A House for the Future

ISOBO Aktiv

JADARHUS®
Det lille ekstra

Jadarhus AS

Jadarhus AS was founded by Håkon Nyland, Per Malde and Rune Hatlestad in 1995. We wanted to establish a wooden house building company based on quality and personal follow-up and the company has been growing ever since we started. The company is based on development of houses with thoroughly considered and good technical solutions, and a modern design. Therefore, the Jadarhus AS is far advanced when it comes to further development of the Norwegian wooden house production and we are on an ongoing basis working together with SINTEF (Building Research) on projects to ensure that our innovative ideas will be of the highest possible standard. E.g. we were among the first in Norway to develop and build low-energy houses and our first brand within this category, ISOBO, was established in 2003. The prototype, which was built in Skadberg, held the Norwegian record of low air leakage at the time. The competencies that we have developed over the years will benefit all our customers no matter whether they want low-energy houses or other types of buildings.

JADARHUS **ISOBO Aktiv**

7 steps of **ISOBO Aktiv**

■ **Solar collector**

Hot water and space heating

The house has 4 solar collectors with an absorber area of about 8 m².
Calculated to cover 50% of the required hot waster consumption.
Calculated to provide 10% of the required heating by radiators and under-floor heating in the bathroom.

■ **Heat pump**

Hot water and space heating

Calculated to cover 40% of the required hot water consumption.
Calculated to provide 85% of the required heating by radiators and under-floor heating in the bathroom.
Air-to-water heat pump. Uses outdoor air to heat utility water and water for radiators/under-floor heating.

■ **Ground collector**

Preheated or precooled air

A ground heat collector with a piping system which is placed under the house.
It is connected to the ventilating unit to increase efficiency and ensure a more even temperature in the house.
On cold days the intake air to the ventilating unit is preheated so that it will require less energy to heat the air sent into the house.
On hot days the intake air of the ventilating unit is cooled so the air sent into the house has a lower temperature than normal.

■ **Balanced ventilation**

Fresh air and minimal heat loss

A most efficient ventilating unit is used; the efficiency has been calculated to more than 90%.

■ **Hot water unit**

Preheated water from solar collectors and heat pump

The hot water unit is storing the heat produced by the solar collectors and the heat pump and has a tank for hot utility water and one for the building's heating system.
Active control of the hot water unit ensures that energy by the most environment-friendly source will be prioritized.

■ **Intelligent windows and sunscreening**

Light and ventilation create an optimal indoor climate

External sunscreening on selected windows with individual, active control.
Active control system for opening and closing of selected windows for ventilation.

■ **Solar cell panels**

The house has 8 solar cell panels, system type Gevity™, integrated in the roof in specially constructed frames, which are ventilated to optimize the temperature and effect of the panels. Each solar cell panel has an effect of 160 wp; for all 8 panels the total is 1.28 kwp. The panels will produce approx. 1230 kWh per year, which is approx. 17% of the required electricity for light and appliances during the year. The surplus production is "sold" back to the energy supplier.

The Challenge

An active house contributes to sustainability in several ways:

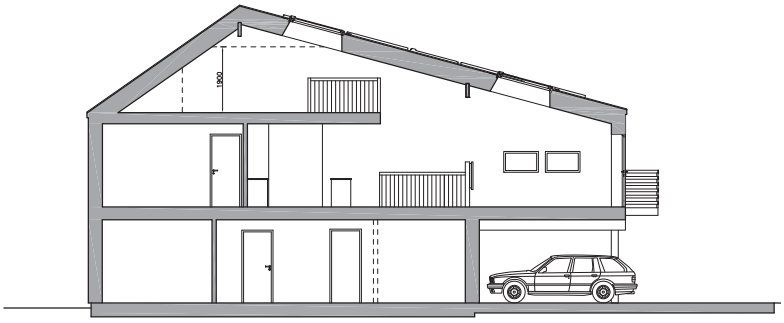
- by creating balance between energy consumption and production
- by the living environment in the house: indoor climate, function and health
- by creating an experience in and around the house

A Solution

Torer Berg, SINTEF senior researcher, is not in doubt; Norwegians are much too spoiled with low energy prices. He is expecting considerable price increases in the coming years, mainly because the politicians want to make us conscious of saving energy.
– Compared to the rest of Europe, we have low energy prices. But we cannot continue this way. It is, therefore, important that the building industry is offering energy solutions such as Jadarhus is doing with ISOBO Aktiv, the senior researcher says. ISOBO Aktiv has better insulated walls, floor and roof as well as an air tight construction and windows with less heat loss. But won't such houses be too tight?

– The answer is balanced ventilation. We must be able to control what comes in and what leaves the house and the ventilating unit must utilize the heat of the air.

Many think that we shall soon be building low-energy houses that generate their own heating so that we will not need any heating source. Low-energy houses will use ground heating and heat from the electronics in the house, Berg answers. A lot of house buyers are saving as much as they can in order to realize their dream of a house of their own.
– ISOBO Aktiv is one of the most sensible house purchases that you can make. This investment will pay back already the first year in form of low energy costs.
Furthermore, the future sales price will be much higher, Berg says. The senior researcher has worked together with Jadarhus for a long time and finds that the company has the right focus.
– Jadarhus has for many years been far ahead when it comes to energy savings in the building trade. Jadarhus is e.g. always one step ahead of legislation within this area. This was the case both in 2003 and when the new rules were passed in 2009. It shows that they are taking energy saving seriously, the SINTEF researcher says.



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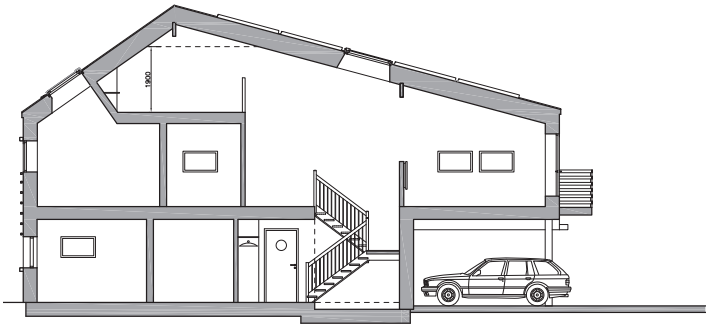

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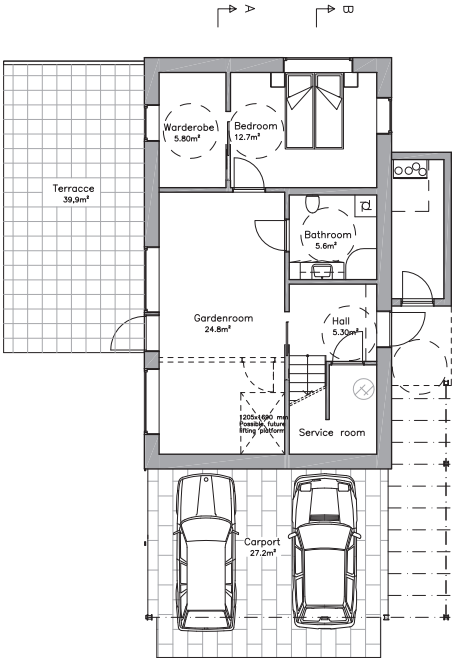
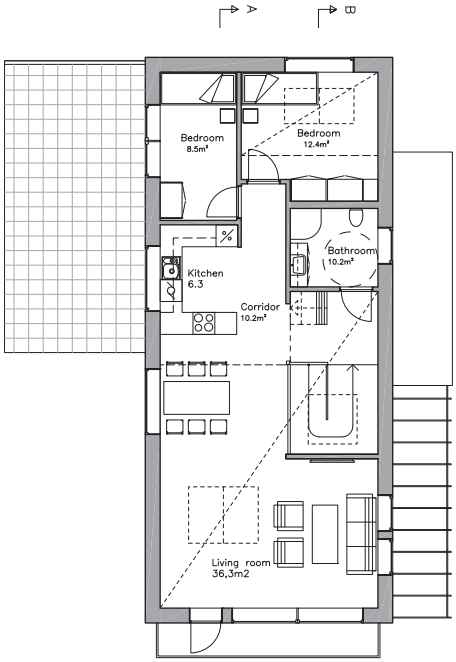
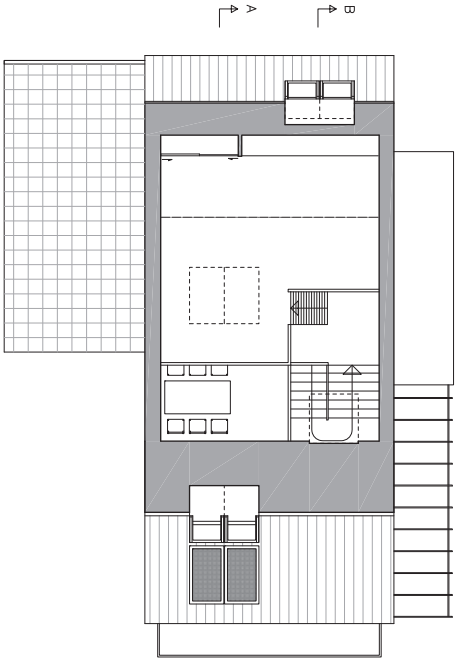


Plan 1st floor



Plan 2nd floor



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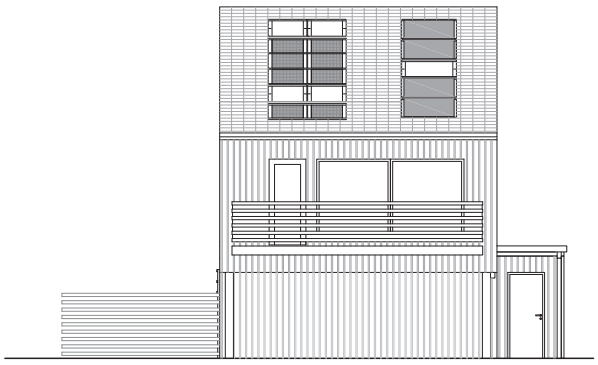
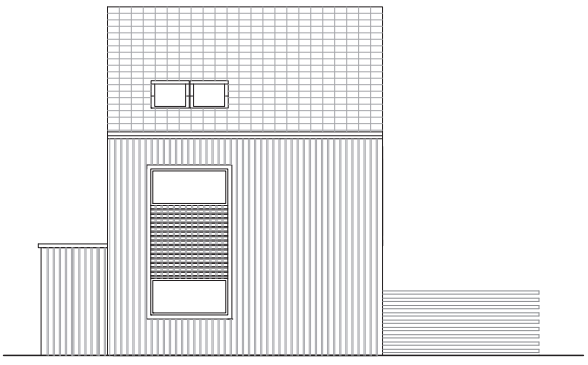
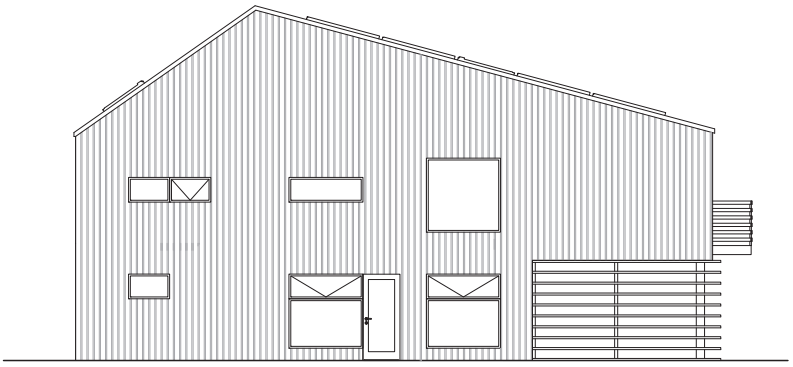


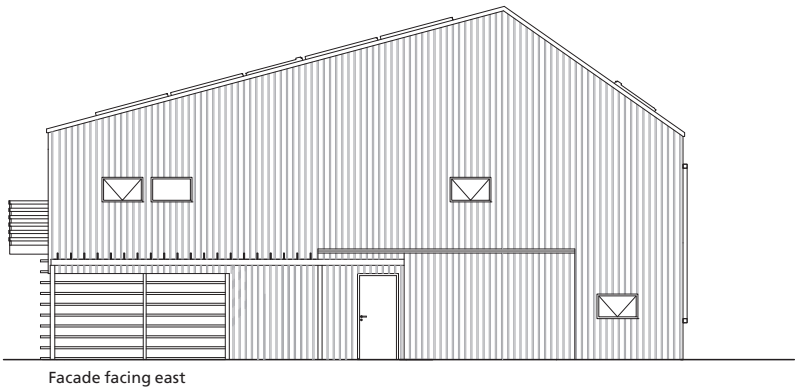
Facade facing south



Facade facing north



Facade facing west



Facade facing east

Building process

The house is under construction as the first ISOBO Aktiv house in Norway


JADARHUS

Norunn Østråt Koksvik, mayor of Sandnes municipality, cuts the first sod for the ISOBO Aktiv house.

Henrik Norlander Smith, architect of VELUX A/S, lectures on the Active House Day in Stavanger, April 2011

The Active House Seminar in Brussels, April 2011, with presentation of the first Active Houses built in Norway, Canada and Russia.

Aerial photo May 2011. The ISOBO Aktiv house is in the middle of the picture.

EU Climate Commissioner, Connie Hedergaard, at the Active House Seminar in Brussels, April 2011

The Active House, August 2011.

JADARHUS **ISOBO Aktiv** 2010-2011

Facts

Project management:	Jadarhus AS by Kurt Hobberstad
Designers:	Jadarhus Gruppen AS by Geir Sandsmark
Consultants:	Sintef by Tor Helge Dokka
Partners:	VELUX Norge AS
Technical consultants:	Alpha-InnoTec Norge AS, Isola AS, NorDan AS, Systemair AS, OSO Hotwater AS, Lima Rør AS, Sandnes Elektriske Forretning AS, Lyse AS Moelven Iso3 AS, Optimera AS, Jackon AS, Glava AS, Byggma ASA, GETEK
Architect:	SFAS|arkitektur
Technical drawings:	Arkitektkontoret IHT
General contractor:	Jadarhus AS
Address:	Heiamyrå 19, 4033 Stavanger
Project address:	Tårnfalkveien 38, 4318 Sandnes
Project period:	2010 - 2011
Start-up of building site:	December 2010
Finishing date:	Approx. September 2011

Project description

Sandved Vest is a development area started up in spring 2008 and finished in the summer 2011. It has been divided into 3 phases and consists of 12 houses, 18 linked houses, 36 terrace houses and 16 apartments. Twelve Jadarhus Isobo low-energy houses have also been built (based on Husbanken's criteria from 2004). These are 3 houses and 9 linked houses.

One of the purposes of these ISOBO Aktiv houses is to test different technical solutions in one single building. Another purpose is to look at which measures must be taken to get the best possible, optimal indoor climate, especially, with a view to avoiding super heating. Combined roof and vertical windows are used to help ventilating the house, but by chosing active ventilation of the house, you will need more roof windows than normally.

However, by using roof windows you will also get other positive effects such as better daylight (more lux) and better spreading of it. A roof window lets in twice as much light as a vertical window. By getting more natural daylight into the house, the use of electric light is reduced which gives an energy gain and increased quality of life.

The house will be constructed as a timber house with traditional rafter construction. By using our usual construction partners, all construction units will be delivered as precut, industrially produced by Optimera. This means that all construction parts will be deliverd dry to the building site ready for assembly.

The house will be sold on the condition that it should be accessible for 2 years for logging of the users' experience and monitoring of the performance.

Key figures

Area: Floor space 178 m2 (BRA)

Energy consumption: Calculated energy need for the building 7919 kWh, specifically delivered energy 44,4 kWh/m2
Solar collector unit and heat pump (air-liquid) cover 95% of space heating and 90% of hot water requirement for the buildings yearly energy requirement. The house has 8 solar cell panels yielding 1230 kWh per year.
The house has a ground collector (ground heat) as well; when used for intake air to the ventilating plant it im proves the efficiency of the recovery unit

Energy performance

Description	Value	Demand
Net heating requirement	13,9 kWh/m^2	18,9 kWh/m^2
Net cooling requirement	0,0 kWh/m^2	0,0 kWh/m^2
Energy consumption or fossil energy carriers	44,4 kWh/m^2	62,1 kWh/m^2

Environmental measures

Areas and transport:
The area where the house will be built is a regular area with a mixture of high-density low-rise buildings.
It has been a goal for the project to find as many partners and suppliers as possible in our district. We want the compentence created locally and that it will become a volume allowing for more favourable prices in the long run. By finding local partners and suppliers it is also simpler when it comes to planning, projecting, delivery, complaints and service.

Reduction of construction waste:
Delivery as precut gives less waste on the building site.

Energy:
Energy rating A (A++). The building is based on passive measures such as extra insulation, extra tight building envelope and good windows. Apart from the passive measures, solar collectors, solar cells, heat pump air-liquid, balanced ventilating system with heat recovery of the countercurrent unit type (with an efficiency of minimum 90%) connected to ground collector (ground heat) have been installed.

Constructions and materials:
To keep external walls as slim as possible, the new Iso3 studs from Moelven Wood will be used in combination with Glava's new insulation material Extrem 33. It must also be considered whether Glava Extrem 33 should also be used for other constructions. When the construction is very thick, the effect of the insulation will be considerably less; therefore, this must be evaluated against saved energy and the cost of the more expensive product. To get the best possible effect of the insulation, I-profiles are used for rafters and beams towards the outside. I-profiles are also used for the beams to hide the ventilating unit as good as possible.

The house is built with the following constructions and values:

- **In the base:** 300 mm Jackon Super EPS80 insulation. U-value = 0.10
- **Encircling wall:** Jackon Thermo 350 mm for the encircling wall system of the external wall > 198 mm.
- **External walls:** 250 mm Iso3 timber frame, 250 mm Glava Extrem, Isola vapour barrier, 48 mm internal application of Glava 50 mm Extrem, 12 mm bitumen wind-tight plating and Isola wind barrier sheating. U-value = 0.11
- **Beams outward:** 300 mm I-beams with 300 mm Glava Extrem, lined with 250 mm Glava kv37, 12 mm bitumen wind-tight plating and Isola wind barrier sheating. U-value = 0.09
- **Sloped roof:** Rafters I-400 mm, 400 mm Glava Extrem, Isola vapour barrier. Airing above rafters by cross ventilation. (Wind barrier sheating above rafters, cross vintilation, OSB-pl, Isola roofing with Isokraft, hoops, batterns and tiles). U-value = 0.10
- **Windows:** 3-layer Nordan passive windows NTech. U-value = 0.74
- **Roof windows:** VELUX roof windows with 3-layer glass with internal blackout blinds. U-value = 1.0
- **Front door:** U-value = 0.95
- **Leakage values:** Measured on the finished house. 0.35 (N50) [1/h]

Thermal bridge value:
In general there will be some thermal bridges by use of Iso3 timber frame, encircling wall system with external insulation, recessed edge beams, and windows recessed in the construction. The carport ceiling will be well insulated and with insulation across to avoid thermal bridges. We will get some weak spots at the cantilevered balcony facing south and by having roof windows placed on top of the construction. But to get the other qualities such as, among other things, the active airing system throught the roof windows and the better light conditions, we will reduce this demand somewhat.

Technical solutions:
Normally you will not get a full house at your disposition for "research". We want to use this unique opportunity to test as many as possible technical solutions to find out which gains and challenges they present. During the building period and the two years where the house is used as test house, we hope to get information and results, which will tell us what we should go for in our district. We are aware that this house has a lot of technical solutions demanding more than usual from the ordinary user, but this is also something we want to get some experience with. To get space for the different technical solutions we will use the room under the stairs as technical control room and we will among other things lower the floor to get more volume. In addition to this the garden shed will be somewhat enlarged to provide room for the ventilating plant and the ground collector. Consequently, the shed will be insulated and get a drain to get rid of possible condensation from the ventilating unit (countercurrent exchanger).

Passive solutions/products

To get a passive house, all main constructions towards the outside and the base must be planned to get the least possible heat loss. This is obtained through choice of products and solutions. To get the best possible solutions we have chosen to work closely with the following suppliers:

- **VELUX Norge AS**

To get an active house we have based the solution on the different VELUX test projects in Denmark. We use VELUX roof windows, which open and close automatically. The roof windows will provide the house with a lot of natural light, which will reduce the need for electric light. The roof windows will be fitted with outside sunscreening and internal blackout blinds. Use of blackout blinds can reduce heat loss with up to 25%

- **Isola AS**

Isola AS deliver their climate system with wind barrier for walls and roof with adhesive edges for horizontal installation, a membrane specially adapted to 30 cm wall thickness (passive house), wind barrier tape, vapour barrier and special membrane for the transition between the floors, tightening products of the flexwrap type for doors and windows, bitumen underroofing for roofing tiles and the solar cell panel system type Gevity™ from Du Pont .

- **Moelven Iso3 AS**

To get the lowest possible U-value and not too thick walls, we have used the new Iso3 studs. This is a product that breaks the thermal bridge, holds very low humidity, is light and directionally stable (of great importanct when walls are rightened).

- **NorDan AS**

To get the lowest possible U-value and the possibility of recessing the windows deeper into the wall, we have used the Nordan passive window NTech. NorDan has also adapted the frames to be able to integrate motors in selected windows as part of the active airing system. Some of the windows facing east and west are delivered with solar heat reducing panes.

- **Glava AS**

To get the lowest possible U-value and avoid too thick walls, we have used the new Glava Extrem 33 insulation material. This is also a little more firm and will, therefore, keep the shape.

- **Byggma AS**

To get room for the thickness of insulation required for the roof, we have used I-rafters. They can reach over long spans and are easier to work with. For the timber frame, I-rafters are also used, among other things to be able to hide ventilation, enable greater spans, flatten the timber frame, be lighter, etc.

- **Jackon AS**

To get an encircling wall system for thicker walls with the lowest possible thermal bridge value, we have used Jackon Thermo 350 mm.

- **Optimera AS**

To get the best possible control of the construction, we use Optimera's precut system. All external walls, supporting walls, beams, rafters and columns are produced in a professional and dry plant. All units are marked and packed by a system making it as simple as possible to make the construciton on site.

The chosen technical solutions are:

- **VELUX Norge AS:** Solar energy I:

On the roof facing south, 4 solar collector frames of` 2 m^2 each have been installed, totally 8 m^2 delivered by VELUX Norge AS. The total VELUX solution that is building on the roof windows, gives a very nice visual impression. Here you get the same flashing element as for the roof windows and the solar collectors are at level with the roofing tiles.

- **Isola AS:** Solar energy II: The house has 8 sections of solar cell panel systems type Gevity™, which are integrated in the roof in specially constructed frames that are ventilated so the temperature and the effect of the panels are optimized. The system also functions as roof covering and is installed directly on the batterns like the roofing tiles. Each solar cell panes has en effect of 160 wp and totally totalt 1.28 kwp for all 8 panels. The electricity produced by the panels is delivered to the internal and external electric grid. When more electricity is produced than consumed in the house, it has been agreed that the surplus energy is "sold" back to the energy supplier Lyse AS. Isola AS is cooperating with GETEK as that delivers inverters and other hardware, which will transform energy produced by the solar cell panels to 230 VAC in the electric grid of the house.

- **Alpha-InnoTec Norge AS:** Heat pump:

The heat pump LWD 50A is delivered as air/water and collects energy from the outside air; the heat pump will function at temperatures as low as -20°C outdoor and can supply up to 70°C hot water for utility and approx. 65 °C flow temperature for radiators. The heat pump has been optimized for use in modern houses with a heat factor (COP) of 3.7 at 2°C outdoor temperature/35°C flow temperature. LWD 50A is a newly developed heat pump using the natural and absolutely environment-friendly refrigerant R290 for the best possible heat factor (COP). When designing the heat pump, great importance was attached to the sound level, sound emission at 1 metre is 45 dB(A); the heat pump is made of very good materials with aluminium covers. The regulator, Luxtronik 2.0, is closely integrated in the heat pump and regulates the heating unit, hot water charging as well as monitors the heating unit. For best possible control and reliability, the regulator is internet compatible and the heat pump unit can be logged on and operated/regulated via the internet including handling of alarms via e-mail/SMS.

- **OSO Hotwater AS:** Hot water tank:

OSO Optima for utility water and heating plant adapted for heat pump and solar collectors.

- **Systemair AS:** Ventilation:

Countercurrent unit balancing ventilation and heat recovery with an effect of around 90%. The ventilating unit is connected to a ground collector, which reduces the temperature of hot intake air or heats up cold intake air. This enables better control of the temperature of the air, which goes into the house and helps to reduce the energy consumption of the ventilating plant. When the house uses natural ventilation during summer, the air intake is stopped. I.e. the unit will function as mechanical ventilation and only in the the wet rooms.

- **Systemair AS:** Ground heat:

Ground collector for preheating/cooling of the intake air for the ventilating plant is delivered by Systemair. The ground collector is a ground heat system and for this house there are almost 100 m of 35 mm piping under the house.

- **VELUX Norge AS:** Window airing I:

For active airing there must be windows in both the facade and roof which open and close automatically according to need. INTEGRA roof windows are installed which among other features have electric motors to control active airing. The IO-Home-Control system from WindowMaster is used as well as other technical solutions from WindowsMaster Denmark such as motors for facade windows and monitoring units (signal box) for facade windows. The roof windows are equipped with sunscreening.

■ **NorDan AS:** Window airing II:
For active airing there must be windows in the facade and roof which will open and close automatically as needed. NorDan has adapted some of their standard windows so electric motors can be installed in the frame. Facade and roof windows are connected to the IO-Home-Control system from VELUX.

■ **T. Aasen Solskjerming AS:** Sunscreening system:
The house will be equipped with automatic sunscreening on the facade windows facing south, type ZIP-SCREEN. The system is controlled by IO-Home-Control system from VELUX, but can also be controlled manually.

■ **GETEK AS:** Energy solutions:
GETEK supplies a system for receiving solar energy from the solar cells and project plant. GETEK's inverter will deliver 230VAC to the electric grid of the house. When more electricity is produced than consumed, the surplus energy is "sold" to the electric power plant Lyse. Special monitoring equipment will be installed which will deliver data on the energy production and the temperature conditions which will be available on the net.

■ **Lyse AS:** Energy company:
Lyse will buy the surplus energy from the solar cell unit. They will deliver a meter to log energy consumption per hour etc. The house is adapted for Altibox, which includes e.g. TV, broadband, burglary and fire alarm. Lyse will make and plan for a system for logging of various measuring parameters (e.g. energy production by heat pump, solar collectors, solar cells). The systemet will be connected to IPad and with possibility for use with TV and PC.

■ **Lima Rør AS**: Pipe fitter: Lima Rør will deliver radiators (2 units) and waterborne heat system for two bathrooms beside their normal pipe fitting delivery. Lima Rør will also connect to various systems such as solar collectors, heat pump and ground collector.

■ **Sandnes Elektriske Forretning AS:** Electro:
Sandnes Elektriske will deliver the X-comfort system for internal monitoring of various circuits, and LED lighting. Simple disconnection systems will be added to some main circuits so that the light will be put out when the house is left etc.

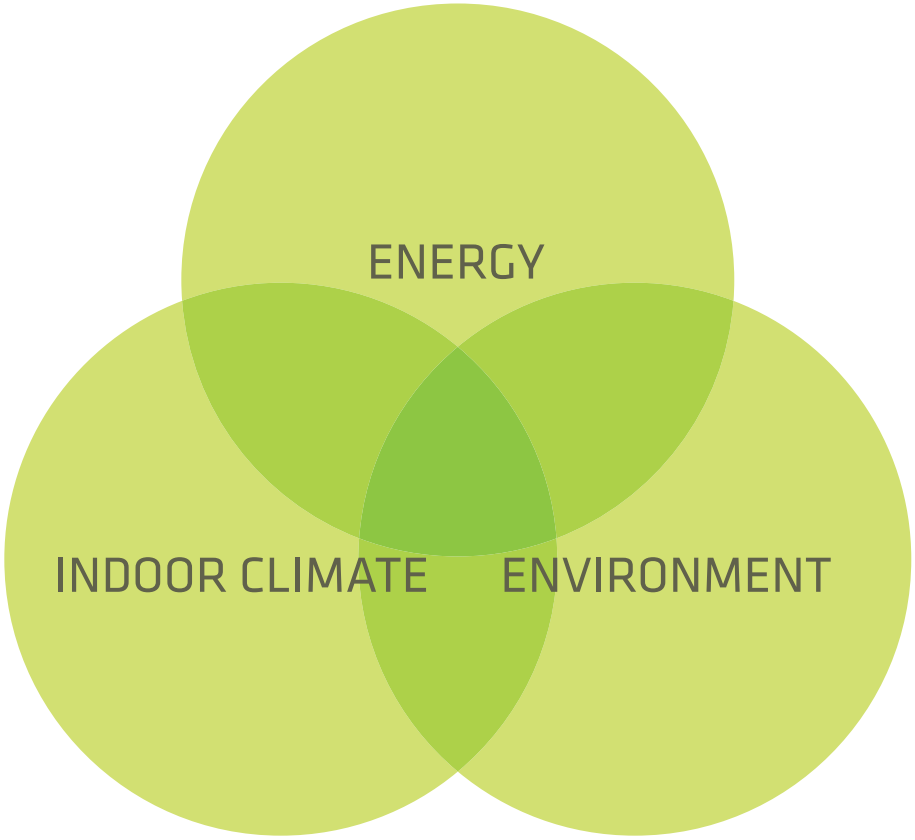
■ **Local monitoring/logging:** Control system in general:
For the various systems to function optimally, there are some different control systems in the house. E.g. to make it simple and keep costs down, it has been chosen that the suppliers will to the largest extent use their own systems for logging of the necessary information. Lyse is working with a new system, which in this project will plan applications that will be able to get and visualize the infomation from the various systems. They will among others have X-comfort and IO-Home-Control to control different functions. It must be possible to remote read the house during the test period. The house will also get sensors for logging of humidity in external walls and roof during the test period.

■ **Technical preconditions:** Light, brown and white goods:
Fixed lighting equipment used in the house must follow the energy requirements of the Passive standard NS 3700. The customer will be recommended to buy products with good energy ratings such as A+ or A++. There will also be a simple control system switching things off when the house is left or the users go to bed.

Heating system:
The house must be heated by waterbourne heat. In the bathrooms (2 rooms) this will be waterbourne heat in the floor (pipes), but in the livingrooms it will be one radiator per floor. To get better control between the so-called hot zones and the "cold", the internal walls and beams will be insulated around bedrooms and bathrooms.

Good indoor climate:
The house is defined as an ISOBO Aktiv house. This system consists of roof windows and facade windows that will air/ventilate the house in the periods where room temperatures are higher than normal. Here a control system programmed according to temperatures and seasons is required. Based on their own control system, facade and roof windows will automatically open and close according to need; there will also be different sunscreening solutions. To protect the house extra against solar heating, the most exposed windows will be equipped with external, automatically controlled blinds. Windows facing east and west have solar heat reducing panes. Another advantage of using many roof windows is that they provide the rooms with good daylight (more Lux) and a better spread of it. A roof window gives twice as much light as a window placed in a vertical wall. To control the temperature of the ventilating air better, the ventilation system must be connected to a ground collector. I.e. on hot days the outdoor air will be cooled somewhat and the opposite on cold days.

Universal design:
The property has projected in certain accessibility demands to meet the NS11001 requirements. There has been projected wheelchair turning circles and no steps for easy access. Plans have been made for an area on the ground floor and 1. floor to facilitate a future platform lift. There is in the same area prepared a cavel in the soffit that can open up when a lift platform is being installed.



Active House

An initiative supported by the VELUX Group

Energy – Contributes positively to the energy balance of the building
An Active House is energy efficient and all energy needed is supplied by renewable energy sources integrated in the building or from the nearby collective energy system and electricity grid.

Indoor Climate – Creates a healthier and more comfortable life
An Active House creates healthier and more comfortable indoor conditions for the occupants and the building ensures a generous supply of daylight and fresh air. Materials used have a positive impact on comfort and indoor climate.

Environment – Has a positive impact on the environment
An Active House interacts positively with the environment by means of an optimied relationship with the local context, focused use of resources, and its overall environmental impact throughout its life cycle.

Active House lives up to the future requirements for sustainable buildings and has been developed with focus on the health and comfort of the people who will be living in the house.

It has been designed to adapt to local conditions and to a high degree to use natural resources to become CO_2-neutral.

The VELUX Group is one of the main actors in the Active House alliance, an international consortium cooperating on the Active House concept.

Active House is a vision of buildings planned for a healthier and more comfortable life for those living in them and to contribute to a cleaner, healthier and safer world. The Acthive House vision defines ambitious and long-term goals for the future building stock.

The purpose is to gather interested actors around a balanced and overall approach to building design and energy efficiency, and to plan for cooperation on e.g. building projects, product development, research initiatives and performance goals that may contribute to fulfil the vision.

Active House defines a goal on how buildings can be contructed and renovated to contribute to health and well-being by focusing on the indoor and outdoor environment and use of renewable energy. An Active House is evaluated on the balance between energy requirement, indoor climate and impact on the environment.

www.activehouse.info and www.velux.com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Gilde

Energy

ISOBO Aktiv house

All external construction units are better insulated than required by law (roof, external walls, beams towards the outside part of the first floor).

■ **Solid constructions do not require more maintenance than ordinary constructions (passive goal).**
The construction is more than seven times as tight as an ordinary TEK-10 construction (minimum requirement).

■ **Prevent air leakage though various parts of the construction**.

■ **Prevent draft from the floor.**

■ **Same temperature at the walls as in the middle of the room.**

■ **Controlled air currents in the house**.
The construction is better insulated than required in an ordinary house. This corresponds to 30% higher U-value.

■ **Prevent thermal bridges at window areas**.
You can sit at the window without feeling cold.

Roof windows let more light into the house and provide good ventilation.

■ **A roof window gives better and more pleasant light and saves energy by reducing the need for electric light**.

■ **A roof window lets in twice as much light as a vertical window**.

■ **Less energy is required for lighting in a passive house/low-energy house. Therefore, bulbs are used that require less current (e.g. LED lighting**).

■ **Low-energy appliances/white goods are recommended with a good energy classification** (A+ or A++).

■ **The property has a smarthouse technology system witch allows you to use a smart phone, to remote control for eksample light and heat as needed.**

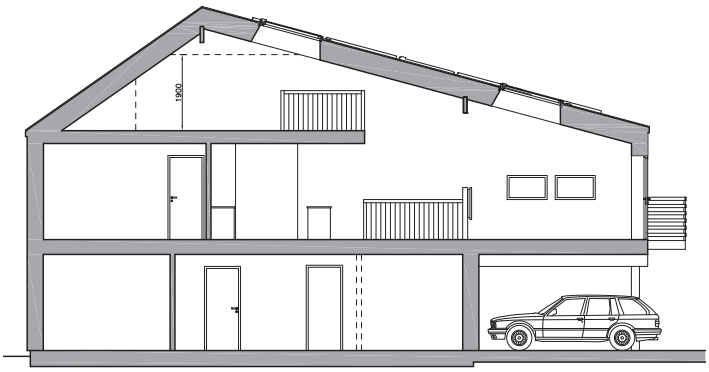
To reduce the CO_2-emission and improve the energy efficiency, the house must be considered as a whole, not just as the sum of its components. Energy efficiency is an integrated part of planning the house and available natural resources such as sun and air are used to their maximum.

Windows e.g. must be considered sources of energy. They must be placed strategically correct to contribute with heating and natural ventilation.

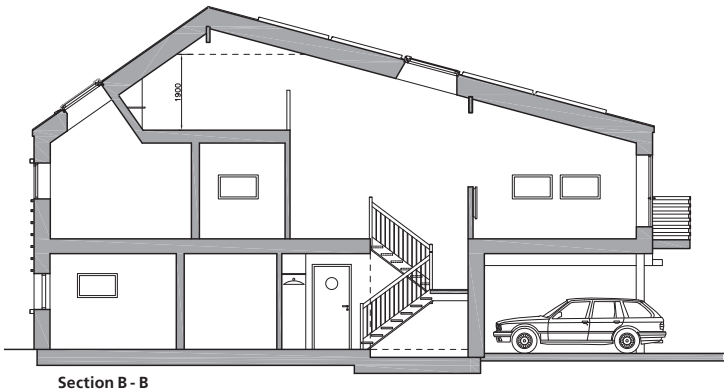
A flexible building will prevent super heating and glare when the sun is high in the sky. Consequently, VELUX roof windows are equipped with electrically controlled awning blinds - either managed by the users of by the fully automatic steering system io-home-control®.

VELUX solar collectors are integrated in the ISOBO Aktiv house roof to the south and provide hot water (+ space heating).

VELUX solar collectors can normally generate up to 70% of the energy required for production of hot water.



Section A - A



Section B - B

Indoor climate

As much daylight and as good ventilation as possible are the preconditions for the optimal indoor comfort and the minimal energy consumption required in the future.

In a world facing increasing healt problems (partly due to an increased number of allergic cases) the indoor climate is an important issue when designing buildings.

Several studies show that daylight has a potive effect on health, productivity, children's learning ability, and wellbeing in general. In the same way, fresh air through natural ventilation will be decisive for the creation of a healthy indoor climate and reduction of the consequences of toxic emissions from e.g. electronical equipment and chemicals in the building - something that will reduce the risk of developing allergies.

Physical well-being, high productivity and efficient learning are connected with a healthy indoor climate. Consequently, an optimal indoor climate will always be valuable for pupils and teachers. The Center for indoor climate and energy at the Danish Technical University has shown that pupils in public schools may learn the same in six years as they spend 7 years on learning today, if the indoor climate is optimal. The two most important preconditions for a pleasant indoor climate are good ventilation and a comfortable room temperature.

Automatic control of natural ventilation and indoor temperature in an ISOBO Aktiv house is based on a fully automatic steering system of the io-home-control® type. This system is controlling all the strategically placed VELUX roof windows and sunscreening.

The active VELUX climate control provides climate control in a house with a quite new dimention by opening and closing windows and sunscreening systems automatically according to changes of sunlight and temperature.

All things considered, the electrical VELUX products provide new solutions for better comfort at home, energy savings, safety and indoor climate control.

Integration

All io-homecontrol® components in the house speak the same language. The same remote control will manage everything - opening, closing, airing, turning heat on or off, etc. You can do what you want in your home even when you are away.

Immediate feedback

All user commands are controlled and confirmed by a sound signal or a visual signal. You can check the status on the house or a component in the house (open/closed, on/off) at any time.

Simple and reasonable

It is not necessary to install a central control panel or extra cables; all you need is electricity for the components. All the io-homecontrol® components are simple to install without extra cost.

The practical remote control makes is simple to maintain a comfortable indoor climate.
VELUX automation for the home, based on io-homecontrol®, gives you light and fresh air by pushing a button.

The VELUX Group has more than 30 years ex-

perience of controlling windows, Venetian blinds, and awning blinds by pushing a button - and the solutions function quietly and efficiently.

The main focus has always been on making the electrical solutions simple to install, use and upgrade. The development of INTEGRA®, the first completely electrical window in the world, is one of the most thrilling results.

Facts

The daylighting performance in the house has been specified using the daylight factor (DF) as indicator.

The daylight factor is a common and easy-to-use measure for the available amount of daylight in a room. It expresses the percentage of daylight available inside, on a work plane, compared to the amount of daylight available outside the building under known overcast sky conditions. The higher the DF, the more daylight is available in the room. Rooms with an average DF of 2% or more are considered daylit. A room will appear strongly daylit when the average DF is above 5%.

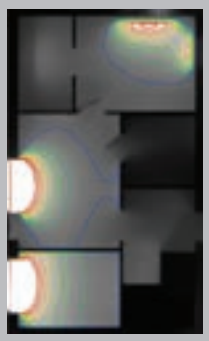
The daylight factor analysis has been performed using computer simulations made by the VELUX Daylight Visualizer 2, a software tool dedicated to daylighting design and analysis. For more details and download, visit http://viz.velux.com.

The figures below are showing the daylight factor levels on each floor and the impact of the installed roof windows.
On the last figure the effect of the roof windows is evident. It shows that the roof windows has especially a positive effect on the daylight conditions in the centre of the room and above the stairs.

Daylight factor

Daylight factor, first floor

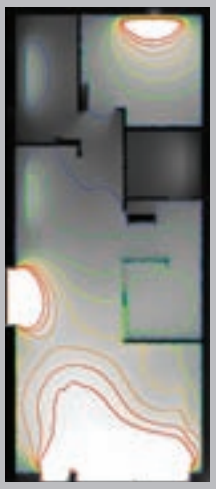
Without roof windows



With roof windows

Daylight factor, second floor

Without roof windows



With roof windows

Environment

VELUX roof windows are integrated in the roof and provide pleasant daylight reaching deep into the livingroom.

Roof windows are an extra source of light in the house and are also a source of efficient airing. A roof window provides better and more pleasant light to the room (higher lux value) which reduces the need for electric light and saves energy. Roof windows let in twice as much light as facade windows.

The Active House

Pictures from The Active House, August 2011.

JADARHUS **ISOBO Aktiv**

Norway

Partner

VELUX A/S

VELUX Norge AS

Architecture

Sjo Fasting AS

Working and detail drawings

Arkitektkontoret IHT AS

Contractors / Suppliers

T. Stangeland Maskin AS

MS Betong AS

Lima Rør AS

Sandnes Elektriske Forretning AS

Malerbua Håndverk AS

Norema AS

Alpha-InnoTec Norge AS

NorDan AS

Optimera AS

Isola AS

Systemair AS

Lyse AS

OSO Hotwater AS

Jackon AS

Moelven Iso3 AS

Glava AS

Byggma ASA

T. Aasen Solskjerming AS

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One step further

Life is to continue taking new steps forward.

Some steps are small.

Others are big.

Sometimes you stagger.

Sometimes you know where you want to go.

Jadarhus takes you a big, safe step forward.

JADARHUS®
Det lille ekstra

Jadarhus AS
Heiamyrå 19
N-4033 Stavanger
Phone +47 51 81 93 20

www.jadarhus.no