

Triple Strategy



Holistic Sustainability

The design of Green Solution House is based on several parameters to show a holistic approach to sustainability. The building is certified to the standards of the recognised German Sustainable Building Council (DGNB), based on the criteria of the Active House vision and inspired by the Cradle to Cradle life cycle concept. The building and landscape present the latest developments in the field of sustainable architecture; we show that sustainability involves more than aspiring to green certification, and that it is possible to quantify our project's high quality on the basis of several parameters.

See also:

Active House, Cradle to Cradle, DGNB

Eliminating Waste



Waste Equals Food

Waste? What waste? Green Solution House takes what it can from redundant materials and puts these resources through new cycles of use. All new construction and refurbishments consider principles of Design for Disassembly, aiming to maintain material value into the future. Reuse, upcycling, recyclability, and the use of local material resources are always prioritised. Existing furniture was reupholstered and refreshed to maintain its function and show off its beauty. We separate waste streams, including organic waste, which is processed on site. Food scraps, for example, become a valuable resource for our pyrolysis plant, which generates heat, electricity and biochar for the gardens. Wastewater from the main building is cleaned through a biological water purification system and reused on-site. The glass covering the pathways are offcuts from a local artisan's glass studio. As long as materials can be separated and cleaned, they remain nutrients feeding other cycles and supporting our goal of zero waste.

See also:

Pyrolysis Plant, Utilising the Existing, Biological Water Purification, Circular Business Model, Better Parking, Responsible Replacement, Biochar, Cradle to Cradle, Repurposed Glass

Material Transparency



Conscientious Selection

To be transparent is to first be aware, responsive and accountable; secondly, it is to be open and communicative. Making ethical material choices is at the core of the Green Solution House vision and we want the whole picture when it comes to the products we select for construction. At the Green Solution House we worked with a material filter, our own selection criteria, to secure quality and sustainability of the materials used in the buildings and landscape. This process enables selection based on a value framework that accounts for full resource and energy lifecycles as well as the day-to-day contributions to the health of our environments. In support of transparency and DGNB certification, products are reviewed to the detail of chemical composition and documented in our list of materials.

Who's behind it:

GXN Innovation, Rambøll

See also:

Material Filter, DGNB

Embracing Daylight



Designing with Daylight

The cycle of natural light is fundamental to our wellbeing and ability to maintain a healthy circadian rhythm. Daylight improves our productivity and ability to focus, and furthermore it also reduces energy consumption for artificial lighting. The conference rooms at Green Solution House are designed to accommodate meetings in broad daylight, utilizing diffused light from the north. Inside the hotel rooms, daylight conditions have been optimised with retrofitted glass balconies. VELUX Sun Tunnels and Parans light cables redirect daylight to every nook and corner, where natural light is limited. In all common areas and hallways, skylights are utilised to create a comfortable indoor climate with generous daylight levels. Altogether, a strong focus on daylight driven design has helped to create well-lit spaces, resulting in better user experience and less energy consumption.

See also:

Daylit Conference, Solar Balconies, Energy Generating Skylights, Innovative Skylights, Redirecting Daylight, Channeling Daylight, Glass Climate Screen, Recyclable Facade, documentation of the daylight analysis in our eBook.

Reclaim, Reuse, Renovate



Utilising the Existing

'If it ain't broke, don't fix it'. At the Green Solution House we believe in the value of repurposing and eliminating waste. This thinking has been applied to many aspects of the refurbishment and expansion of the buildings, as well as the landscape design. Parking space is built on a base of rubble from the demolished buildings that used to occupy the site. The remaining buildings received a facelift with new energy efficient façades and roofing, although most of the original features remain. Like the buildings, the furniture, light fixtures and much much more were given a facelift and re-integrated in the hotel's interior. Some furniture was reupholstered with Cradle to Cradle certified textiles. What could be used was reclaimed and repurposed, what couldn't was donated to charity. Our approach is to be responsible, for us this is both better for the environment and the finances.

See also:

Better Parking, Eliminating the Concept of Waste,
Responsible Replacement, Upcycled Furniture

Water and Soil Balance



Rainwater Landscaping

A landscape designed to flood. As a result of climate change, heavy and frequent rains put pressure on existing storm sewers and make flooding a risk. The high water table on the site poses a challenge, but instead of fighting nature and treating this as a problem, the landscape was designed around the element of water. The soil excavated for the foundation of the new building was retained on site and used to sculpt the landscape, embracing runoff from cloudbursts or heavy rainfall. Various watershed designs guide rainwater to seasonal ponds, creating an easy to maintain landscape, which increases biodiversity, provides natural irrigation, has a cooling effect in the summer months and even limits the hatching of mosquitoes. The gravel parking area is made with local granite waste and directs rainwater to a nearby wetland pond, en route the water passes through soils and a specific mix of gravel, to remove pollutants from the cars and ensure clean runoff.

Who's behind it:

SLA

See also:

Symbiosis, Better Parking, Green Footprints Park

Renewable Energy



On-Site Energy Production

At Green Solution House we produce energy. Solar cells integrated into the façades and glazed ceilings generate electricity. Our on-site pyrolysis plant converts organic waste to electricity and heat. Additional hot water is generated with a solar thermal plant integrated into the landscape. Since it was not economical to renovate the 30 year old swimming pool, we converted it into a highly insulated energy storage system for excess heat. The solar thermal plant and excess heat from the pyrolysis plant join forces to heat and store water throughout the year, supplying it as needed for in-floor heating and potable hot water for the hotel. To keep an eye on operations, we display our on-site energy production and energy consumption correlated to building zones, with a custom energy visualisation. In the case that we generated surplus energy at Green Solution House it is supplied to the Bornholm grid, meaning our electricity meter can run backwards.

See also:

Solar Balconies, Energy Generating Skylights,
Pyrolysis Plant, Thermal Energy Storage, On-Site
Hot Water, Energy Visualisation

Smart Room



The Hotel Room of Tomorrow

What's it like, the hotel room of tomorrow? We answer that question with two smart guest rooms at Green Solution House. We focused on choosing quality interiors, which meant prioritising recyclability and sustainability certifications, when it came to selecting our materials and furnishings. Air cleaning carpets, recyclable tiles, recycled plastic fixtures and low energy lighting are some of the things pushing the vision forward. The rooms are delightfully daylight with skylights and Sun Tunnels, complementing the glass façade and balcony. And how does it feel, the hotel room of tomorrow? Controlled by a simple click from our intelligent indoor climate app, the room is yours to explore. The app tracks the impact of your stay, monitoring water and energy consumption, daylight levels, air quality, temperature, and humidity levels.

Who's behind it:

GXN Innovation, Autodesk Research, Strategic Innovation, Rambøll, Kuubo

See also:

Intelligent Indoor Climate, Cradle to Cradle, Air Cleaning Carpets, Recyclable Tiles, Upcycled Furniture, Recycled and Recyclable Fixtures, Woodchip Furniture, Recycled and Recyclable Bed

Clean Air



Active Materials

Clean air is essential to optimising the quality of indoor environments. At Green Solution House we have created a variety of solutions that contribute to keeping our air fresh and pollutant free. The carpets on the floor absorb dust particles, the plasterboard on the walls take care of formaldehyde, and the roof membrane captures and neutralises pollution particles from traffic. The Green Wall in the Third Climate Zone naturally purifies the air with plants and balances humidity levels.

See also:

Active Plasterboard, Green Wall, Third Climate Zone, Air Cleaninc Carpets, Air Cleaning Roof

Third Climate Zone



Connecting People and Nature

A contemporary intelligent winter garden. The east wing of the conference center is a unique spatial experience, connecting our visitors with nature. As a transitional space, with extensive glazing, views of the site, and generous daylighting, this space can be used throughout the seasons. The Third Climate Zone hosts algae generators as part of our on-site biological water purification system, which filters and purifies our wastewater. With the aid of plants and light, the water is recycled and used for irrigation. This water supports the green wall, a key feature of the space, which works to improve the indoor environment. The stone floors can be heated by hot water stored in a repurposed swimming pool, generated from solar thermal energy. The Third Climate Zone is a place for meetings, quiet reflection and inspiration – from nature and each other.

Who's behind it:

Steenbergs Tegnestue

See also:

Symbiosis, Green Wall, Water Cycle, Algae Generators, Space for Innovation,

Facts:

With the heated stone floor, the space is maintained at 5°C, and the ambition is to be able to achieve 15°C by renewable energy. The water from the biological water purification process is purified to drinking quality, but is only used for irrigation for now due to the building law, which prevents reusing it in the building.

Design for Disassembly



Investing in the Future

We are current and we intend to stay that way. In our ever-evolving industry, design requirements are increasingly sensitive to the necessities of sustainable development, and the future. At Green Solution House our Design for Disassembly strategy informed the earliest design decisions through to final detailing; as such, our approach supports the eventual recycling and reuse of building components. Design for Disassembly in our context means valuing building systems for their current purpose, but also their future beyond Green Solution House. We see construction projects as material banks that will support future generations. In this way, the design of the conference center and landscape prioritised accessible mechanical fastenings that can be separated over the use of permanent adhesives and other chemical fixes.

Who's behind it:

GXN Innovation, Steenbergs Tegnestue

See also:

Separable Constructions, Glass Climate Screen,
Recyclable Façade, Building with Wood

Green Footprints Park



Sustainable Landscape Concept

The landscape around Green Solution House features local materials, manages on-site storm water and demonstrates sustainable landscape solutions. Water is the main organising factor. Turning the challenge of a high water table from a problem into an opportunity was the motive for moving 20000 m³ of soil. This topographical change defines rainwater reservoirs that become seasonal ponds and thriving habitats for local wildlife – not to mention opportunities for human delight. By using local biotopes the site is kept low maintenance and the planting is left to grow wild, helping to increase biodiversity.

Who's behind it:

SLA

See also:

Water and Soil Balance, Symbiosis, Bitumen Free Landscape, Local Biotopes, Better Parking, Water Cycle, Food Cycle, Natural Paving

Symbiosis



Building in Balance with Nature

At Green Solution House we strive for a mutually beneficial relationship with nature. We believe that our buildings can support the natural processes of the landscape and can in turn benefit from the resources in our contextual environment. We gain energy, food, clean water and healthy air from our environment by properly managing these on-site resources. Trees planted on-site are coherent with the surrounding landscape, providing shelter, sun and views where needed. Within our buildings we maximise natural ventilation, recover heat, take advantage of daylight and use exterior planting to reduce solar heat gains, all of which is made possible by how the design responds to and leverages nature. The fan shaped building reaches into the landscape, defining a direct and visual connection with the outdoors. With the help of technology we augment nature's own processes to clean water and produce energy, all the while reducing our reliance on external resources.

See also:

Pyrolysis Plant, Biological Water Purification, Renewable Energy, Thermal Balance, Embracing Daylight, Green Footprints Park, Water Cycle, Food Cycle, Natural Shading

Repurposed Glass



Glass Paths

A one-of-a-kind experiment. Glass paths are very fitting for Bornholm, since the island is well known for its glass production. A local glass artist, Pernille Bülow, donated 12 tons of glass to Green Solution House, which was used to make a paved walking path in the Green Footprints Park. The glass was tumbled in a cement mixer to soften sharp edges sharp edges before being applied as a smooth and glittering glass path.

Who's behind it:

SLA, Pernille Bülow, Bornholms Mørtelværk

See also:

Green Footprints Park, Bitumen Free Landscape,
Vegecol

Bitumen Free Landscape



Natural Hardscape Design

Bitumen is a waste product from crude oil processing, and the binder of asphalt. Green Footprints Park is a bitumen free landscape, and the parking lot at Green Solution House demonstrates that it is possible to make a robust paving surface for driving, without asphalt. Where needed a plant-based binder, called Vegecol, is used as an environmentally friendly alternative to bitumen – elsewhere aggregate surfaces are simply compacted fill.

Who's behind it:

SLA

See also:

Green Footprints Park, Better Parking, Repurposed Glass, Vegecol

Better Parking



Demonstrating Reuse

At Green Solution House the parking lot is not your traditional solid black asphalt with white stripes. On the contrary, the parking surface has a loadbearing layer of crushed materials, repurposed from the demolished buildings on the site. The surface itself is bitumen free, and made out of packed granite chippings and dust from local granite production. Rainwater is managed on-site instead of being sent to the storm sewer system. Surface runoff is guided to a nearby wetland pond, first sifting through a specific mix of gravel – where pollutants are removed – before reaching the pond from which the purified water will slowly seep into the ground.

Who's behind it:
SLA

See also:
Green Footprints Park, Bitumen Free Landscape

Local Biotopes



Native Planting

Embraced by nature, Green Solution House is amidst a mix of woods, wetlands, meadows and commons, which have been elaborately composed to create a diverse landscape. The Green Footprints Park is planted with biotopes native to Bornholm. The biotopes can be left to grow wild, which increases biodiversity, expands biomass and keeps maintenance requirements to a minimum. Local biotopes are adjusted to the specifics of the Bornholm climate and as such do not require irrigation beyond that of natural rainfall.

Who's behind it:

SLA

See also:

Green Footprints Park

Thermal Balance



Comfortable Indoor Climate

At Green Solution House we have been successful in balancing the thermal environment for optimal indoor comfort. We achieve comfort by balancing natural ventilation, mechanical ventilation and our heating strategy in response to the seasons. This strategy has resulted in the highest score possible in the Active House analysis of comfort in the building. Our diffuse ventilation strategy supplies fresh air through permeable acoustic panels in the conference center and restaurant ceiling and has two major advantages in terms of indoor climate. First, the even distribution lets us use cooler air without causing discomfort and drafts, and thus reduces supply air requirements and duct sizing. Second, by supplying cool air through the acoustic panels they act as a chilled ceiling, further supporting comfort by radiative cooling. In floor heating and cooling is supported by our on-site thermal energy storage system. Thermal glazing in the conference center maximises indoor comfort relative to solar exposure.

Who's behind it:

Steenbergs Tegnestue, Rambøll

See also:

Active House, Acoustic Panels, Thermal Energy Storage

Environment Conscious Lighting



Park Lighting

Each area of the Green Footprints Park has a suitable lighting design, all LED and low energy. The entrance to the main building and the parking area are lit with spotlights mounted on masts of raw extruded aluminum that dim automatically when traffic is minimal. The main paths through the site are equipped with ground level lighting, which provide safe walking conditions while being considerate of light pollution and the night environment.

Who's behind it:

SLA

See also:

Green Footprints Park

Low Energy Lighting



LED Lighting

Less energy, longer life! At Green Solution House energy consumption is minimised by using light emitting diodes as the standard solution for lighting. This technology consumes 75% less energy and can last 25 times longer than incandescent lighting. LED lighting is durable, does not contain harmful gasses or mercury, and wastes less energy as heat than conventional lighting.

See also:
[Energy Visualisation](#)

Daylit Conference



Naturally Lit Learning Experience

Let the daylight in – anytime. There are no curtains in the conference center, and that’s just the way we want it. Daylight is good for learning and focus – we want to offer our guests a comfortable and naturally lit experience, even during presentations. By using LED monitors instead of conventional projectors, we make it possible for guests to both read the slides, see fellow conference guests and enjoy the view of nature – while learning.

See also:

Embracing Daylight, Intelligent Skylights, Glass
Climate Screen

Responsible Replacement



Supporting Charity

It can be a bit of a mystery what happens to our old things when we replace them for something new. Where items end up once disposed of is not always clear and we did not want this to be the case at Green Solution House. During renovation, it became important to ensure a future life for the hotel's old furniture. Most is still in use, but what no longer had a purpose, was donated to both a local Red Cross refugee center on Bornholm and other volunteer organisations.

See also:

Reclaim, Reuse, Renovate, Upcycled Furniture

Local From Bornholm



Resourceful Thinking

Bornholm is a very resourceful island and we benefit from that at Green Solution House. Instead of having to transport materials and services from far we use local everywhere possible. Raw materials like granite and wood are used in the landscape, and glass from local artists is used to make an innovative, and glittering, pavement. Concrete elements for the entrance area are casted 5 km from the site and the granite is sourced in a quarry 10 km out. Local biotopes are planted in the landscape, strengthening the native biodiversity. Local produce is prepared in our kitchens and served in the restaurant. We also like to do our share, which is why we produce energy on-site, purify our own water and grow some of our own greens.

See also:

Repurposed Glass, Local Biotopes, Food Cycle, Renewable Energy, Bornholm Wood, Bornholm Granite, Material Filter

Circular Business Model



Redefining Revenue

We demonstrate resilience and have the business model to do so. Green Solution House is designed to continuously adapt by embracing new green technologies that demonstrate state of the art developments in the building industry. Achieving this requires a regenerative business model; therefore, monetary revenue from the hotel and the conference centre's operations is channeled to fund the ongoing integration of new solutions and the assessment of existing systems and products. Green Solution House works to inspire enhanced sustainability practices in both international and local design briefs.

Intelligent Indoor Climate



Smart Room App

Interact with your room! At Green Solution House we custom-built a mobile app to track resource consumption and easily control the indoor environment in our Smart Rooms. Energy, light, air and water are the four themes on which live feedback is provided to our guests, helping to inform behaviour by increasing awareness at a personal level. The app works both from an individual and collective perspective. Data from all energy resources is readily available, and therefore it becomes evident when low impact energy or heat is available for consumption. By correlating energy availability to day-to-day routine, the hotel room enables a subtle understanding of how our decisions influence the overall energy and resource profile for the site. When it comes to indoor comfort, the app helps our guests correlate their own experience in the hotel rooms to the quality of the air and daylight levels.

Who's behind it:

GXN Innovation, Autodesk Research, Strategic Innovation, Rambøll

Where you'll find it:

In the Smart Rooms.

Energy Visualisation



Correlating Use to Supply

At Green Solution House we know where our energy comes from and where it goes. The interactive energy visualisation in our lobby both tracks our energy footprint and correlates it to carbon and resource impact. On-site we produce our own energy for consumption, and make up the difference between demand and production by either consuming energy from, or selling it back to, the Bornholm grid. Aligned with our goal of continuous improvement we want an ongoing and thorough understanding of the resource mix used to produce our power – this means understanding the fluctuations between highly renewable energy and highly resource dependent energy. With this understanding, we correlate our operational practices to best mitigate environmental impacts. Together with the day-to-day operations, our guests influence our consumption profile; as such, our energy visualisation is an interactive learning tool – correlating the characteristics and impact of use to behaviour and routine.

Who's behind it:

GXN Innovation, Autodesk Research, Strategic Innovation, Rambøll

Where you'll find it:

In the communications room.

Energy From Waste



Pyrolysis Plant

At Green Solution House we produce energy from food leftovers. All food scraps and organic materials from the main building are fed into our own stationary pyrolysis plant, which takes all carbon based waste. The material is first dried and ground, then all oxygen is removed. The pyrolysis process heats the waste, breaking it down to produce natural gas and char. A cyclone separates off the gas leaving biochar, which sequesters carbon in a stable state. Biochar is valuable as an additive for the gardens as it improves soil health and water retention. The gas is combusted in a combined heat and power engine, generating heat and electricity to be used in the building. The system is self-supporting, and only requires a small amount of energy to start up. Excess heat is stored onsite as hot water in a swimming pool, repurposed as a thermal energy storage system.

Who's behind it:

Frichs A/S, GXN Innovation

Where you'll find it:

In the Green Footprints Park, north of the main building.

The facts:

Green Solution House will release approximately 12.4 tons of dry material to the pyrolysis plant yearly. The plant has the capacity to process 1 ton of dry material over 6 hours which produces an output of 180 m³ of gas, 360 kWh of electricity, and 100 kg of biochar.

Water Cycle



Biological Water Purification

Water is infinitely recyclable, if we treat it right. Water from the sinks and toilets in the main building is collected and flows through anaerobic, clarifying, and biological filtering stages to enable on-site reuse. Two earth lungs in the Green Footprint Park remove odorous gases with planting selected for this purpose. The first stages of purification are hidden below ground, after which the system emerges into view and is assisted by sunlight and LED lighting. Here, the water flows through algae tubes that absorb CO₂ and continue the water cleansing process. The purified water is used for irrigating the Green Wall and gardens. The aim is to close the loop and use this water for the public toilets; however, this is currently unsupported by the building law. We are working to obtain permission to trial this solution and contribute to updating the building law regarding reuse of wastewater and closed loop cycles. The ambition for the system is to obtain drinking water quality through the biological purification process.

Who's behind it:

Rambøll, The Last Straw, SLA, GXN Innovation

The facts:

500 L of water can be purified per day

Where you'll find it:

In the landscape and the Third Climate Zone.

Material Filter



Parameters for Material Selection

When we choose materials and products for Green Solution House they have to fulfill certain parameters. We developed our own criteria to select materials, prioritising certifications and environmental labels, recyclability, social responsibility, use of resources, safety of compounds, and energy in production, to name a few. We send out questionnaires to producers and suppliers, in order to gain knowledge of the ingredients, installation options and production methods. If a material or product has harmful substances or a negative production footprint, we source alternatives. As a result we have many solutions that are designed for disassembly, Cradle to Cradle certified, and have a positive impact beyond their mere function. Furthermore, rather than choosing a certified product from far away, a locally sourced product gets preference by savings on transport emissions and its ability to enhance the local identity of the project.

Who's behind it:

GXN Innovation, Steenberges Tegnestue

Food Cycle



Kitchen Gardens

The kitchen gardens are part of the Green Footprints Park. Self-grown fruit, berries, vegetables and herbs are served together with organic food and supplies from local farms and producers. The park's paths lead to the kitchen gardens and thus the gardens are open to the public. The gardens are mulched and fertilised with biochar, which is a product of our own pyrolysis plant. The biochar is essentially carbon, which helps oxidising the soil and keeping it porous. We want to inspire our guests – have your own kitchen garden!

Who's Behind It:

SLA

Where You'll Find It:

In the Green Footprints Park, north of the main building.

Algae Water purification



Algae Generators

Grow algae to reclaim water! Algae feed on the nutrients in wastewater, effectively purifying the water and producing oxygen during the process. Sunlight and LED lighting help the organisms to feed and grow, therefore our algae generators stand in the daylight filled Third Climate Zone. Water slowly recirculates through the six algae tubes, each of which has a steel base containing zeolite, a mineral that acts as a microbial filter, absorbing microorganisms that are not otherwise digested by the algae. The algae generators at Green Solution House are an important element of our on-site biological water purification system. The entire system can process 500 liters of water a day, which is used for irrigating the green wall and gardens and has the potential to be used for flushing public toilets in the building. The water cleaned by the algae is separated and further purified by UV light to reach drinking water quality.

Who's behind it:

Rambøll

Where you'll find it:

In the Third Climate Zone.

The facts:

The system can process 500 L of water per day. The plexiglass algae tubes are 50 cm in diameter and 2.5 m long. Six algae tubes contain four times the daily discharge of wastewater from the hotel.

On-Site Hot water



Solar Thermal Plant

Solar thermal collectors generate hot water from the sun to offset the operational requirements from the local heat plant. The energy generated can be used for heating potable water - what goes to the sinks and showers - or for general heating needs such as radiators, in floor heating, or ventilation heating. At Green Solution House we have 150 m² of high efficiency solar collectors. In the case that excess heat is produced by our solar thermal plant it can be stored in our thermal energy storage for later use, such as overnight heating.

Who's behind it:

Sunmark, Rambøll

Where you'll find it:

In the landscape northwest of the main building.

The Facts:

We have 150 m² of high efficiency 'big plate' solar collectors with peak thermal power of ~100 kW.

Thermal Energy Storage



Hot Water Reservoir

The hotel's old swimming pool was repurposed into a thermal energy storage system, storing up to 80000 liters of hot water from the on-site solar thermal plant and any excess energy from the pyrolysis plant. The system has two operational modes, depending on the season. During the summer months our on-site generation systems – pyrolysis and solar thermal – together with the storage system, meet all the hotels needs for heating and the production of potable hot water. The repurposed pool is insulated and equipped with heat exchangers to maintain the desired temperature of 80°C. The system's capacity acts as a buffer to meet the overnight heating and hot water requirements when no solar thermal energy is available. During the winter, when daylight for the solar thermal plant is limited, the storage system runs at about 40°C, maintained by a heat pump. The low temperature heat is used for in floor heating in the conference center and preheating potable hot water.

Who's behind it:

Rambøll, Steenberges Tegnestue

Where you'll find it:

In a former swimming pool in the renovated hotel building, below the kitchen floors

The facts:

The capacity of the thermal energy storage is 80000 L.

Earth Lung



Natural Deodouriser

The Earth Lung is a part of the biological water purification system that purifies the blackwater from the Green Solution House. The Earth Lung's role is to remove odourous biogas which is generated during the anaerobic digestion stage of the water cleaning process. The design is simple – biogas is fed into the bottom of a plant box, which has a soil buildup that secures a porous composition. The roots of the plants consume the gases, which also act as fertilisers, promoting growth.

Who's behind it:

Rambøll

Where you'll find it:

In the landscape southeast of the main building.

Separable Construction



Walls and Ceilings Designed for Disassembly

At Green Solution House, non-loadbearing assemblies are designed for disassembly. Plasterboard is mounted onto steel or FSC timber frames. Joints are accessible and fittings with bolts, screws or nails are preferred over adhesives and permanent assemblies. Wherever feasible standardised elements are used and comprise of few components that are safe to disassemble.

Who's behind it:

Steenbergs Tegnestue

See also:

Active Plasterboard, Acoustic Panels, Lightweight Plasterboard

Where you'll find it:

In new non-loadbearing walls and ceilings in the main building.

Green Roof



Roofscape Retrofit

At Green Solution House we have a 200 m² green roof located above our kitchens. The design of the roofscape retains rainwater and delays runoff, thus reducing the total infiltration capacity required by the landscape and the frequency of overflow to the stormwater sewers. Our on-site water management strategy maximises the retention of stormwater on site during heavy rainfall events. The green roof is planted with sedums produced in Denmark and adapted to the local Scandinavian climate, plus some of our hotel rooms have a view over this green roofscape, providing an aesthetic benefit for our guests.

Who's behind it:

Steenbergs Tegnestue, Byggros

Natural Shading



Living Solar Screen

At Green Solution House we have planted trees strategically near the building to shelter from wind and provide shade from the sun. It is a primitive solution which helps manage the indoor climate and, yes, it's as simple as it sounds. Sometimes effective and tailored results can be achieved without the need for high-tech solutions. Seasonal changes support our intention, since more light will reach the interior during the winter months when the trees have dropped their leaves. Views of natural foliage are also beneficial to psychological health, so we wanted to ensure a close visual connection to nature from inside the building.

Who's behind it:

SLA, Steenbergs Tegnestue, Classen & Co

See Also:

Symbiosis

Building with Wood



Lilleheden Glulam Construction

The new building is constructed with wood. Usually the environmental footprint of a building's construction is substantial – at Green Solution House we lowered ours by using wood, as opposed to steel or concrete. Wood is a natural and renewable material – that is, if it comes from responsible and sustainable forestry operations, which ours does. By using a laminated wood construction to form the fan shape of the building, the design has the benefit of being visible, giving the spaces a comfortable and warm aesthetic.

Who's behind it:

Lilleheden

Where you'll find it:

Construction of the new building.

Certifications:

FSC certified, CE labelled.

Facts:

Construction details are designed for disassembly, avoiding chemical fixes and glues.

Lightweight Concrete Blocks



Ytong Massivblok

These building blocks are incredibly light, yet strong and stable – made of a precast porous concrete. The material is inorganic, therefore resistant to damp, and does not rot. Ytong porous concrete is made out of lime, sand and water. The porous nature of the building blocks make them great fire and heat insulators. By being lightweight, the material is ergonomically safe during installation and uses little energy for transport. The blocks are free of harmful chemicals and contribute to a positive environmental balance.

Who's behind it:

Xella

Where you'll find it:

In the main building.

Certifications:

Qualifies for the ISO 14025 standard, CE labeled

Lightweight Plasterboard



Gyproc ErgoLite

It has never been easier to mount drywall! ErgoLite is Denmark's lightest plasterboard, weighing 25% less than standard boards. The weight does not only save energy on transport but makes it ergonomic to install. Thanks to a revolutionary technology, it is also impact-resistant. ErgoLite is a new product, showcased at Green Solution House.

Who's behind it:

Gyproc, Saint-Gobain

Where you'll find it:

In new non-loadbearing walls in the main building.

Certifications:

EPD Verified in accordance with ISO 14025 and EN 15804.

Facts:

Construction details are designed for disassembly, avoiding chemical fixes and glues.

Recycled Glass Insulation



Isover Insulation

This mineral wool insulation is made from 80% recycled glass. Even better, some of that glass used to be in the façade of the building before renovation, and was shipped to Isover and recycled. The insulation contributes to a healthy indoor climate, being chemical free, sound insulating, and able to keep damp and draught away. Isover insulation is lightweight and compressible, making it ergonomic to install and easy to transport. By being produced in Denmark its transportation distance is good and short.

Who's behind it:

Isover, Saint-Gobain

Where you'll find it:

In renovated and new walls and roof, as well as the thermal energy storage.

Certifications:

EUCEB labelled, CE labelled.

Insulating Foundation Blocks



Leca Stones

The new fan shaped conference center has a foundation of porous concrete called Leca. The porosity makes the material heat insulating, strong and frost-proof – as well as lightweight. The porosity minimises material use for the foundation, compared to more traditional materials. Leca is an inorganic material and cannot be destroyed by rot, fungus or insects.

Who's behind it:

Weber, Saint-Gobain

Where you'll find it:

In the foundation of the new building.

Insulated Facade



Weber Serpomin

Plastered directly on mineral wool this solution is a durable mineral façade. The solution is installed on a base of masonry, concrete and wood and ensures a better indoor climate, preventing thermal bridging and cold outer walls. The façade solution is insulated with ISOVER glass wool that is produced from recycled glass.

Who's behind it:

Weber, Isover, Saint-Gobain

Where you'll find it:

In the façade of the main building.

Recyclable Facade



VELFAC Windows

Save energy and reduce waste. Is it too good to be true? Firstly, the north and south façades of the renovated building are triple glazed, saving over 50000 kWh compared to the pre-renovated façade. Secondly, they are designed for disassembly. This means that after a very long life in the building, the aluminum window frames by VELFAC will be taken apart and recycled.

Who's behind it:

VELFAC

Where you'll find it:

On the renovated parts of the main building.

Facts:

The triple glazed glass façade is 355 m² and saves over 50000 kWh compared to the pre-renovated façade. 95% of the window frames can be recycled.

Energy Generating Skylights



VELUX Modular Skylights

Not only do our skylights provide plenty of daylight and ventilation, but the modularity of the system ensures minimal material waste during production, and the integrated photovoltaics generate energy. The VELUX Modular Skylights consist of a high performance composite, exclusively developed by the VELUX Group. The material offers excellent insulation properties equal to wood, provides the strength of aluminum and delivers the thermal stability of glass. Altogether, the material makes it possible to exert a very slim frame design, which maximises daylight inside the building. As a special option for Green Solution House, one third of the modular skylights have been fitted with integrated photovoltaics. The cells produce electricity equivalent to what is required for 1500 homes per year – and offer pleasant shading from the sun during the summertime.

Who's behind it:

VELUX, Foster+Partners, Solar-Future Energy

Where you'll find it:

In the ceilings of the foyer.

Facts:

There are 196 VELUX Modular Skylights at Green Solution House, 68 of which have integrated PV cells. The 98 m² of photovoltaics produce approximately 7077 kWh per year.

Redirecting Daylight



VELUX Sun Tunnels

Think tunnels are just for transporting vehicles? Think again, and enjoy the daylight transported via the VELUX Sun Tunnels, which were developed to transfer pure daylight into nooks and crannies that normally are too remote for natural light. The bathrooms in our Smart Rooms thus offer good daylighting and require less artificial light during the daytime. The tunnels also direct daylight into the lower level of the building, providing natural light for our guests to enjoy all day long.

Who's behind it:

VELUX

Where you'll find it:

In the Smart Rooms and the communication room.

Certifications:

ENERGY STAR® qualified

Channeling Daylight



Parans Solar Lighting

Bring the sun inside! Daylight design is taken to another level with the use of redirecting light channels. The daylight is led into rooms that are out of reach from direct daylight. The reception area was given an additional boost of natural light with the help of Parans sunlight system. A rotating solar receiver on the roof captures the light from the sun throughout the day. Solar cables transport the sunlight and release it into the reception area, reducing electricity requirements while creating a comfortably lit space, despite of the depth of the room.

Who's behind it:

Parans

Where you'll find it:

In the reception area.

Intelligent Skylights



VELUX INTEGRA®

Let the daylight in, get comfortable, and use less energy! Our intelligent VELUX roof windows complement the north façade of the conference hall, with evenly distributed light and fresh air as needed. They even help us achieve a positive energy balance in the building by maximising heat gain from the sun and retaining accumulated heat inside the building during the heating season. VELUX Thermo Technology™ supports the use of large windowpanes for optimal daylight effect in combination with high energy performance. VELUX INTEGRA® is an innovative operating system, programmed to automatically control ventilation, indoor climate, energy balance and sun screening.

Who's behind it:

VELUX

Where you'll find it:

In the ceiling of the conference center.

Glass Climate Screen



Schüco Insulated Glazing

Super insulative! This triple glazed façade system is intelligent and energy saving. The façade changes its functionality with time of day and the seasons – providing shading during hot summer days and letting more light in during cold winter days. The system is simple – aluminum profiles are fitted with bolts and sealing strips are mounted in grooves. As such the system can be disassembled in order to recycle the constituent materials separately, whether aluminum, composite or rubber.

Who's behind it:

Schüco

Where you'll find it:

In the glass façades of the new building.

Facts:

Construction details are designed for disassembly, avoiding chemical fixes and glues.

Bornholm Wood



Locally Sourced Timber

Bornholm is home to the third largest forest in Denmark – as a result conservation and forestry are balanced to promote ecology and local industry. A variety of wood species can be found on Bornholm. All the wood used in the landscape is from Bornholm’s forests, including oak, cypress, douglas fir and larch. In the Smart Rooms, decorative panels showcase the aesthetic of naturally aged ash.

Who's behind it:
Østerlars Savværk

Where you'll find it:
In the landscape and in the Smart Rooms.

Bornholm Granite



Locally Sourced Stone

Bornholm is an island of granite, and the only place in Denmark where you'll find exposed bedrock. Granite is used in the Green Footprints Park and parking lot, and because it is a local material, it both minimises transport and strengthens local production. With the quarry located just 10 km away, it's as local as can be! When granite is cut, there is always waste stone – from big chunks to sharp chips and dust. SLA's approach was that no granite should go to waste, and therefore the design uses it in all sizes and shapes. In the parking lot, both chips and stone dust are made useful.

Who's behind it:

SLA, NCC Bornholm

Where you'll find it:

In the parking lot and park.

Recyclable Ceramic Tile



Mosa Tiles

These tiles have a future and it's not only on our walls. Mosa tiles contain solely nontoxic and environmentally friendly raw materials; they can therefore be recycled back into new tiles or alternative products. Their production method responsibly manages water, energy and health – plus their product packaging is even recycled and recyclable.

Who's behind it:

Mosa

Where you'll find it:

In the Smart Room bathrooms, in 20 hotel apartments, on the floor of the foyer and the Third Climate Zone, as exterior cladding of the new building.

Certifications:

Cradle to Cradle Certified.

Active Plasterboard



Gyptone Activ'Air

This revolutionary acoustic ceiling uses an innovative technology to improve indoor air quality by removing formaldehyde from the air and converting it into safe, inert compounds. For up to 75 years, and even through multiple renovations, it will keep on working and remain 100% recyclable. Cleaner air makes for more comfortable working and living spaces for happier people – with higher productivity and improved health as a result.

Who's behind it:

Gyproc, Saint-Gobain

Where you'll find it:

In a part of the restaurant and in the new building.

Facts:

Construction details are designed for disassembly, avoiding chemical fixes and glues.

Acoustic Panels



Ecophon Focus™ Ds

Did you know hearing is the one sense that never sleeps? Smartly designed acoustics enhance communication by absorbing sound instead of reflecting it. These modular ceiling panels contain more than 70% recycled material and are produced using mainly hydro power. The panels are made of third generation glass wool with a plant-based binder. Glass wool is the lightest acoustic material out there – resulting in fuel savings during transport. The panels are diffusion-open allowing the rooms to be ventilated through the panels.

Who's behind it:

Ecophon, Saint-Gobain

Where you'll find it:

The ceiling of the restaurant and in the new building.

Certifications:

Swan labelled, Indoor Climate labelled.

Facts:

Construction details are designed for disassembly, avoiding chemical fixes and glues. Ecophon will launch a take-back system in 2016.

Air Cleaning Carpets



Desso AirMaster

Carpets that clean the air you breathe. Desso's carpets do not emit harmful chemicals, and the final product is designed to capture fine dust particles in the air – four times more effectively than conventional carpets. These carpets are installed as tiles that can easily be replaced. Desso designs its carpets for disassembly, which means the yarns can be separated from the backing and recycled separately into material for new carpets.

Who's behind it:

Desso

Where you'll find it:

In the renovated hotel and the new building.

Certifications:

Cradle to Cradle Certified.

Natural ColoUrs



Egen Vinding og Datter Paints

This natural wall paint is free of toxic and allergenic substances – that are prone to degas from chemical wall paints. The paint is vapor permeable, which means that damp can move freely through the paint, contributing to the optimal indoor climate. This environmentally friendly paint is a linseed oil emulsion paint, and is used on the brick walls of the apartments at Green Solution House as well as in the conference center.

Who's behind it:

Egen Vinding og Datter

Where you'll find it:

On the raw brick walls of 28 hotel apartments, on the walls of the new building except for wet areas and bathrooms.

Space for Innovation



Meeting Igloo

This flexible, modular, igloo shaped meeting room promotes new ways of meeting. Its hybrid and modular design creates a unique opportunity for a user-defined environment. The meeting space is digital friendly having screens that easily connect to our guests' smart devices via Bluetooth. The igloo is made from prefabricated modular elements and can be easily disassembled and transformed for various needs. The textile clad igloo makes for cozy acoustics.

Who's behind it:

Aart Architects, Holmris, Gabriel Fabrics

Where you'll find it:

In the Third Climate Zone.

Certifications:

The textile cladding from Gabriel is Cradle to Cradle Certified.

Clean Curtains



Chemical Free Fabrics

Breathe easy and get cozy. Textiles often contain harmful chemicals as a result of their processing – which can affect air quality. We wanted the best indoor climate possible, which is why we chose Boelaert & Moens curtains that contain only harmless substances in their fabrics.

Who's behind it:

Boelaert & Moens Fabrics

Where you'll find it:

In the hotel rooms.

Certifications:

Meets the Oeko-Tex® Standard 100.

Recycled Plastic Fixtures



Satino Black

Our bathroom accessories are made using only green energy for production. They are made from recycled plastic and can be completely recycled themselves. Even their product packaging is made from recycled cardboard and recyclable plastic polyethylene film.

Who's behind it:

Van Houtum

Where you'll find it:

In the bathrooms in the main building: in the hotel rooms, by the reception and in the restaurant.

Certifications:

Cradle to Cradle Certified.

Woodchip Furniture



OSB Furnishings

Oriented Strand Board is economical and made from fast growing timber that can be sourced as thinnings from sustainably managed forests. The production process maximises the wood used per log. In comparison to other wood sheet materials, oriented strand boards outperform in strength and embodied energy – being so robust, they can last a long lifetime.

Who's behind it:

GXN Innovation, Kuubo

Where you'll find it:

In the Smart Rooms.

Formfleece Furniture



Conmoto Chairman

New technologies enable new ideas. A new fleece material – formfleece-felt – can be made into furniture. We've purchased chairs for our Smart Rooms that consists of polyethylene terephthalate, a polyester which can be made from recycled plastic bottles. The material remains fully recyclable and is pressed to form a static yet soft seat shell.

Who's behind it:

Conmoto

Where you'll find it:

In the Smart Rooms.

Recycled and Recyclable Bed



Auping Bed

Rest well, rest healthy. The beds in our Smart Rooms are made of fully recycled or recyclable materials. The mattresses are designed to maximise comfort and do so with healthy materials which can be recycled at the end of their life. The frames are designed for disassembly so their materials can return as valuable resources for future products.

Who's behind it:

Auping

Facts:

The bed is designed for disassembly.

Where you'll find it:

In the Smart Rooms.

Certifications:

Cradle to Cradle Certified.

Upcycled Furniture



Gabriel Fabrics

New context, new life – sometimes that is all you need to keep functional products out of landfill. Directly transitioning products into new life cycles is the most effective way of minimising virgin resource and energy consumption. Even conventional recycling consumes significant amounts of energy in order to feed materials back into production. Therefore, at Green Solution House, much of our existing furniture stayed in place and was reupholstered with Gabriel's environmentally friendly fabrics.

Who's behind it:

Gabriel Fabrics

Where you'll find it:

In the renovated buildings.

Certifications:

Cradle to Cradle Certified.

Air Cleaning Roof



Icopal Noxite Membrane

The roof of the main building is covered with a Noxite roofing membrane – a roof cover that cleans the air of harmful pollutants. Emissions from cars and industrial production contain harmful pollutant particles called NOx. When the sun's ultraviolet rays reach the roof surface, titanium dioxide in the material acts as a catalyser in a process where the NOx particles are converted to nitrate, which can then be washed away with rainfall. It is easy to contribute to cleaner air when you work with nature.

Who's behind it:

Icopal

Where you'll find it:

On the roof of the main building.

White Concrete



PL Beton

The area outside the entrance of Green Solution House is paved with precast white concrete elements. We wanted a beautiful material that could bear the weight of busses and vehicles and we didn't have to look far, for the solution was right under our nose. By collaborating with a local concrete company all ingredients, except the white aggregate, were locally sourced and the elements were cast at PL Beton, just 5 km away from Green Solution House.

Who's behind it:

PL Beton

Where you'll find it:

Outside the main entrance.

Natural Paving



DOB Vegecol

Vegecol is a 100% plant based and a colorless alternative binder for paving surfaces. The material's transparency emphasises the qualities and appearance of the gravel used. Vegecol is used to bind paving in the path system of the Green Footprints Park, which is made up of a blend of recycled glass from local production and local granite chippings.

Who's behind it:

Dansk Overfladebehandling

Where you'll find it:

In the path system of the Green Footprints Park.

Solar Balconies



Gaia Solar Cells

Our solar balconies generate electricity and let in more daylight! 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. Now 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.

Who's behind it:

Gaia Solar

Where you'll find it:

On the balconies of the hotel rooms.

Facts:

The yearly energy production is 5000 kWh.

Green Wall



Natural Greenwall System

A large green wall integrated into the Third Climate Zone helps create a good microclimate thanks to the plants' natural ability to freshen the air, stabilise humidity levels and cool the space in summer time. The wall is planted with ferns, which are chosen due to their prevalence in the surrounding nature on Bornholm. Ferns are also able to tolerate low temperatures, making them ideal for the variable temperature of the Third Climate Zone.

Who's behind it:

Grønning Plantemiljø

Where you'll find it:

In the Third Climate Zone

Nutrient Cycle



Biochar

Biochar is a useful byproduct of the pyrolysis process, remaining after the natural gases are extracted with the cyclone in our on-site system. Biochar is practically solid carbon, as such its stable state effectively sequesters carbon that would be otherwise released during the natural decomposition or burning of the waste. The biochar we produce is used in the Green Footprints Park and the gardens for general soil health, since it helps retain water soluble nutrients, maintain soil porosity and improve water retention, all of which aid plant growth.

Who's behind it:

Green Solution House

Where you'll find it:

It is used as a soil supplement for the gardens.

Active House



Comfort, Energy and Environment

Active House is a vision for buildings that create healthier and more comfortable lives for their occupants without having a negative impact on the climate – moving us towards a cleaner, healthier and safer world. The main focus areas of the Active House principles are comfort, energy and environment. Green Solution House is based on these principles and performs very well within the three categories. We offer great indoor comfort due to good daylighting, active materials, and clever ventilation that includes both natural and mechanical solutions. Good energy performance is achieved with energy saving solutions and by using renewable energy from both on-site and off-site sources. A positive environmental impact is secured through recyclability and local resources as well as by excluding harmful chemicals during material selection. On-site biological water purification reduces freshwater consumption – which further supports our positive impact.

Results:

Green Solution House is validated as an Active House and has achieved great results on the Active House Radar, especially in the Comfort Category.

See also:

Documentation of the Active House Radar and the daylight analysis in our eBook, Embracing Daylight, Thermal Balance

The facts:

Active House is an international building standard, which is administered by the Active House Alliance. In Denmark the standard is managed by AktivHus Danmark.

Cradle to Cradle



Regenerative Thinking

Imagine a world in which buildings – just like trees – use the sun's energy, produce nutrients, provide living space for other creatures, cleanse water and purify the air. This is a Cradle to Cradle world. Waste Equals Food, is a fundamental theory in Cradle to Cradle, and a principle that inspires Green Solution House's circular design methods. At Green Solution House, we aspire to eliminate the concept of waste. In order to do this we have chosen materials that can be disassembled, recycled or are biodegradable. We have implemented active materials that purify the air, both indoors and outdoors. We have created a regenerative system that cleanses wastewater to drinking water quality using a biological process, and another one that transform kitchen leftovers to nutrients and clean energy. The Cradle to Cradle principles are an inspiration and a driver in the continuous development of Green Solution House, both in the buildings and the landscape.

Results:

Green Solution House is Cradle to Cradle inspired and uses many products and materials that are Cradle to Cradle Certified.

See also:

Eliminating the Concept of Waste, Biological Water Purification, Pyrolysis Plant, Nutrient Cycle

The facts:

Cradle to Cradle is a concept created by Michael Braungart and William McDonough. The Cradle to Cradle Certified Product Standard is administered by The Cradle to Cradle Products Innovation Institute, a non-profit organisation.



Investigating Quality

Outstanding quality is necessary to obtain a DGNB certification. DGNB describes and assesses the sustainability of the building as a whole, over its entire life cycle. The criteria for the certification addresses the building's qualities in the following categories: environmental, economic, sociocultural and functional, technical, process and site. Green Solution House combines the criteria and requirements for both residential and commercial buildings, being the first hotel in Denmark to be DGNB certified. The high standards of DGNB and the comprehensive building approach mean that Green Solution House is more than a collection of environmentally friendly technologies. It is also friendly towards social relationships and comfort, effectively supports the wellness of the surrounding environment and generates a healthy, long term economy. Although DGNB is looking at the building as a whole, it also requires a thorough investigation into the ingredients of the building – which is why we tracked all the ingredients of the materials used in the building.

Results:

Preliminary results confirm a DGNB certification – final results are pending.

See also:

Material Transparency

The facts:

DGNB is a German building standard, which in Denmark is administered by Green Building Council Denmark.

Ø Logo



Organic Ecolabel

Green Solution House's restaurant is the first hotel on Bornholm to receive state controlled ecolabel for organic food. The restaurant is awarded a Bronze ecolabel, serving up to 60% organic food. We will not necessarily raise this percentage and go for the gold, because we always prioritise local over imported organic. For the Green Solution House it is important to promote the delicious and seasonal local foods fresh from the island's farms.

Results:

Bronze

The facts:

The Ø logo is a state controlled ecolabel administered by the Ministry of Food, Agriculture and Fisheries.

See also:

Read about the restaurant and the menu on our website, www.greensolutionhouse.dk

Green Key



Tourism Ecolabel

Green Solution House holds the Green Key, an international ecolabel awarded to hotels, hostels, conference centers, and other leisure organisations that meet a number of environmental requirements. Some of the demands are to limit the production of waste, decrease use of water and electricity, and focus on education and communication – all fields where Green Solution House is successful. Obtaining The Green Key shows the sense of responsibility an organisation has for the environment and for society.

The facts:

The Green Key is an international ecolabel, which in Denmark is administered by HORESTA.

Daylight Analysis



Daylight Factor

The daylight conditions at Green Solution House have been evaluated using the daylight factor method in the VELUX Daylight Visualizer and achieved exceptional results. The daylight factor is a recognised performance indicator used to evaluate the available amount of daylight in a room. It expresses the percentage of daylight available on indoor work surfaces compared to the amount of unobstructed daylight available outside, under an overcast sky. The higher the daylight factor, the more daylight is available in a room. With an average below 2% a room will look dull and the frequency with which electrical lighting is used will increase. With an average above 5%, interior spaces will feel nice and bright.

Results:

Daylight levels in the main building are high. For example, in the conference center the average daylight factor is 6.6%, in the Smart Rooms it is 3.0% and 1.9% in the hotel hallway.

The facts:

The daylight simulations are created in VELUX Daylight Visualizer.

See also:

Documentation of the daylight analysis in our eBook, Embracing Daylight, Daylit Conference, Smart Room, Energy Generating Skylights, Innovative Skylights, Redirecting Daylight, Channeling Daylight, Glass Climate Screen, Recyclable Façade.