and fresh indoor air quality.

ENERGY

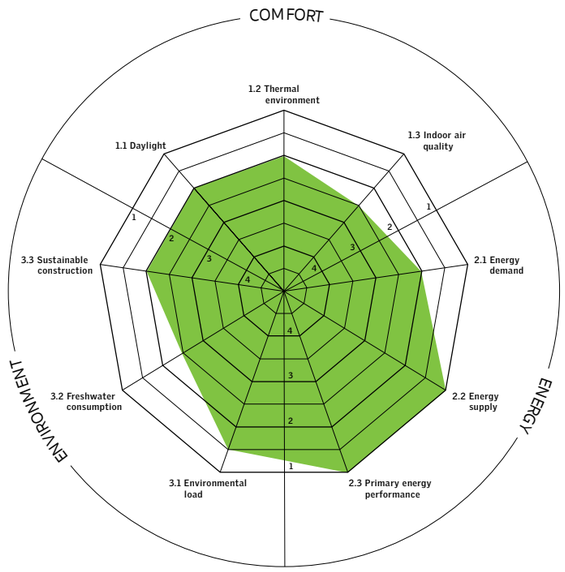
Energy control has been an essential topic, while designing Futura Home. The annual consumption of energy is set to have a maximum 20 kWh/m² limit.

- Since the building is heated by an air-to-water heat pump, there is no need for district heating. Rooms use underfloor heating, reducing the amount of wasted heat as the heat is spread equally in each room.
- Solar panels supply the building with free solar power and reduce the need for electricity from the public grid.
- The building envelope has been designed in a way, which makes the quantity and quality of the insulation perform to its full potential.

ENVIRONMENT

During the design process numerous environmental considerations were taken into account. For one thing the wood is FSC certified, meaning the wood is cut and processed in a sustainable way and every worker is protected by specific standards all the way from cutting to building. Here are some of the other considerations:

- Both the Kebony wood and the bricks used in the facades requires a minimum of maintenance.
- Materials were specifically chosen for their recyclability. Rockwool insulation and Troldtekt wool wood panels comply with this criterion.
- Bearing structures are made of aerated concrete and can be crushed and recycled.
- Selected plumbing luminaires help to reduce water consumption.



CASE: OptimaHouse

Architectural team:
Alexander Kucheravy

Location:
Ukraine

Project type:
New built

Use:
Single-family house

Owner:
Ukraine Affordable Housing

Year: 2015

COMFORT

OptimaHouse is a compact modern house composed of two floors with windows and ventilations placed strategically to ensure the maximum of comfort and health environment. Designed to accommodate a family of 3-4. The main idea of OptimaHouse is holistic approach and optimal solutions in comfort of living, energy efficiency, impact on the environment, terms of construction, economically reasonable cost.

OptimaHouse suggests occupants not less than +21 °C inside air temperature in cold period and not more than +24 °C in hot period by:
– hybrid ventilation (natural cross-section ventilation with stack effect in autumn-spring season and mechanical ventilation with heat recovery 83% in heating and cooling period)
– Air-air heat pump
– zoned heating by "water floor" and electrical ceramic panels in living rooms.

Hybrid ventilation ensures that CO_2 concentration will be less 900 ppm inside. Air quality sensors in living rooms help to provide optimal air quality. They are:
– measure inside temperature, humidity, CO_2 concentration
– give command to open/close roof windows
– sent information to occupants
– control speed of mechanical ventilation with heat recovery.

31,5% of all windows to total building area provide necessary light, solar gains in cold period, allowing to achieve daylight factor 3-5% in living space.

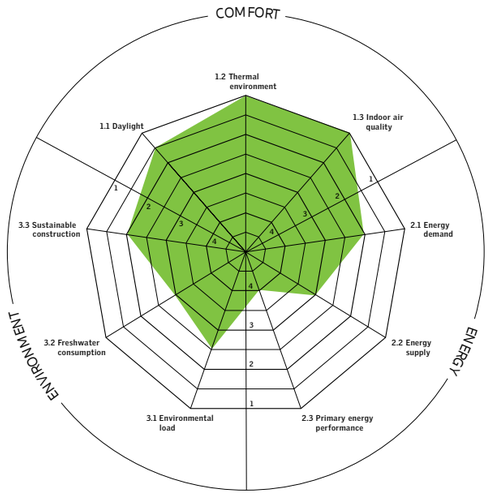
ENERGY

OptimaHouse is supplied by renewable energy sources integrated in the building. It takes 65% less energy than traditional modern building in Ukraine.

OptimaHouse energy demand less 60 kWh/(m^2 a) for all needs through:
– Compactness. Outside construction area to heating volume is 0.83
– Optimal orientation to the sun
– Good level U-values of the envelope: outside walls 0.15 W/(m^2K), roof 0.09 W/(m^2K), floor slab 0.20 W/(m^2K), roof windows 1.28 W/(m^2K), façade windows 1.0 W/(m^2K)
– Outside sun protection in hot period
– Air-Air heat pump reduce energy consumption for heating and cooling.

- 45% of energy OptimaHouse takes from renewable sources. 86% of hot water preparation and 10% of floor heating are satisfied by 24 vacuum solar tubes on the 50 degrees east slope and 20 vacuum solar tubes on the 30 degrees west slope. 44 solar vacuum tubes could produce 3825 kWh thermal energy for hot water preparation and 530 kWh for heating.

- 6 integrated roof panels 1135x340 mm with 14 series connected 156mm polycrystalline silicon cells each panel installed on south roof 45 degrees. 2.3 m^3 of photovoltaic cells could produce 360 kWh electric energy per year.



ENVIRONMENT

Impact on the environment in OptimaHouse is minimized. CO2 emissions into the atmosphere are less than 7 kg/m² per year or 1 ton per year.

- In OptimaHouse it's less through water saving taps and inhabitants responsible water using. Impact on the environment in OptimaHouse is minimized. CO_2 emissions into the atmosphere are less than 7 kg/m^2 per year or 1 ton per year.

- Fresh water consumption in OptimaHouse is reduced on 25% in comparison with local legislation 50 liters hot water per person per day, 80 liters cold water per person per day. In OptimaHouse it's less through water saving taps and inhabitants responsible water using. Taking into account prices for water, using gray water systems is possible, but not economically reasonable yet.

- Recycled content for all building materials in OptimaHouse more than 30%. Not less than 80% of wood applied in building from local forest certified by FSC. And more than 50% of our producers have certification ISO 14001.

Two years of monitoring confirmed energy consumption less 8000 kWh per year for all needs: heating, cooling, ventilation, hot water preparartion, electricity for appliances and lightening. It means that cost of living in OptimaHouse is 37 euro per month. The building cost was 1000 euro/m^2 including all solutions for comfort, energy efficiency and environment, but without price for building plot and furniture. Active House Radar was a tool to find optimal solution and made right decisions.

CASE: Lumar

Architectural team:
Miha Završnik u.i.d.a., Lumar

Location:
Slovenia, Dragomelj

Project type:
New construction

Use:
Single-Family house Lumar

Client:
Lumar

Year: 2019

COMFORT

House Lumar Primus-R 150iEDITION is designed with architectural elements, details and solutions which brings the house to the highest architectural design and comfort. It is designed on the rational floor plan with open living area on the ground floor, that includes bright kitchen with dining area and living room. Sleeping areas are planned on the first floor. House is defined with clean lines and compact design. The functionality of design represents great added value to the house. It is designed for a single family of four and can be easily adjust to individual needs of the user as well as the sourroundings where it is built.

High comfort and comfortable indoor conditions are achieved with good planning of ventilation system, natural lightning and acoustic comfort.

- House is designed in a way to ensure natural light in all living rooms. Average daylight level of living area is above 5%. Children room in first floor combine vertical windows with flat roof windows to ensure even higher daylight level.
- The thermal comfort is ensured with excellent combination of thermal insulation of the envelope and sufficient shading of all windows. In the summer nights, natural ventilation through vertical and flat roof windows is used for natural cooling.
- Air quality in the house is ensured with a ventilation system with heat recovery with very high efficiency (90%) and supported with natural ventilation.

ENERGY

House is planned in a holistic way, to ensure optimal efficiency of useable space, high inner comfort standard and excellent energy efficiency. With photovoltaics on the carport, the house produces even more electricity than needed. The surplus is used for electric car.

- House is built as a prefabricated house with optimal thermal insulation of the envelope. Excellent envelope insulation is upgraded with green roof, which offers additional insulation in winter time and prevents overheating in summer due to additional heat absorption potential.
- Total energy demand is very low, it has a value of 42,1 kWh/m^2 a. For space heating only 13,6 kWh/m^2 a is needed and for domestic hot water additional 23,8 kWh/m^2.
- House is heated with floor and ceiling heating; the heat is produced with air-water heat pump with a high COP that additionally reduces the use of electricity.
- The electricity is produced on site with PV cells installed on the car port next to the house. The percentage of renewable energy supply is 194%. The surplus of electricity is used for electric car and represent a connection between sustainable living and sustainable mobility.

ENVIROMENT

The goal to reduce negative environmental impact, is achieved with good choice of materials as well as the concept of the house.

- With high energy efficiency we also reduce the impact on the environment, with the minimum heat demand and the use of heat pump we reduce the CO_2 emissions.
- The green roof ensures also environmental advantages; it reduces the urban heat island effect; it reduces the runoff of storm water and ensure natural habitat for various species.
- Bearing construction is made with wood with FSC and PEFC certificate, with a share of recyclable content of 41%.

CASE: Casa sul Parco

Architectural team:
Studio Del Boca & Partner and
Giovanni Rossi & Partners

Location:
Natural park, Fidenza, Italy

Project type:
New built

Use:
10 apartments

Developer:
Montanari Costruzioni SRL

Year: 2018

COMFORT

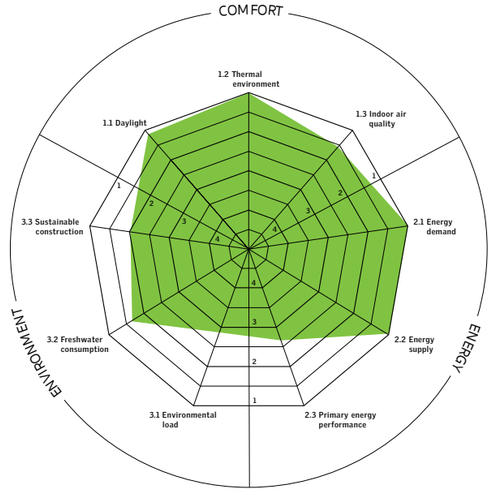
Natural illumination was particularly important for the project, due to the location in the natural park of Fidenza and as one of the main commercial topics of the object. The different flats were checked by Daylight calculations and improved with the size of the windows. The negative overheating risk is controlled by mobile and fixed shadings and by a cooling unit (geothermal heat pump). Also the trees around of the project where included in the shading concept.

- Air quality is handled by the mechanical ventilation system and monitored by CO_2- datalogging and remote alarm to the constructor.
- Thermal comfort is optimized by a certified passive house envelope, which gave maximum of guaranty for winter and summer comfort.
- Maximum thermal comfort it guaranteed by soft radiant heating and cooling on the ceiling, combined with dehumidification by decentralized slow air treatment units and distinct mechanical ventilation. Together with the automatic controlled shading elements it creates a controlled indoor air quality and comfort zone.

ENERGY

A geothermical heat pump was adopted to raise the use of renewable energy. The heating COP is on 4.8, the cooling on 3.8. There are two heatpumps to improve performance for mixed mode (cooling/hot water production).

- The area of the park attached to the historical center of Fidenza is protected by Italian landscape law. Therefore it's forbidden to install solar panels (PV or thermal) on the roof. But the investor constructs a great PV-plant outside of the city, dedicated to this and the next Active House project. The renewable energy production of this plant was not taken in to account of the radar, because non installed directly on the building.
- The project started as a certified Passive House construction. The reached goal asked to stay under 15 kWh/m^{2}a for heating and cooling demand. To reach it, the constructor improved air tightness (n50 = 0.58), trasmittances (< 0.15 W/m^{3}K), windows (glazing at 0.6 W/m^{2}K), thermal bridges (calculated and reduced) and mechanical ventilation with high heat recovery (84%).



ENVIRONMENT

Environmental aspects were cared from the beginning as it was constructed in the center of the city in a natural park. To guarantee either earthquake stability and recyclability the constructor decided for an ICF-building with highly recyclable materials and recycle guarantees from the producer.

- Only 2 apartments of 10 have a little garden. For this reason the construction concentrated water reduction on flow limitator and water saving installations. In a special meeting for the new apartment-owner was explained importance of water saving home appliances.
- Because of the location in the park, landscape planing of the green was a special task for the architects. The dweller should feel the park on the balconies, terraces and roof gardens of their flats. This was important also for the integration in the city landscape plan of the park area.

CASE: GREEN SOLUTION HOUSE

Architectural team:
3XN, Copenhagen

Location:
Denmark, Rønne

Project type:
Renovation

Use:
Congress center and hotel

Client:
Carl Edvard Mogensens Fond

Year: 2015

PHOTO: ADAM MØRK

PHOTO: STARMERS KONTOR

> GREEN SOLUTION HOUSE IS DESIGNED TO STIMULATE THE SENSES AND THE COMFORT OF THE GUESTS AND EMPLOYEES

Kasper Guldager
Senior Partner 3XN, Director GXN.

COMFORT

Green Solution House is an innovative conference center, based on ambitious sustainable ideas. It is located on the Danish island of Bornholm and uses the cycle of natural light to support the wellbeing of its guests. Daylight is used to improve productivity and mental awareness, but also to reduce energy consumption for artificial lighting.

- Conference rooms are designed to accommodate meetings in broad daylight, utilising diffused light from the north. In the hotel rooms retrofitted glass balconies improve daylight. VELUX Sun Tunnels and Parans light cables redirect daylight to every nook and corner. In all common areas skylights are utilized to create generous daylight levels.

- To ensure as much clean air as possible, carpets have been chosen that entraps dust particles, the plasterboard on the walls absorb formaldehyde, and the roof membrane captures and neutralises pollution particles from traffic. A Green Wall in the Third Climate Zone purifies the air with plants and balances humidity.

- A balanced system of natural and mechanical ventilation in combination with a season related heating strategy ensures a comfortable thermal environment. A diffuse ventilation strategy supplies fresh air through permeable acoustic panels in the conference centre and restaurant ceiling. By supplying cool air through the acoustic panels they offer cooling by radiation. Floor heating and cooling is supported by the on-site thermal energy storage system. Thermal glazing in the conference centre maximises indoor comfort relative to solar exposure.

PHOTO: STARMERS KONTOR

ENERGY

The façade is insulated with ISOVER glass wool made of recycled glass and covered with plaster for greater durability. The base is masonry, concrete and wood, which ensure a better indoor climate, preventing thermal bridging and cold outer walls.

- An interactive unit, visualising the energy performance of the building is located in the lobby. The unit tracks energy footprint and compares it to carbon and resource impact. Energy, which is produced on-site, make up the difference between demand and production by either consuming energy from, or selling it back to, the Bornholm grid. Together with day-to-day operations, guests influence the consumption profile; as such, the energy visualisation becomes an interactive learning tool – linking the characteristics and impact of use to behaviour and routine.

- During the retrofit of the main building, all balconies were changed from concrete to glass and those on the south façade were equipped with photovoltaic cells. The solar balconies produce an extra 5000 kWh of energy per year for the building. In addition, the glass balcony railings let significantly more daylight into the hotel rooms than before.

- All food scraps and organic materials from the main building are fed into a stationary pyrolysis plant. The material is first dried and crushed after which all oxygen is removed. The pyrolysis process heats the waste, breaking it down to produce natural gas and char. While the biochar is used as fertilizer in the gardens, gas is combusted in a combined heat and power engine, generating heat and electricity to be used in the building. Excess heat is stored onsite as hot water in a swimming pool, repurposed as a thermal energy storage system.

> HAVING A DAYLIGHT CONFERENCE CENTER IS OUR BEST SELLING POINT

Trine Richter
Director Green Solution House.

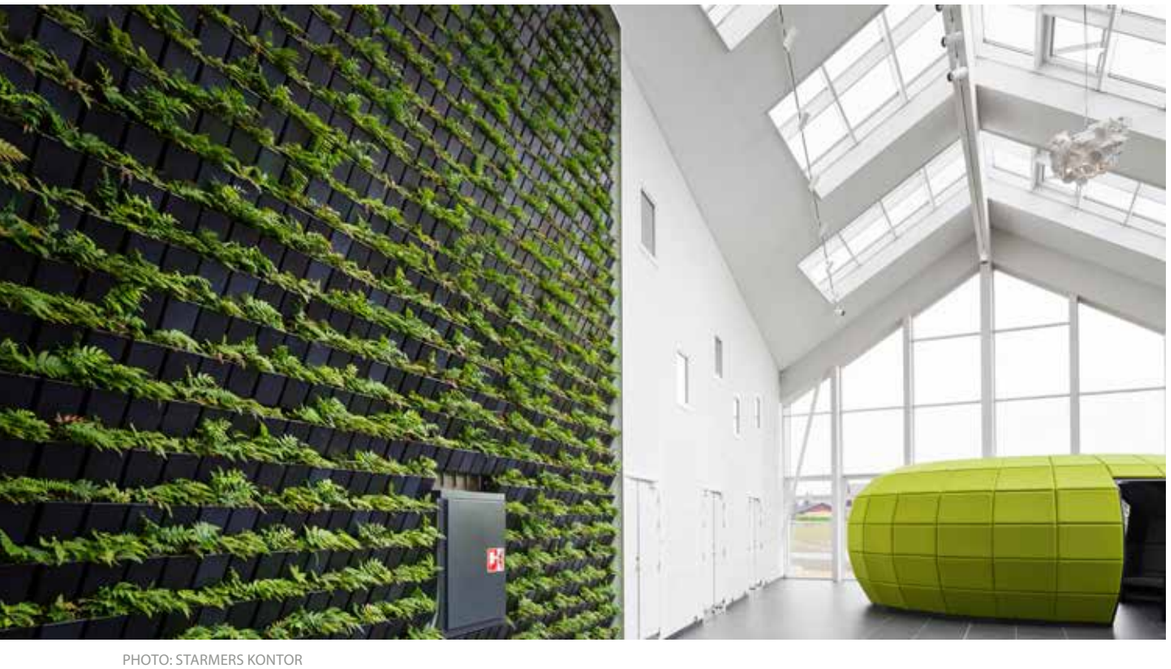


PHOTO: STARMERS KONTOR

ENVIRONMENT

Products and materials were carefully selected to meet or exceed high standards.

- The Copenhagen International School is located in the Copenhagen North Harbour area and designed to provide students with the best possible indoor environment while simultaneously limiting energy consumption and environmental impact. A number of architectural features and technological systems support indoor comfort.

- Due to decentralized ventilation systems, which are designed according to DS/EN 15251 Category II, a high air exchange helps to keep temperature levels in the range between 20 and 26 °C during the entire year. High air exchange also helps to keep CO_2 levels acceptable, i.e. no more than 500 ppm above outdoor CO_2 concentration.

- The lighting quality is based on a combination of LED lighting and access to daylight. The window area has an average ratio of around 32% above floor area, ensuring a very good daylight factor of 5,1% inside the rooms.

- The use of district heating and district cooling ensure that no related air pollution is emitted directly from the premises.

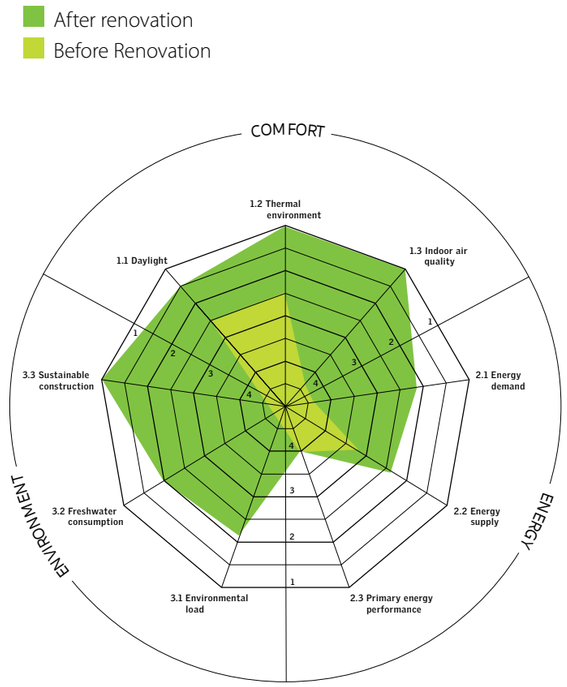


PHOTO: STARMERS KONTOR

CASE: COPENHAGEN INTERNATIONAL SCHOOL

ACTIVE HOUSE AWARD OVERALL WINNER 2018

Architectural team:
C.F.Møller Architect

Location:
Northern Harbour in Copenhagen, Denmark

Project type:
New built

Use:
Private school of 25,550 m2

Client:
ECIS, The foundation of CIS

Year: 2017

Photos: Adam Mørk

COMFORT

12.000 solar panels, an efficient heat recovery system and connection to environmental friendly district heating and cooling makes the school stand out in terms of energy demand and supply.

- The actual heating use is 10.4 kWh/m^2 for room heating and 6.3 kWh/m^3 for domestic hot water (DWH). The moderate heating requirements are caused by the building envelope, which is extremely well insulated. The building is connected to the district-heating network.

- Power consumption for ventilation (SEL value) has been calculated to 1.3 kJ/ m^3. Heat recovery efficiency is 82% in average. Mechanical cooling is installed with efficiency of 3,98%.

- The facade is covered in 12,000 solar panels, each individually angled to create a sequin-like effect. The panels will supply more than 50% of the school's annual electricity consumption. The total area of 6,048 square meters of solar cells makes it one of the largest building-integrated solar power plants in Denmark.

- The contribution from 720 kWp PV panels, on all facades besides the ground floor (approximately 6000 m^2), is 10.7 kWh/m^2, which can be compared to the yearly electricity use for operation: lighting, fans, pumps and cooling of 7.0; 5.3; 0.2 and 0.9 respectively.

- The Danish Be15 calculation shows an overall final energy use of 15 kWh/m^2 per year. Compared to low energy class 2020 in Denmark, which demands a level of max. 25 kWh/ m^2 per year for a school, it is a very satisfying result.

- It is important to point out, that the Active House tool calculation also takes into consideration the renewable energy production part from the grid, unlike the Danish energy frame calculation.

- Approximately 58% of the Central district heating / cooling in Copenhagen is produced by green energy sources. Moreover, renewable resources produce also 50% of the Danish grid electricity. In total, taking into consideration the renewable part of electricity and district heating from the grid, 72% of the energy demand is supplied by renewable energy sources, which is equal to 21,7 kWh/m^2. As a result, the primary energy of the building by only 15 kWh/m^2 is equal to a level 3 in the Active House radar.

ENERGY

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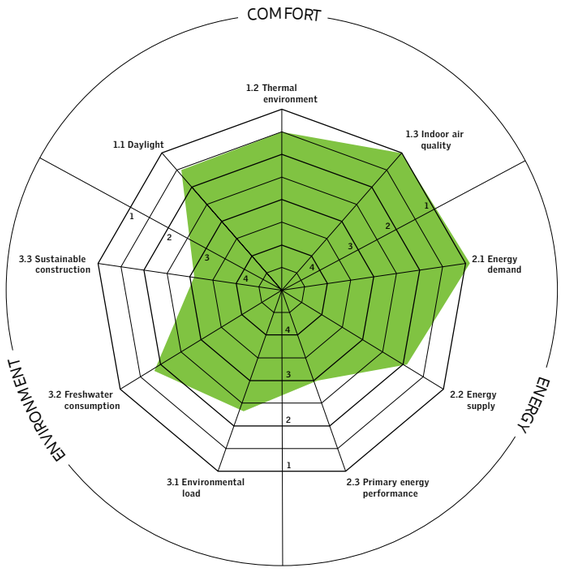


ENVIRONMENT

The school is a good example of the so-called Prosumer building of the future with building integrated photovoltaics on all facades. The solar panels cover approx. 39% of the total electricity use, highlighting the school as an almost zero energy building that scores convincingly on the Active House radar.

- Water-saving fixtures helped to improve the environmental quality of CIS by saving 28% of the cold-water consumption.

- The environmental impact caused by the building component production and energy used for building operation is at a good level. Moreover, 82% of the building construction materials are recyclable.

Active House Specifications

3.0

Active House Specifications 3.0 outlines the specifications for designing an Active House, a building that integrates health and comfort with energy efficiency and environmental performance. It can be used in combination with the Active House Guidelines to help people get an understanding of the vision and principles of an Active House, and how to apply them to new designs or renovations.

The Active House Specifications explain the vision that is Active House and outline the technical specifications that determine the quality and performance of an Active House.

This definition and description of an Active House is intended as a guideline at an international level. It seeks innovative technical approaches whilst introducing goals of architectural quality and environmental design, at the same time as providing energy efficiency.

Active House is a vision of how to create sustainable buildings anywhere in the world. These Specifications offer insight and knowledge needed to draw up the required technical specifications and design concept for an Active House. They include important issues to consider when creating an Active House. These issues can be qualitative or quantitative.

The qualitative aspects describe aspects that influence the quality of a building or how it is being experienced by the user, but difficult to put a number on, such as having a view. The quantitative aspects form the basis for the Active House radar, that can be used as a communication instrument to display the quality of an Active House in an instant.

An Active House is the result of efforts to actively integrate the three main principles of Comfort, Energy and Environment in the design of a building and in the finished building.

The Active House Radar shows the level of ambition of each of the three main Active House principles, containing four criteria for Comfort, three for Energy, and two for Environment.

The integration of each principle describes the level of ambition of how 'active' the building has become. For a building to be considered as an Active House, the level of ambition can be quantified into four levels, where 1 is the highest level and 4 is the lowest passing level.

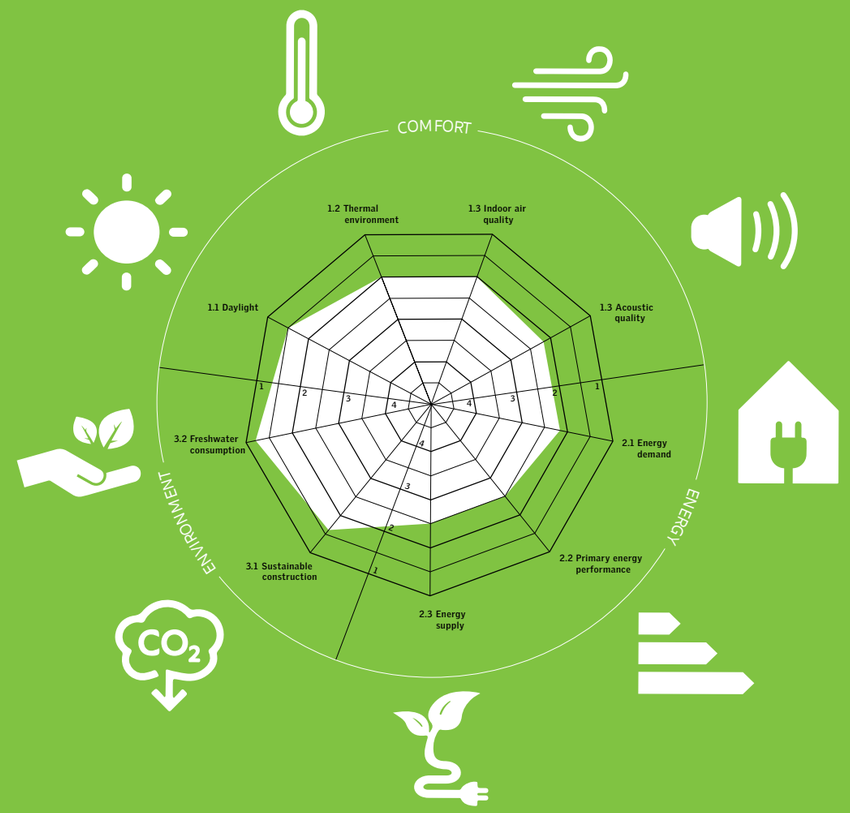
The ambitious requirement for Active House includes all nine criteria and recommends the lowest level for each of them. As long as a criterion is better or equal to the lowest level of ambition, it is an Active House feature within that specific criterion.

The Active House Radar to the right shows how all criteria and goals within each principle are dependent on each other.

When (re)designing a dwelling or housing complex, the basic idea is to select individual and ambitious requirements for each criterion.

The Active House Radar is a great tool for displaying the ambition reached for the building with the calculated values. When the building is inhabited and the criteria are calculated based on measurements, the Radar can also be a useful tool for monitoring, evaluating and improving the building. As a communication tool, it provides a clarity as to why the integration of criteria is important for creating Active Houses.

To calculate the separate values displayed in the radar, different tools can be used. On the website of Active House (www.activehouse.info), a number of tools are available.



COMFORT
An Active House creates healthier and more comfortable indoor conditions for the occupants, ensuring a generous supply of daylight and fresh air. Materials used have a neutral impact on comfort and indoor climate.

ENERGY
An Active House interacts positively with the environment through an optimised relationship with the local context, focused use of resources, and its overall environmental impact throughout its life cycle.

ENVIRONMENT
An Active House is energy efficient. All energy needed is supplied by renewable energy sources integrated in the building or from the nearby collective energy system and electricity grid.

Find the detailed specifications on
www.activehouse.info/about/about-active-house/specifications/

HEALTHY BUILDINGS FOR PEOPLE AND PLANET

The International Active House Alliance is a global network made up of: Academia & Knowledge institutions, Designers & Planners, Developers & Builders, Building Industry Producers, who think alike on how sustainable buildings work, are created and delivered. The Alliance is a non-profit organization of partners working with a holistic view of sustainable buildings, based on the three guiding principles: comfort, energy and the environment.

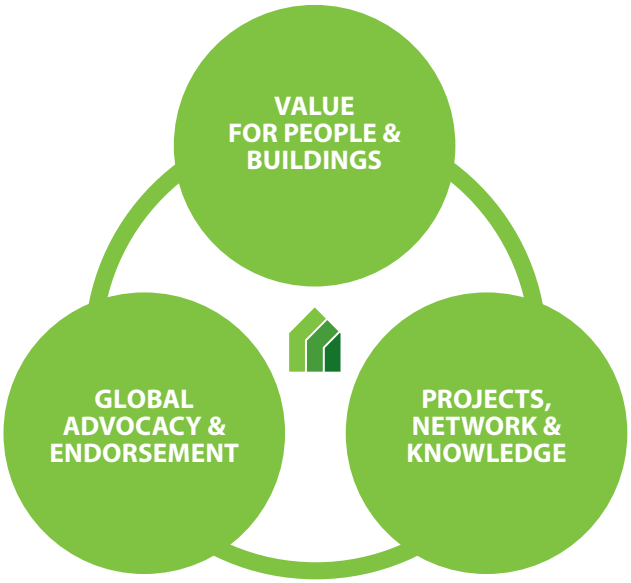
The **Alliance** was established in 2010, following a roundtable in 2009 which set a first vision for the Alliance and several processes which put the spotlight on the acceleration of climate change and the need to use resources more carefully, however not excluding the user parameters of a good indoor climate and long-lasting qualities of building design.

In 2016, the alliance defined the Active House label, a non-profit quality mark for the broader building market.

Today there are 7 national Alliances, multiplying the membership into a global community of partners who aim to scale sustainable cities with smart buildings, creating long lasting value.

The Active House principles are recognized amongst the top 10 certification schemes, and is truly global working across the value chain of buildings, from knowledge over designers and planning, with engineers, industries and developers working from the key principles.
Healthy Buildings for People & Planet.

The Active House Alliance is a wide and well consolidated partner platform between public, private, industry and consumers – an example of the Sustainable Development Goal # 17.



NATIONAL ALLIANCES:

activehouse Canada · activehousenl · aktivhus · activehouseitalia · aktivplus · 中国建筑学会 | 主动式建筑学术委员会 Active House Academic Committee of Architectural Society of China · UA

INTERNATIONAL ALLIANCE:

Schneider Electric · SAINT-GOBAIN · somfy · VELUX · GREAT GULF | Live greatly. · RENSON Creating healthy spaces · RESCON · hta · EuroWindoor · HouseMachine · European Green Cities · VFF · schmidt hammer lassen architects · DUCO Ventilation & Sun Control · leapcraft · ARKITEMA ARCHITECTS · BPIE · AAECR · Institute of Building Research & Innovation · HBSCP · DTU · POLITECNICO MILANO 1863 · CENER · DANISH TECHNOLOGICAL INSTITUTE · DANISH BUILDING RESEARCH INSTITUTE · a h a active house academy · KOMPETENZ|ZENTRUM Gesundes Bauen · UNIVERSITY OF TORONTO JOHN H. DANIELS FACULTY OF ARCHITECTURE, LANDSCAPE, AND DESIGN · SUPSI · dGmR · THE UNIVERSITY OF SYDNEY

PARTNER ORGANISATIONS:

BUILD UP · innovative gebäude · Good Homes Alliance · uia · BLOX HUB

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