

30 SUSTAINABLE NORDIC BUILDINGS

Best practice examples based on the Charter principles



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Title:
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Year of publication: 2015

Articles and edition: COWI A/S
Graphic design: COWI A/S

Printed by: Kailow Graphic

ISBN: 978-82-8277-069-9

Front page photo: Fred Jonny



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PREFACE

Environmental issues are high on the public agenda of the five Nordic countries – Denmark, Finland, Iceland, Norway and Sweden. The Nordic peoples expect the environment where they live and work to be sustainable and at the same time to reflect the values that prevail in the Nordic societies.

The Nordic Built programme was initiated by the Nordic Ministers for Trade and Industry and launched by Nordic Innovation and the Nordic Council of Ministers in 2012. The aim was to accelerate the development of sustainable building concepts in the Nordic region and to contribute to the realisation of the Nordic region as a leading innovative region in green growth and welfare.

The platform of the programme is the Charter, created by 75 leaders representing some of the most forward-thinking businesses in the Nordic building industry.

The Charter consists of 10 principles that define the strongholds of the industry. They represent a holistic approach to building that includes all three dimensions of sustainability – social, environmental and economic. The Charter involves more than just the actual physical building, it reaches out to the people living, playing, learning and working in it.

The Charter is the backbone of this book, which tells the story of 30 sustainable Nordic buildings. It is our hope that you will enjoy reading it and that you will get inspired by the innovative sustainable solutions that it presents.

Enjoy!

NORDIC INNOVATION

THE CHARTER

The Charter was launched in 2012 by Nordic Innovation and the Nordic Council of Ministers. It consists of 10 principles for a sustainable built environment, reflecting the prevailing values of Nordic society.

This book offers inspiration on the use of the Charter in practice. How does the Charter work? What do the ten principles mean, and how can they be interpreted? The 30 Nordic building projects presented in this book showcase the practical application of the Charter's 10 principles.

Some of the projects are completed and you can actually visit and experience them. Others are in the planning phase. Whatever stage they are in, they are exemplary in their innovative sustainable use of building concepts, and may serve as inspiration for building owners, architects, client consultants, developers and academia looking for new ways to consolidate a sustainable Nordic built environment.

Integrating the principles

To demonstrate how the principles of the Charter can be realised in practice, Nordic Innovation launched a design competition. The Nordic Built Challenge invited the Nordic building sector to compete on the development of sustainable concepts according to the principles of the Charter.

THE 10 CHARTER PRINCIPLES

We will create a built environment that:

- | | | | |
|----|--|-----|---|
| O1 | IS MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE | O6 | IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST |
| O2 | PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE | O7 | UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS |
| O3 | MERGES URBAN LIVING WITH THE QUALITIES OF NATURE | O8 | IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES |
| O4 | ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE | O9 | EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY |
| O5 | IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION | O10 | PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT |

THE NORDIC BUILT CHALLENGE

The Nordic Built Challenge was an open multidisciplinary design contest for the retrofitting of five specific buildings in Denmark, Finland, Iceland, Norway and Sweden. Launched by Nordic Innovation in late 2012, innovators from the building sector and beyond were invited to compete on the development of strong concepts for a sustainably built environment. The assignment was to demonstrate the principles of the Charter by retrofitting existing buildings in an innovative and sustainable manner, while ensuring financial and practical viability.

The five buildings were:

- Denmark: Ellebo in Ballerup
- Finland: Hippostalo in Tampere
- Iceland: Höfdabakki in Reykjavik
- Norway: Posthuset in Oslo
- Sweden: Botkyrka in Stockholm



These sustainable concepts are not only relevant in the Nordics. On the contrary, they are applicable worldwide. This book presents the five national winners of the Nordic Built Challenge together with a selection of 25 exemplary building projects from Sweden, Norway, Iceland, Finland and Denmark. It aims to inspire builders in the Nordic region and beyond to integrate the Charter's principles in their building projects.

Selecting the buildings

The Nordic countries abound with buildings that demonstrate the Charter's principles. In our selection of the buildings we have taken into

consideration what type of building they represent, i.e. their function: housing, mixed use, hotels, shopping, health, education, institutions, offices and cultural buildings. Also, we have taken into account their location in the countries they represent, in order to provide as broad a picture as possible.

An expert panel was appointed, and has been of paramount importance in ensuring that the selection process has been transparent and clear. All the principal design contacts of buildings represented have given their consent to the publication of the buildings.

EXPERT PANEL

Across the Nordic countries, many building projects stand out as exemplary for their innovative, sustainable solutions. They all deserve attention and applause, and therefore, selecting building projects to supplement the five Challenge winners was not an easy task.

With the competent assistance of impartial and independent experts from all five Nordic countries, we were able to select the 25 building projects presented in this book and we are extremely grateful for their assistance. In particular, we owe our thanks to the following:

- Heini Korpelainen, R&D coordinator, Finnish Association of Architects SAFA, M.SC. (archit.)
- Jens Østergaard, CEO, BYG-ERFA Building Technology Experience, Architect MAA
- Peter Andreas Sattrup, Senior Adviser, Sustainability, Danish Association of Architectural Firms, Architect MAA PhD
- Sigríður Björk Jónsdóttir, Managing Director, Icelandic Green Building Council, MA in Architectural History and Theory, MBA Human Resource Management
- Øystein Grønning, M.Arch. Urbanist Owner of MIGRANT AS

VISIONARY RETROFITTING OF SOCIAL HOUSING

The retrofitting of the Ellebo social housing blocks west of Copenhagen will change the currently run-down 1960s estate into modern low-energy housing surrounded by attractive gardens and a lively neighbourhood.



Ellebo Garden Room is the Danish winner of the Nordic Built Challenge and the winner of the entire Challenge competition. Founded on all the Charter principles, the project demonstrates new ways for future sustainable design, and it shows a holistic approach to the renovation of social housing estates. It manages to add many qualities and create major impact on the estate with only minor interventions, setting a new context that includes physical upgrade, energy efficiency and a vibrant urban space and community. Yet compared to other renovation projects, Ellebo Garden Room is a low-budget project.

Aside from the renovation of present flats so that they follow modern energy and living standards, the project includes 4,500 m² new flats incorporated as both rooftop flats for families and an extension of a block building to ensure the encapsulation of a large inner garden.

The landscape of the estate is transformed into a lively, productive, ecologically rich shared garden. The

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ High quality solutions |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Interdisciplinary teams | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Adapted to local condition |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Involvement of users and stakeholders |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions ✓ Industrialised production | <p>O10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



garden will offer a diverse range of spaces of different character, which will cater for the many different needs of a community and will promote the sense of sharing and pleasures of coexistence.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Accessibility to garden and flats

A key strategy of the project is to ensure direct access to the garden

from all flats. Break-out spaces will be provided on the ground floor around the central staircase, so that access is possible from both sides of the building. The improved access to the garden side will encourage a more active use of the garden.

In addition, the accommodation will be designed to cater for users with limited mobility. The addition of new lifts will give level access to existing ground floor and upper level flats as

▲ New balconies enhance connectivity from upper flats to the garden room [Adam Khan Architects].

well as the new rooftop flats. In line with orienting the estate towards the garden, the new lift will be located on the garden side.

Inviting indoor environment and climate

Due to the removal of studio flats, all flats will have a dual aspect, which

BASIC PROJECT INFORMATION

Project

> Ellebo Garden Room

Client

> Ballerup Ejendomsselskab, KAB
www.kab.dk

Principal design contact

> Adam Khan Architects
www.adamkhan.co.uk

Location

> Ballerup, Denmark

Building type

> Housing, retrofitting

Project stage

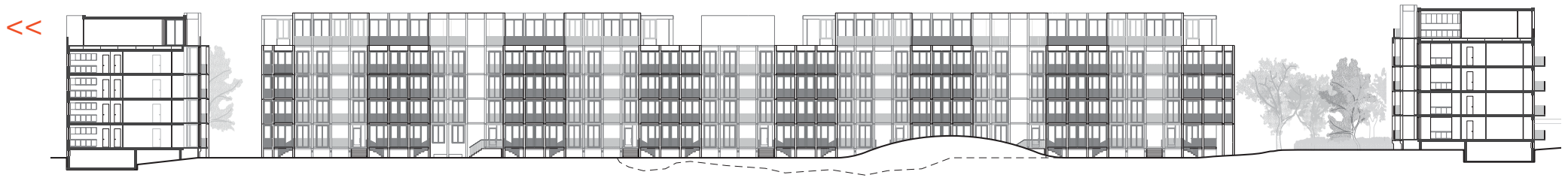
> To be completed in 2018

Gross area

> 5 levels, 22,880 m² retrofitting +
4,562 m² new construction

Local neighbourhood

> Suburban area



▲ The large blocks and the garden are visually broken down into smaller entities in the project [Adam Khan Architects].

enables a greater fluidity of internal living space, a choice of views, cross ventilation and an improved level of light coming from both sides of the flat. The living areas will be better connected and generally focused towards the garden side. Windows will be replaced by highly insulating windows that allow excellent daylight and solar energy transmittance. The window openings will be wider and taller than the present ones, providing more light and a greater sense of space.

As a holistic approach to energy renovation characterises the project, energy and indoor climate/living comfort improving measures go hand in hand. Besides the changing of windows, a façade renovation will contribute to both energy reduction and an improved level of comfort along with an enhanced architectural expression. A new façade with 400 mm insulation will ensure considerable energy savings, and contribute to an improved indoor climate as cold bridges and draughts from leak-

ages are eliminated. Furthermore, the new façade will ensure that potential problems with moisture and mould are avoided.

Ellebo as a lived and loved resource for families

The rationale of the Ellebo Garden Room is to provide a mixed typology of flats. In particular, the renovation aims at ensuring a sufficient number of large flats to attract young families with children. This target group is desirable from the point of view of attracting and enabling generational stability.

For this reason, a great deal of thought has gone into transforming the landscape of the estate into a large garden area with allotment gardens and a big shared space offering multiple functions. The improved accessibility to the garden and an increased sense of enclosure in it will ensure that the garden room becomes the heart of the community.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Minor interventions major impact

The use of architectural and cultural values as sustainability criteria has been enhanced through the application of the principles of the Charter. For this reason, the project takes its point of departure in the site and location, drawing parallels to Danish twentieth-century housing with simple geometry and park-like spaces.

The sustainable retrofit focuses on altering present flats with minor interventions and the building structure is retained with minimal disruption. Instead, changes are made to the façade, adding extra light and space to the flats. New glass façades replace present external walls, and winter gardens or balconies will be added. Furthermore, ground floor flats will have direct access to the converted garden area.

Teamwork on energy calculations

Behind the Ellebo Garden Room project are three architects and three engineering companies. Their partnership and interdisciplinary teamwork has resulted in an interesting comparison of natural and mechanical ventilation and the energy efficiency of the two types. The project aims to fulfil today's energy requirements for the new constructions as well as the retrofitted buildings, which significantly improves the overall energy performance of Ellebo for the new buildings and for the renovated part.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

The notion of shared vibrant garden

The design of the central, abundant garden plays a fundamental role in the entire project. The intention is to transform the outdoor space into a communal, vibrant and ecologically rich garden space with different types of spaces for diverse purposes. Along the inner sides of the four blocks, access conditions are improved and



▲ The new glass façades and winter gardens are mounted without rehousing the tenants [Adam Khan Architects].

small private gardens create distance to trafficked areas. Each of the garden corner rooms will have its own character, but are treated as extensions of the central garden. The large central field serves mainly as a park for shared use, and is also part of the rainwater harvesting system.

Supporting biodiversity

Water and nature will be two keywords in the landscaping of the shared garden. The garden is conceived as one huge meadow with an integrated waterscape with creeks and a central raingarden. The local plant species will be water-tolerant and create a natural environment in the garden. The meadow will promote biodiversity on site by introducing new native planting that attracts wildlife. Lawns, path and playgrounds are incorporated in the meadow, and green paths following the water trails will lead the user through the garden.

Winter gardens

While the shared outdoor garden serves as a public recreational area, the winter gardens function as extensions of the living areas, providing a personal relaxed, recreational space with excellent daylight – somewhere between interior and exterior space – all year round. As well as energy efficiency, the winter gardens make a huge improvement to the generosity, flexibility and attractiveness of the

apartments, giving the user personal control over their environment.

>>

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Passive environmental strategies

Sustainability is an integral part of the renovation strategy for the Ellebo Housing development. The building uses a number of sustainable measures that reduce operational costs, energy consumption and CO₂ emissions. A highly insulated envelope and triple-glazed panels reduce thermal bridging, which ensures that the building's required energy consumption is low. Furthermore, evenly distributed, openable windows facilitate summer cross-ventilation and stack effect heat purging.

Additionally, key components of a passive environmental strategy are the winter gardens, which reduce the heat loss of the flats in the winter and extend the outdoor period in spring and autumn.

Sustainable energy

District heating is Ellebo's energy source. The district heating system is recognised as a sustainable heating supply system that produces both electricity and heating based on locally collected waste. The project does not include onsite renewable energy production for the time being



as it is not regarded as an economic and efficient solution in this particular case. Instead, the project proposes to apply regional renewable energy sources such as wind power, a well-developed industry in Denmark.

Energy renovation will reduce the heating requirements significantly, bringing the entire complex up to today's legislation. Therefore, the heating system for space heating can be changed into a low-temperature system, which reduces the heat loss

in the district heating system and in the heat distribution system in the blocks.

Holistic energy concept

Achieving the highest level of energy performance in the Danish building code for new constructions is not a problem, but upgrading existing buildings to something near today's standard of energy as well as indoor climate performance is a challenge. Even so, a successful renovation will provide the overall best and future-

◀ Many functions are gently integrated in the garden room
[Adam Khan Architects].

proof performance. Hence, the focus point in Ellebo is to design a unified energy concept for the entire project.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Danish aesthetics and social values

The design of Ellebo Garden Room rests on a comprehensive research and typology study conducted by the architects to find and emphasize the root of the Danish/Nordic design traditions. The project has used the Charter to meet the requirements of aesthetic appeal, which enhance the social and functional value of the estate. The project refers to well-known large-scale housing estates in Denmark, using them as a basis for a level of detailing.

Prefabricated elements

All new built areas, e.g. the top floor add-on flats and a large extension of block 1 will be realised using prefabricated timber cassettes to reduce weight. This enables a complete prefabrication of the elements off site and an easy process of installation. Finally, the ventilation system and the

façade elements will consist of pre-fabricated units that will be replaced sequentially using modern methods.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Long-lasting concrete panels

The retrofitting project proposes a single skin concrete panel system with high thermal performance, low embodied energy and a lifespan of 80-100 years. Though this system is more expensive than the timber cassettes, it exceeds the typical life costing methods based on a 50-year lifecycle. The balconies are designed in concrete for the same reasons as above and due to fire regulations.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Water as a resource

The sustainable drainage strategy for the building reflects visionary engineering of the garden landscape, using water as a resource and design parameter. The integrated flood meadow provides buffer capacity for storm drainage and a wildflower meadow for most of the year. A natural pond will use harvested rainwater from the buildings and give enough storage capacity to provide irrigation for the garden. The parking and path



▲ The access terrace provides high quality shared space for the penthouse flats [Adam Khan Architects].

surfaces will be made of compact yet permeable gravel, which is part of the drainage strategy.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Respecting people's lives

Ellebo demonstrates a transparent process involving the community, and includes innovative proposals for how tenants can remain in their homes during renovation, even during the replacement of the facade. A key aspect of the project has been to improve the quality of the homes without having to go through the expensive and stressful process of re-housing. In this way, disruption to people's lives during the works is minimised.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Reproducible design

In Scandinavia, there is much social housing in need of modernisation. The design solutions and production method therefore have a large potential for similar estates in many suburban areas. The concept of retrofit mainly on the outside, comprising industrialised building elements,

highly insulated concrete elements or prefabricated wood cassettes – rather than changing interior layout, makes it suitable for adaption to similar housing blocks elsewhere.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

In conclusion, driven by the Charter, the Ellebo Garden Room stands out as an initiative clearly made for people and clearly promoting their quality of life. It is unique in that the project demonstrates how an architectural interpretation of a place can provide a retrofitted building complex with cultural and social properties.

It considers specific local aspects while at the same time using design approaches that are generally applicable, because they draw on both traditional and contemporary techniques.

FROM OFFICE TO VILLAGE

From a uniform office complex to a multi-functional building. The winning design of the Nordic Built competition in Finland, Equilibrium, presents a comprehensive retrofitting of the government office complex Hippostalo, turning it into a balanced HipposVille.

Urban gardens, senior citizen homes, a kindergarten and new flexible office solutions. The winning project of the Nordic Built competition in Finland, Equilibrium, presents a retrofitting of the government office complex Hippostalo, where more than 60 percent of the facilities will be converted into non-office use.

The retrofitting of Hippostalo is based on an innovative concept where agencies from the public, private and third sectors are merged together to exploit synergies and collaborate in new ways. Through a comprehensive transformation, introducing flexible and easily adaptable work environment solutions, Hippostalo will be updated to meet requirements for today's modern and mobile work environment.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

A multifunctional building

The office complex Hippostalo lies in Tampere, Finland's third largest city. It is a building typical of its time similar to other office complexes

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

01 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

- ✓ Pleasant and comfortable
- ✓ Accessibility

02 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

- ✓ Extraordinary sustainable performance

03 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

- ✓ Access to urban natural elements

04 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

- ✓ Carbon emissions in operation phase

06 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST

- ✓ Flexible design, adaptable materials

08 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

- ✓ Collaboration models and innovative business models

09 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

- ✓ Reproducible and adaptable
- ✓ Export potential





▲ The new glass façade and atrium upgrade functionality as well as the exterior [KVA Architects Ltd].

built in Finland and elsewhere in the 1970s-1980s. However, like many of these buildings, Hippostalo faces many challenges. Outdated technical installations, an unsatisfactory indoor climate and floor plans that do not meet the needs of a modern and mobile work environment.

Equilibrium presents an overall solution for a contemporary update of Hippostalo. From consisting exclusi-

vely of offices, the project proposes a transformation of Hippostalo into a multifunctional building. To attract both workers, residents and visiting citizens, as much as 60 percent of the present facilities will be converted into other use than offices. In other words, one could say that the project aims to transform the Hippostalo office complex into a village – hence the name HipposVille. Today, the Hippostalo presents itself as one mas-

sive concrete building. By adding vertical and horizontal extensions to the building, Equilibrium aims to make the building look more attractive.

A spacious atrium

More specifically, this will be done by creating a new atrium in the south-west part of the main façade. With a transparent glass façade and an open staircase, the atrium will link all floors to the entrance space, inviting people

BASIC PROJECT INFORMATION

Project

> Equilibrium HipposVille

Client

> Senate Properties
www.senaatti.fi

Principal design contact

> KVA Architects Ltd, Helsinki
www.kva.fi

Location

> Tampere, Finland

Building type

> Offices, retrofitting

Project stage

> National Winner Nordic Built
Challenge 2013

Gross area

> 18,795 m², 8 levels + basement

Local neighbourhood

> Suburban area

<< to move between the different levels of the building.

A wooden structure residential block for senior citizens with day care facilities will be added to the south-east part of the block, diversifying site utilisation, bringing life to the area 24/7 and increasing density.

Socialising in outdoor space

As for the space outside the building, a new city square will provide room for activities and exhibitions. To create an attractive living space, the parking lot will be transformed into a sheltered, car-free park and urban gardening area. The present building and the new addition will form a protective sound barrier against traffic noise from the surrounding main roads.

The building is situated close to public transport. Equilibrium also proposes an innovative bike parking solution with automatic underground storage as well as a bike hotel offering bike services and winter storage. In addition, a car pool service will be made available for residents and other users.



▲ Shielded from noise and wind the new garden will be an attractive new shared space [KVA Architects Ltd].

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

An attractive mix of people and services

The aim of creating HipposVille is to facilitate a platform where government, municipal agencies and their partners can create and test new service models based on public-private partnership agreements, networking and open source-learning processes.

The aim is a cross-functional village, including senior citizen homes and child care facilities. Social sustainability is achieved through the different age groups meeting and learning from each other. Senior managers mentor start-ups, school kids take the senior residents for a walk, and grandparents do gardening with the children from the kindergarten.

The senior residents benefit from being located in the middle of a stimulating environment, and the office workers can have their children taken

care of in the same block. The attractive service mix ensures financial sustainability, as people from a wider area come together to do business, participate, learn and spend time together.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Bringing people together

Equilibrium provides a number of platforms for activity, relaxation and social life. The meeting centre in the building can be rented by internal as

well as external users, and the all-day restaurant is open to all visitors. The urban garden area has the potential to bring together different groups of people with an interest in gardening and ecology. The project proposes allotments and common gardens, locally grown ecological production and local nutrient recycling in partnership with the restaurant.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

New façade provides ventilation and insulation

The overall energy concept for HipposVille is ambitious and comprehensive. Solutions that minimise the building's energy consumption have been central to the planning of the building. To ensure a pleasant temperature in the office complex' meeting rooms, they have been located in the northern part of the building. Column shaped Swedish Aspen trees will provide shade in the southern part of the building during the summer.

Better insulation of walls and roofs as well as new technical solutions will bring HipposVille close to the status of a plus-energy building with an E-figure of 33 kWh/m². One of the technical solutions suggested is a three-dimensional glazed façade. While the glazed façade also provides an extra layer of insulation in the winter, it can

on hot days be opened, thus providing natural ventilation and removing excess heat, just like an overcoat.

Intelligent technical solutions

Other important elements in optimising HipposVille's energy performance is efficient building services and demand control in all technical systems. Technical solutions facilitating energy efficient adjustable ventilation and flexible indoor climate zoning are proposed for each floor of the building. Low temperature heating and high temperature cooling through ceiling panels raise efficiency of the geothermal energy production. Loose duct sizing saves electricity for transport of air, and the Smart Grid helps optimise electricity utilisation by load shedding, peak shaving, energy storage and selling.

The building is heated by district heating. Adding to the production of warm water and electricity, the Equilibrium project includes 5,000 m² photovoltaic panels situated in a nearby traffic junction inside a road exit loop, and solar heat panels on the roof of the building. Battery storage for balancing peak power outputs from the PV-panels evens out the difference between maximum production and maximum consumption. In addition, a ground heat system with heat pump and heat storage provide cooling and heating.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Flexible use with minimum change

To meet future user-demands the Equilibrium project supports a wide range of possibilities for the flexible use of HipposVille. With minimum changes, the building can be retrofitted in function, space layout or size.

Ensuring flexibility and variety in accordance with client demands is achieved by utilising the same floor plate for all floors with designated zones for enclosed spaces. As an example, most zones can be subdivided into smaller units. Equilibrium also introduces inflatable, mobile spaces that can be erected anywhere, and used to create a bubble for teamwork or individual contemplation. Round-table settings surrounded by curtain walls will be available for discussions, workshops, meetings or individual work.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Interdisciplinary team

An interdisciplinary team focusing on how the building will be used, maintained and managed when

built developed the predesign of the Equilibrium project. Both the building owner, the design team and suppliers contributed to the concept of the new, retrofitted Hippostalo.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

A balanced solution for export

Today, many countries face an increasing need for a radical reform of public agencies if they are to meet the demand for more efficient services in the future. The concepts developed in the Equilibrium project consist of five key elements: a mixed-use building/block, a holistic eco-concept, an efficient workplace concept, an interactive management system and a participative approach.

Depending on local circumstances, these five key elements could all be transferred to other projects in varying degrees and at different levels and contexts. HipposVille is a test bed for a new service model and retrofitting concept. The result will be interesting for large single-use buildings or urban areas, turning them into multi-purpose urban villages.

REYKJAVIK'S GREEN CAPE

The retrofit of an old office park in Reykjavik city, Iceland, will convert the buildings into more than just office space. Once completed, Cape Green will be a green office park with an inspiring environment.

Cape Green is the winner of the Nordic Built competition in Iceland. Developed with the Charter in mind, the project introduces a sustainable planning solution for the site with a realistic approach to creating a new identity for a green office park.

The vision is to create a lively and pleasant place for people working in different fields. A place where people gather to mingle and experience active life together with those working in the area and to make use of different services available in the district.

Cape Green will embrace the quality of city life and leisure by catering for all daily needs. The buildings will accommodate restaurants, cafés, shops, printing services, banks, post office, seminar facilities, fitness facilities, hairdressers, car and bicycle rental/pooling - and even a kindergarten.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|---|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable | <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ High quality solutions ✓ Flexible design, adaptable materials |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |





▲ Greening on and around Cape Green welcomes people from the distance [VA ARKITEKTAR].

Just as important, the office park will have a square in the middle and adjoining green areas with trees, vegetation and natural elements allowing for recreation and a pleasant social life. The promotion of green transport solutions comprise another key element, as the site design will give priority to pedestrians, bicycles, and the access to public transport.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Giving priority to green transportation

The site of Cape Green will be an almost car-free zone, as cars will be diverted to parking areas before they enter park square. Car park for employees will be under the new square,

while parking on the ground will mainly be for short visits and rentable and shared, low emissions cars and bicycles. This will offer an opportunity for both increased density and recreation space on the premises. To endorse sustainable transport, a clear connection leads to the main bicycle paths on the coastline and along the highways.

BASIC PROJECT INFORMATION

Project

> Cape Green

Client

> Reitir Properties
www.reitir.is/en

Principal design contact

> VA Arkitektar
www.vaarkitektar.is

Location

> Reykjavik, Iceland

Building type

> Offices, retrofitting and new constructions

Project stage

> National Winner Nordic Built Challenge 2013

Gross area

> Lot size: 44,700 m²
Low buildings: 18,000 m², 2 levels
High buildings: 7,060 m², 7 levels

Local neighbourhood

> Suburban area

<< 03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Recreational green environment

Cape Green uses several features to welcome a diverse community. In particular, extensions to the lower buildings with green walls and roof gardens add value to the existing buildings and give the area its inviting and green image. The roof gardens with terraces, grass and vegetation on the buildings' eighth and ninth levels will be accessible for all tenants in the building for recreation and for gathering on the roof and enjoying spectacular views.

Natural life cycle

The green environment promotes the maintenance of a natural life cycle and ensures a higher degree of carbon sequestration (dioxide saturation), which will ensure cleaner air in the buildings. Further to this, the green areas and green roof gardens will make it possible to harvest rain-water for irrigation. Harvested rain-water from roofs and horizontal surfaces will be led to an open channel along the square and into open ponds on the main square.

► Roof gardens accommodate social life at the doorstep of the workplaces [VA ARKITEKTAR].



◀ Roof terraces, green walls and site benefit not just social life but also the environment [VA ARKITEKTAR].

Additionally, a nature park on the south edge of the site and on the west side of the main building will attract birds and insects. The manmade wetland will provide a varied flora and fauna adjacent to the heavily trafficked motorway. In this way, both air and noise pollution will be minimised through a natural sound barrier.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Energy reducing measures

Sustainable energy is plentiful in Iceland and access easy. Even so, the project focuses on minimising energy requirements along with façade protection and optimising indoor climate and outdoor facilities.

The buildings' vegetated roofs will not only provide convenient outdoor space, they will also contribute to providing a higher level of envelope insulation, thus reducing energy consumption. The fiberglass screen also has a multifunction, which affects the indoor climate and use of energy as well as serving as a weather coat that will reduce the maintenance costs of the building. The membrane makes it possible to open windows for natural ventilation even on windy days.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Nordic values

The idea behind Cape Green is to provide a sustainable site that promotes social life and support people's well-being. To accommodate this goal, public facilities and open space work facilities dominate the design, which are in line with Nordic values. The enhancement of the building's lightness and transparency is another principal design parameter.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Flexible design solutions

The building seeks - both in the short and long term - to serve various kinds of businesses with its flexible and functional design. Two new storeys will be added to the main building, which creates opportunities for developing sustainable solutions for the building in the future. The additional space will provide more space for rent, thus minimising the owner's costs in renovating the building towards sustainable requirements.

The seventh floor of the building will be rebuilt similar to the lower floors with multifunctional and flexible office

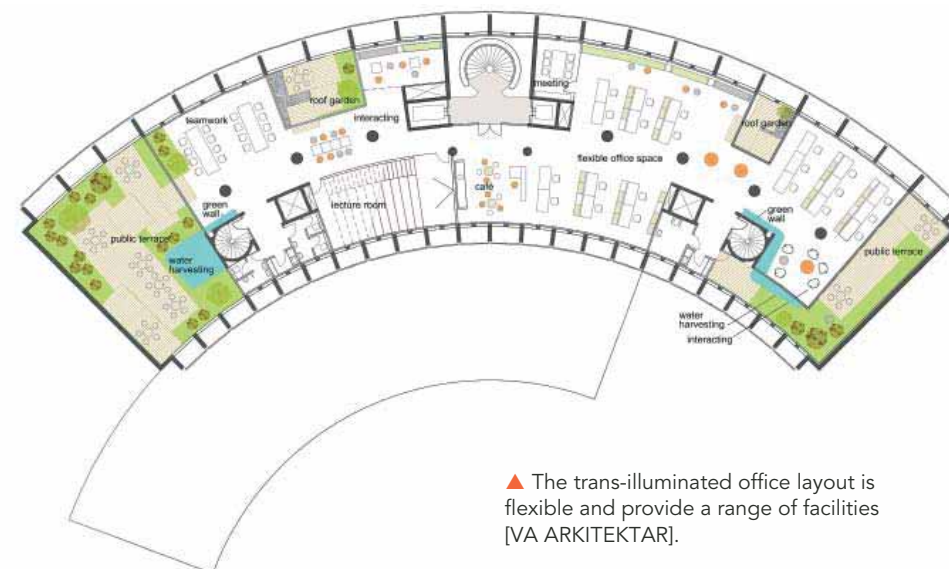
► 3D section of low rise buildings with green walls and roof gardens [VA ARKITEKTAR].

spaces. The eighth and ninth floors are intended to be lightly constructed penthouses for public use. An option following the ideology of sustainable ecology and economy is to allocate the eighth floor to shared office space where small firms and individuals can rent a space or desk for a short period with access to common facilities.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Reproducible design solutions

The office park in Reykjavik City shares similarities with other office parks built in the same period and same type of location – often rather anonymous, rational concrete office blocks on the outskirts of cities. Hence, many of the design solutions in the Cape Green project are reproducible and scalable, and can be used in other contexts, such as the inclusion of shared and/or public facilities, the greening of the buildings and enhanced focus on indoor climate.



▲ The trans-illuminated office layout is flexible and provide a range of facilities [VA ARKITEKTAR].

AN URBAN MOUNTAIN IN DOWNTOWN OSLO

Once the retrofitting of the Urban Mountain high-rise is completed, the Norwegian capital will feature yet another icon. The architecture interlinks closely with Nordic Built environmental strategies that insist on setting new standards for sustainability.

The former home to the Norwegian National Postal Service is centrally located in Oslo. A renewal of the high-rise completed in 2003 added a vertical glass furrow to the structure giving the visual effect of dividing the building into two towers.

While the refurbishment was much applauded, the owners, Entra Eienendom, found that the building did not live up to the highest standards of environmental sustainability and user-friendliness. As this is a prerequisite for meeting the tough competition for premium tenants in downtown Oslo, Entra welcomed the invitation from Nordic Innovation to let their building be the Norwegian entrant for the Nordic Built Challenge.

Meeting the Charter

The project transforms the building into an 'Urban Mountain' adding a new building edition to the north of the original high-rise and a glass solar chimney with natural plants. The chimney shoots up between the old and the new towers and utilises solar heat to create a stack effect for natu-

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|---|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ Flexible design, adaptable materials |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Involvement of high-level experience ✓ Interdisciplinary teams | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Material emissions | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |





▲ The proposed retrofitting of the tower building combines a remarkable exterior with modern and sustainable office space [smith hammer lassen architects].

ral ventilation. Rising above the tallest tower, the chimney will be visible from several angles, adding an iconic feature to the building.

The Urban Mountain project has been developed according to the Charter. It integrates environmental strategies and architectural visions in a way that promotes sustainability for people, business and the environment.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Accessible and well connected

Urban Mountain is located by the central bus station, Oslo's main railway station and the tram. Thus, it provides easy access to sustainable public transportation for tenants and visitors.

A new street level will create a streetscape above the railway tracks, and connect Urban Mountain directly to the Opera and the new bus terminal on the south side of the building, and to Oslo City and Oslo Plaza on the north side. Cyclists have direct access to Urban Mountain via ramps leading to an automated bicycle parking system.

The architectural vision is to connect the lower building of Urban Mountain to the surrounding city and traffic hubs. The public areas of the building

BASIC PROJECT INFORMATION

Project

> Urban Mountain

Client

> Entra Eiendom A/S
www.entra.no

Principal design contact

> schmidt hammer lassen architects
www.shl.dk

Location

> Oslo, Norway

Building type

> Mixed use, retrofitting

Project stage

> National Nordic Built Challenge Winner 2013
> Expected completion in 2019

Gross area

> 79,000 m²

Local neighbourhood

> City centre

Certification

> Potential BREEAM Outstanding certification

will have conference centres, auditoriums, restaurants and view terraces, and a green mall on the ground floor will underpin the status of the building as a sustainable landmark. The mall is envisaged as a green market place attracting people who prefer



▲ The lower floors interact with the surrounding city [smith hammer lassen architects].

healthy food supplied by local producers. In this way, the mall matches the sustainability mindset of the entire building concept.

Indoor climate

The environmental strategy of Urban Mountain is based on the concept 'Reduce – Optimise – Produce' and focused on an optimal indoor environment and energy optimisation: First, reduce the need for energy by passive means such as a highly insulated building skin and efficient solar shading; secondly, optimise daylight, natural ventilation and installations. Finally, power the building through the active use of solar energy, heat recovery and energy storage.

Daylight and natural ventilation have been important design parameters and have determined the façade design and integrated atriums. The extensive use of plants constitutes the building's 'green lungs' that enable the use of natural ventilation and increase the daylight intake. Consequently, the overall design of Urban Mountain creates optimum conditions for a healthy and comfortable indoor climate for the building's inmates.

The daylight design focuses on finding the right balance between visual and thermal comfort and the lowest possible energy consumption for heating, cooling and lighting. In this

context, one of the strategies to improve daylight conditions has been to increase room height near façades, local atria and reflective louvers.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Cross-disciplinary

Behind the Urban Mountain retrofitting project is a large pool of Nordic and German specialists from private companies and universities. The group includes architects, engineers and specialists within biology, climate engineering, office planning and cradle-to-cradle in the built environment. Together, this team has set new standards for cross-disciplinary interaction. The combination of an ambitious building owner and the visionary Charter principles has paved the way for unique sustainable solutions in Urban Mountain.

Natural ventilation

The numerous green atria or 'green lungs' ensure an innovative natural air intake that cleans, humidifies and reduces the CO₂ concentrations of the incoming air to the benefit of the users' comfort and well-being.

The indoor climate will be controlled automatically through openings in the

façades. In the solar chimney climbing from street level to the top of the building, the thermal stack effect generated by the solar heat gain will drive the exhaust. A greenhouse on the roof will capture the surplus heat of the building and the solar heat gain of the solar chimney. The captured heat will preheat the mechanical air inlet or be stored in a thermal storage system using ice. Finally, as yet another innovative feature, a wind tower in connection with the greenhouse increases the natural driving force of the air exhaust.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Biodiversity

Oslo is the municipality in Norway with the highest biodiversity. It is the ambition of Urban Mountain to match this and become the building with the highest biodiversity in the country, thus supporting local biodiversity.

The biodiversity strategy for the building has visionary elements for greening both interior and exterior spaces. Vegetation on the outside will reflect the Oslo flora from the landscapes in the fiord and islands as

Section of the building. The green spine of the building plays a cultural and unifying role. Not just for its users, but also for a sustainable operation [smith hammer lassen architects].

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well as from hinterland forests. The selection of species will include Red List plant species creating habitats for Red List butterflies and other insects with respect to different growing conditions. For instance, for the façades with little or no sunlight the Alna river valley has provided inspiration for creating green walls with moss and grasses similar to the steep, shady bedrock slopes of the valley.

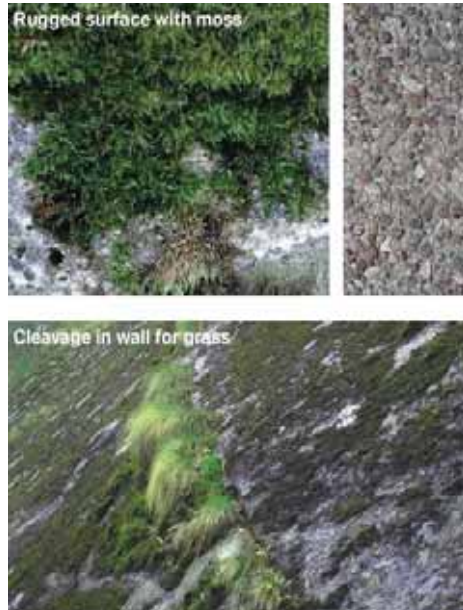
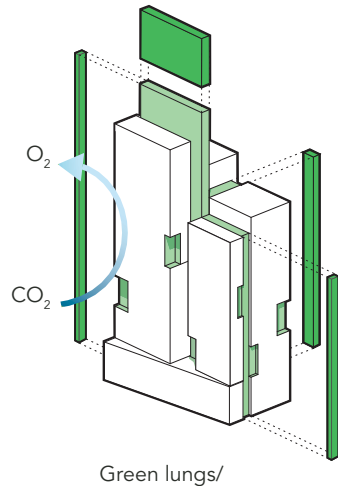
Green atria

Inside the building, the green atria will provide recreation and break-out space. In the Norwegian temperate climate, the extension of the outdoor period this way is a huge gain for the building's users and the local community. The green atria have a significant impact on glare and solar shading on the south façade. They have an insulating effect, thus reducing the energy used for cooling and heating, and in addition they increase moisture contents.

Green atria will provide occupants with a sense of nature, and they are known to increase activity by 15-30 percentage. Some plants make people feel that the daylight level is



Green lungs improve the indoor climate.
[smith hammer lassen architects].



higher, and by growing them the psychological well-being and the thermal comfort of people using the building grows too.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

360 degree energy concept

The overall energy goal for the operation phase is to reduce energy delivered to the building by 45 percent, i.e. a demand for energy delivered to be less than 80 kWh/m² year. The strategy to achieve this is to 1) Reduce energy requirements, 2)

Optimise energy use and 3) Produce energy.

Orientation, utilisation of daylight, passive solar energy and thermal mass in the building are the primary means to reduce energy requirements. At the same time, these means also benefit directly the indoor climate and well-being of the user of the building, e.g. the introduction of the double façade and the green atria make natural ventilation possible and at the same time extend daylight and reduce noise. Thermal mass reduces the cooling demand and the peaks

▲ An optional workplace
(smith hammer lassen architects).

in cooling production by 30 percent. When natural ventilation contributes to cooling, the energy demand for mechanical cooling is reduced by 60 – 80 percent.

Finally, heat pumps will recuperate energy from the building's wastewater. In combination with a bio-digester producing up to 35 percent of the heating demand, the demand for district heating will be very small. The bio-digester will also supply up

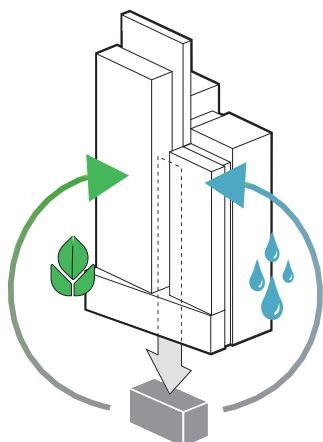
to 13 percent of the total electricity in the building. Only a limited amount of photovoltaic panels will be installed since the crystalline panels are not optimal from a cradle-to-cradle perspective. However, it will be possible to install much more PV when the technology improves.

Cradle-to-cradle

The design frame and intention of Urban Mountain are based on three fundamental cradle-to-cradle principles: Use current solar income, celebrate diversity, and use waste as a resource.

The biodigester transforms bio-waste into energy, water and manure [smith hammer lassen architects].

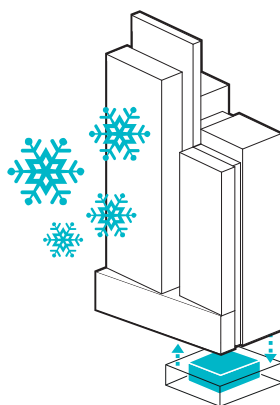
Biodigester/



Materials have been chosen according to cradle to cradle guidelines, and many parts and components are C2C certified. This means that they support resource repletion instead of depletion. Material repletion is a value based business model that defines new dimensions of quality to generate benefits for builders, suppliers, building occupants, operators and owners. Therefore, Urban Mountain will be made of materials measurably defined in cradle-to-cradle terms of chemical contents, effects on air, soil and water and effects on human health.

Excess cooling in winter is stored underground for use during next summer [smith hammer lassen architects].

Icestorage/



06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Design for disassembly

Design for disassembly and easy access to building components for replacement have been key to choosing materials that will support continuous improvements in performance and maintain building value over time. For instance, all façade elements are designed for disassembly and therefore easy to reuse. This design strategy is also a prerequisite for reuse of building materials.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Material passport concept

To facilitate the design of a disassembly strategy the winning team proposed the development of a 'material passport' concept defining use periods, materials content and strategies for recycling and upcycling materials.

The project also strives to eliminate the unnecessary transportation of building materials. Therefore, producers, distances and countries have been carefully mapped to ensure that on the one hand transportation distances are held at a minimum and on the other that building materials are indeed C2C certified and recyclable.

Biodigester

Waste will be considered a resource with potentials for creating economic and environmental added value. A biodigester produces energy, fertilizer and clean water by digesting food waste and faeces.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Scalable and reproducible

There are high-rises in all large cities. Urban Mountain demonstrates how

an existing high-rise can be transformed into a modern building matching a modern way of life and climate and energy awareness. The integrated design of indoor climate and energy concepts can be adapted to similar buildings and turn old and outdated high-rises into future-oriented buildings, which meet the demands for reduced resource consumption and building waste.

Certification

The project has the potential to reach the BREEAM-NOR score 'Outstanding' which is the highest possible sustainability score in this internationally acclaimed certification system.

10: PROFITS, PEOPLE, BUSINESS AND THE ENVIRONMENT

All in all, Urban Mountain demonstrates how social, economic and environmental sustainability aspects can convincingly be integrated into building projects. In particular, the project excels in the way strategies for using daylight, solar energy, natural ventilation and plants will benefit both people and the environment.

HOLISTIC AND TRANSPARENT RETROFITTING

A holistic approach to sustainable renovation is the mantra behind the proposed upgrade project Fittja People's Palace in Stockholm. The renovation project highlights a transparent process involving all stakeholders from the area with special attention to the contemporary as well as historical context.

The holistic approach to the upgrade of the 12 storey social housing complex is one of the reasons why Fittja People's Palace became the Swedish winner of the Nordic Built Challenge. The intended goal is to upgrade the building on a tight budget through small, but strategic, changes. The upgrade aims to solve acute technical and physical problems, strive for sustainable solutions and renovate in a manner, which ensures that the flats remain affordable for the present tenants.

Sustainable renovation

The idea behind the retrofitting of the residential area in Stockholm is a method called Sustainable Renovation, which emphasises a holistic view of community, planning and renovation. The method sees the present physical situation, the experience of the many users and the historical facts as fundamental elements in the upgrade. It implies an extensive involvement of all relevant stakeholders and a transparent process, which takes into account the physical parameters of the site.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|---|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE
✓ Pleasant and comfortable</p> <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE
✓ Extraordinary sustainable performance</p> <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE
✓ Carbon emissions in operation phase
✓ Embedded carbon in product
✓ Material emissions</p> <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST
✓ High quality solutions</p> | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES
✓ Involvement of users and stakeholders
✓ Collaboration models and innovative business models</p> <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY
✓ Reproducible and adaptable</p> <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |
|--|---|





▲ The project is developed in respect of the existing, primarily low-income population wishing to stay in the area [Spridd AB].

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Preserving the characteristics of the building

In Fittja many residents have a non-Swedish background and a low income. As most of the residents are happy with their neighbourhood, preserving the characteristics of the building was taken into account in the retrofitting project.

Instead of a comprehensive overall change, the idea has been to introduce several small-scale interventions in the building and the flats. This meant that the façade and its characteristic expression will be preserved and the upgrade carried out on a budget that keeps the rent at an acceptable level. Nevertheless, the upgrade of the flats as well as the area will be noticeable and improve the tenants' quality of life.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

A life-cycle perspective

A focus point of retrofitting Fittja People's Palace is to create a cost-effective design in a life-cycle perspective. A priority has therefore been to ensure that tenants can stay in their

BASIC PROJECT INFORMATION

Project

> Fittja People's Palace

Client

> NCC Construction Sverige AB
www.ncc.se

Principal design contact

> Spridd AB
www.spridd.se

Location

> Stockholm, Sweden

Building type

> Housing, retrofitting

Project stage

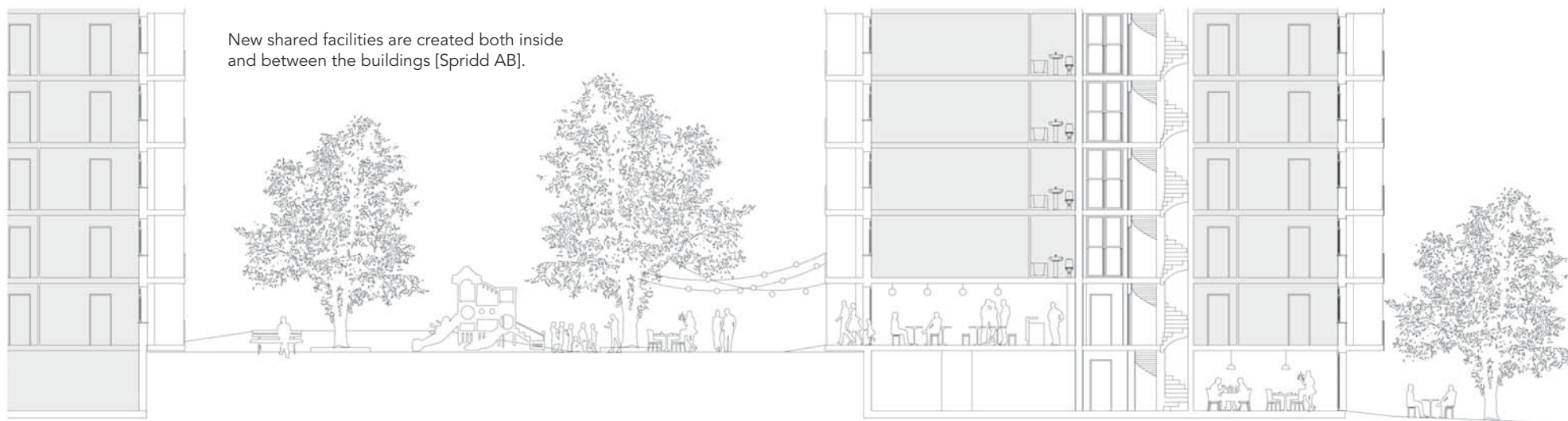
> National Winner Nordic Built Challenge 2013

Gross area

> 5,320 m²

Local neighbourhood

> Suburban area



homes after renovation. In addition, the proposal is able with minimal design measures to create energy savings of 28 kWh/m² (small package), improve the indoor climate and add new qualities to the building for a rental cost increase of maximum ten percent.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Reducing environmental impact

The project proposal aims to reduce continuously climate-changing emissions, focusing at the same time on the energy consumption in the building and transportation. The project suggests the reuse and maintenance of building parts, where it technically and economically makes sense, and

strives to minimise building waste and the use of new materials.

A climate declaration has been developed for the project that reports on the greenhouse gas emissions over a life cycle. The declaration enables the project to focus on the actual contribution to reducing the greenhouse effects and not only on energy consumption – a useful tool when trying to reach the combined goal of a reduced environmental impact and sustainable development.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Reasonable renovation

The project proposal is based on the concept of reusing, repairing and updating existing building elements and materials. Fittja is part of the Million Programme – a Swedish housing programme implemented in 1965-1974, which aimed at ensuring people flats at reasonable prices. The materials used in the programme are known for being time-less and durable which is why their replacement is neither necessary nor cost-efficient. The original high quality materials still characterise the public areas of the building, such as the marble floors and the concrete

façades, so these will be kept where possible. Walls and woodwork will be repaired and painted, and existing structures and surfaces in the kitchens renovated.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Involvement of stakeholders

The transformation process depends on the creation of a platform where everyone affected by the project can contribute with important local knowledge and expertise. The early engagement and involvement of all stakeholders in the process is key,



▲ Street exhibition of retrofitting project promotes dialogue and response from inhabitants [Mikael Olsson].

with tenant representation seen as the most crucial element. The open-ended process includes town hall meetings and facilitated workshops, open meetings announced by posters and flyers in order to reach out to the residents, interest groups, institutions and organisations in the area.

Close partnerships

Sustainable renovation is the work process. It is based on a partnering agreement with shared goals, a shared economy and a shared organisation. It comprises a high level of transparency and follows a complex structure. The project proposal has mapped all the relevant stakeholders – not simply the stakeholders directly involved in the construction process, such as architects, the contractor and estate owner, but also interest groups and organisations who in different ways can contribute to the project.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Adaptable and exportable solutions

Though the approach to sustainable renovation is designed for the Fittja project, it is also flexible and therefore suitable for similar areas built during the same period. The suggested collaboration process, the working

method and organisation structures could also be used in a development project. The incremental integrated process like the one proposed in Fittja makes the project design adaptable to countries and conditions with different types of subsidies and funding for refurbishment. The method is thus scalable in the sense that it can be adapted to very different contexts.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

In the renovation project Fittja People's Palace much attention has been given to creating a socially sustainable solution. The proposal pays respect to the local social environment and inhabitants. This is especially clear from the consideration given to the balance between renovation and renewal. Environmental concerns have focused on improving indoor environment and energy consumption along with conservative renovation and retrofitting. By keeping construction costs low and responding to actual needs, the aim is to enable the residents to stay after project completion and live in an upgraded version of the environment they like. It is renovation from within.

GEARED TO THE FUTURE

The DTU Compute building materialises the first important step in a visionary reform called 'The New DTU'. The New DTU is part of a plan to ensure that the DTU is an attractive and sustainable environment for students, researchers and external partners in the future.

North of Copenhagen lies the Technical University of Denmark (DTU) which houses around 10,000 students studying engineering, technology and natural sciences. Ranked as one of the leading technical universities in Europe, the DTU is dedicated to offering unique research facilities with a focus on sustainability.

In recent years, the DTU has invested in an ambitious development of its infrastructure, including extensive building renovations, alterations and new constructions. In 2013, the new DTU Compute building, also known as building 324, was added to the campus site, and is today a landmark for the university's high ambitions. The 4,500 m² new building belongs to the Mathematics and Computer Science Institute, and has facilities for teaching, research, administration and exhibition - as well as tutorials and social meetings.

As much as 24 trees decorate the interior of the new building. Glass façades surround the vast atrium, and the walls of the offices and meeting

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|---|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high level experience | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ High quality solutions |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



BASIC PROJECT INFORMATION

Project

> DTU Compute – Building 324

Client

> Technical University of Denmark - DTU
www.dtu.dk

Principal design contact

> Christensen & Co Arkitekter
www.christensenco.dk

Location

> Lyngby, Denmark

Building type

> Education, new construction

Project stage

> Completed in 2013

Gross area

> 4,500 m², 3 levels

Local neighbourhood

> University campus area

◀ The atrium is the heart of the building and is used for informal meetings, tutoring, study group activities and social events [Christensen og Co].



rooms are also made of glass. The transparency helps daylight pass through the façade and penetrate deep into the building. Research offices are assembled in three-storey towers connected by walkways and break-out areas with comfortable seating among the large indoor trees.

▲ Formal project team work takes place in classrooms in visual contact with the atrium, hence also campus outside [Adam Mørk].

The project has transformed DTU Compute into an extremely energy efficient building – as well as an indoor learning and growth garden where all users and guests can

meet in a bright and open common environment.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Indoor green oasis

DTU Compute has no long dark corridors. Instead, the building's interior

forms one cohesive and lush oasis with large trees that establish a living, common space, weaving throughout the entire house and spatially connecting everyone and everything. In this way, the interior represents a future-proof 'micro-campus', an internal knowledge development and learning universe.

Eight glass towers

Without compromising the green environment or the effective daylight penetration, the building provides opportunities for privacy, concentration and academic focus. Eight separate towers with walls of glass divide the ground floor into sections, some more intimate than others. Classrooms and space for the students are placed in the ground floors of the towers, while offices and open common areas for teachers and researchers are located on the upper floors. The towers are connected by walkways, creating a vibrant movement around the house's upper floors.

Indoor climate

The indoor trees are a key feature in the indoor climate design. The green indoor environment helps the building 'breathe'. Along with good air quality and optimal humidity and oxygen content, the large internal volume with many green plants ensures stable temperatures, neutralisation of toxicants and good air quality. The trees give shade to the study and break-out areas in the and foster good acoustics in combination with the specially designed cushioned furniture.

The south-facing façade has moveable sun screens while glass on the other façades is coated, depending on their orientation. Through

underground channels, ventilation intake enables natural cooled fresh air in offices, etc. during the summer months.

Accessibility

Easy access and openness go hand in hand in DTU Compute. Inside the building, the two stairs are located centrally in the great atrium, creating easy access upwards to the open walkways and seating areas used for informal meetings for scientists and students. Everywhere the research offices and meeting rooms have glass walls, making it easy to view the study areas on the ground floor.

Outside the building, public transport is easily accessible – and a new light rail is being planned for the DTU Campus. The university premises also offer numerous parking spaces for bicycles and cars.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Bringing own knowledge and resources into play

The DTU Compute brings the institution's own knowledge into the building's design and not least into the energy supply of it. The project uses super-light concrete in the con-



▲ The new building adds new light to the 1970s blocks of yellow brickwork [Adam Mørk].

<< construction which has a low carbon footprint compared to normal concrete. The use of super-light concrete is a subject taught at the university and a subject for several master theses and PhD projects, and the material was invented and developed at the university.

The university has its own district heating plant, district cooling service and power supply. This allows it to optimise the entire supply system of the property rather than just the individual buildings. DTU researchers have developed the unique and pioneering hybrid ventilation system with heat recovery for the project.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Green architectural concept

The building's embedded nature is both part of an ambitious architectural plan and a green initiative seeking to connect urban life to nature. From the beginning, the design team envisioned large indoor trees as one of the project's key features. The vision is that the interior of the building always appears lively and vibrant, full of surprising and varied landscape qualities as an integrated part of the study and research environment.

The green indoor environment connects visually well with the campus



▲ Daylight flows from the skylights into the atrium [Adam Mørk].

area, which is generously planted with oak trees, scrubs and lawns.

Transparent façades

All the transparent façades are easy to open allowing transition between the inside and outside environment. During the summer there is masses of life and movement enriching the

spaces and outdoor courtyards around the building.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Energy efficient designing

The project uses several passive and natural solutions to minimise energy

consumption and reduce carbon emissions. In spite of being a glass-house, the building is highly energy efficient and categorised as low energy class 2015 according to the Danish building code. The low energy consumption is primarily due to the efficient and dense envelope, a new ventilation system based on hybrid principles, high utilisation of daylight, lighting solutions with very low power consumption, efficient fittings and a low temperature heat supply.

A pioneering ventilation concept

In particular, the hybrid ventilation system including natural cooling and heating of ventilation air and the use of return heat from the rest of the campus constitute innovative and efficient energy strategies.

In this way, the air for hybrid ventilation system is preheated or precooled via a tunnel system established under the building as a culvert. This means free heating in winter and cooling in summer. Moreover, the return heat from the DTU's existing buildings and district heating system is used for low temperature heating of the building, and comes therefore almost free. The return heat from the existing 1970s buildings is up to 50 degrees, which is normally very inefficient. However, this temperature is perfectly suited for this building, which is dimensioned for low temperatures.

The innovative hybrid ventilation itself is based on a repression concept and driven by natural forces supplied by an auxiliary engine on the roof. The concept reduces energy consumption for air transport by up to 95 percent in comparison with mechanical ventilation. In addition it allows for up to 70 percent heat recovery in contrast to natural ventilation. The concept is developed by DTU researchers.

Prepared for solar energy

The building is prepared for the installation of 290 m² solar cells on the roof and 460 m² solar collectors. This will cover the building's heating and electricity consumption as well as users' electricity consumption, converting the building from a low-energy building into a 0-energy building.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Nordic design

The project integrates the best of Nordic design tradition by focusing on highly functional and human scale design, daylight and a green mindset. While the building's exterior is geometrically tight and transparent, the interior is characterised by the central green courtyards and offices that are gathered in three-storey towers connected by walkways and



break-out areas with comfortable seating spaces among the large indoor trees.

Hidden installations

One of the building's challenges was that the various installations had to be carried forward to each detached building tower. This was solved by using a large tunnel system, which replaces a normal basement, and by cabling under the connecting walkways. This allowed hidden installations with easy maintenance.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Durable floors

Overall, the project's design solutions entail materials and components that are robust and durable. For instance, the floor's primary components are based on special type sand with cement as a binding agent. After curing, this special composition provides a durable floor surface as well as adding a raw, industrialised look.

◀ Moving from the traditional corridor office blocks into DTU Compute has literally opened for connectivity [Adam Mørk].

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY.

Scalable concepts

The project employs several concepts and design solutions that are scalable and transferable to other contexts. One aspect is the super-light concrete, which is a material developed and produced by the DTU while also being a study subject. This product has great potential for use in similar as well as other contexts. Another aspect is the architectural design and approach to combining research, teaching, tutoring and relaxing/break-out areas. This approach sets a standard, which matches well the requirements of other higher education facilities.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

Overall, the DTU Compute is an entirely new proposal for the future research and learning buildings offering a unique spatial and organisational quality that is both modern and progressive. Combining all the pillars – social, economic and environmental sustainability – the project delivers a building of high quality, focusing on an open and green environment, optimal indoor climate, innovative energy design and sustainable building materials.

HOTEL WITH A POSITIVE FOOTPRINT

Green Solution House is not simply a hotel and conference centre. Green Solution House is a complex with a holistic approach to sustainable design. Visitors are offered a green stay in a comfortable environment.

Green Solution House is a hotel with roots back to the 1960s. It lies on the small Danish island of Bornholm in the Baltic Sea. It has undergone extensive renovation and is today a hotel combined with a conference centre. Driven by a green agenda, the renovated and extended building aims at demonstrating innovative and regenerative solutions in the built environment, including a healthy indoor climate, renewable energy sources, sustainable materials, circular economy and recyclability.

A focal point has been to integrate the surroundings with the building to create an inviting landscape based on sustainable parameters. Striving for a symbiotic relationship with nature, the hotel accommodates its own 'Green Footprints Park'. Here the landscape supports the local climate, mitigates flooding, complements the existing woods and maximises biodiversity.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety | <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high-level experience | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Collaboration models and innovative business models |
| | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |



▲ Approaching Green Solution House after a swim in the Baltic Sea [Justine Høg].

Solar panels, a biological water purification system and a bio-digester integrated in the landscape complete the green concept.

Indeed, the project is a viable example of how green solutions and how an organisation, a building, and a group of people can generate a positive footprint.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Open and integrated building complex

The renovation upgraded the 1960s hotel into modern facilities that reflect the expectations of today's hotel and conference guests. Originally consisting of two separate, concrete

buildings, Green Solution House now forms one building complex with a new entrance and hall, connecting the restaurant, reception, conference facilities and hotel rooms with the landscape. New façades and balconies provide the restaurant and hotel rooms with plenty of light and attractive spaces. The hotel rooms are retrofitted with upcycled furniture, re-

BASIC PROJECT INFORMATION

Project

> Green Solution House

Client

> Hotel Ryttergården
www.greensolutionhouse.dk

Principal design contact

> GXN architects
www.gxn.dk

Location

> Rønne, Denmark

Building type

> Hotel, new construction and retrofitting

Project stage

> Completed in 2015

Gross area

> 4,500 m², two levels

Local neighbourhood

> Island of Bornholm

Certification

- > The building is expected to achieve a DGNB Bronze certification
- > Green Key certification (Eco-label for tourism industry)
- > 'Det Økologiske Spisemærke' Bronze certification (Danish eco-label for organic food in restaurants)



▲ Rainwater handling, relaxation, activities and a variety of biotopes combined in the landscape [Justine Høg].

cyclable tiles and intelligent lighting in a completely up-to-date design.

Daylight for wellness

A key design parameter is the integration and use of daylight, which ensures a comfortable and healthy indoor climate. The conference room is brightly lit-up by daylight and hotel rooms have optimised daylight conditions. As part of the daylight strategy, a rotating solar receiver on the roof

captures sunlight into the reception area throughout the day, reducing electricity requirements and creating a pleasantly lit area.

Clean air strategy

Other innovative solutions for optimisation of the indoor environment include measures contributing to clean and emission-free air. For this reason, carpets in the Green Solution House absorb dust particles, the

plasterboard on the walls reduces the presence of formaldehyde, and the roof membrane captures and neutralises pollution particles from traffic. A green wall in the 'Third Climate Zone' adjacent to the conference room purifies the air with plants, and balances the humidity levels.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Interaction with a 'smart room'

With its so-called 'smart rooms', Green Solution House presents an out-of-the-box solution, that pushes the limits of how to integrate sustainability in a hotel, because they involve

the guests directly. Two guest rooms have been retrofitted with intelligent climate systems, which allow visitors to control the indoor environment, monitor the resource consumption and track the impact of their stay through a custom-built mobile application. The house provides live feedback to the guests on the consumption of energy, light, air and water to increase awareness at a personal level and nudge green behaviour.

Co-creation approach

The Green Solution House was realised by a team of strategic partners and advisors working closely together and bringing their own expertise into play to push forward innovative green solutions.

In the co-creation process, the strategic partners not only contributed to the project with the latest hardware, but also with knowhow and joint efforts to integrate technologies in a new context. The implementation of e.g. a pyrolysis plant, solar thermal panels and photovoltaics integrated in balconies and glass roofs are examples of jointly developed green energy solutions that are founded in a cradle-to-cradle mind-set.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Green initiatives with a double purpose

The building project integrates many green elements in the design. Notably, the large green wall actively contributes to the indoor climate thanks to the natural ability of plants to freshen the air, stabilise humidity levels and cool the space during the summer. The building also hosts algae generators as part of an on-site biological water purification system. The Green Footprints Park transforms the original lawn into a wavy, bio-diverse landscape, not only for aesthetic reasons, but also as a means of mitigating flooding. The park, open to guests and the public, offers several green technologies. It has access to the woods and to the beach and provides 'maximum openness' according to the DGNB certification screening.

In addition to handling rainwater, the park's sustainable landscape concept includes several features and design solutions leveraging nature. Local biotopes are used to ensure low maintenance of the site, and the plants are left to grow wild, helping to increase biodiversity and expand biomass. At the same time, exterior planting is used to reduce solar heat gains and provide natural shading. 'Earth lungs', which are part of the water purifica-



▲ Energy production and sun shading in one [Laura Stamer].



▲ A tempered break-out zone in the conference centre [Justine Høg].

tion system, are integrated in small, raised flowerbeds by the terraces.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Local energy production

In addition to the algae system and the natural green wall contributing to CO₂ reduction, the building also produces renewable energy on-site with low carbon emissions as a result. The

different sources of renewable energy complement each other. Energy is produced with the pyrolysis plant, solar thermal plant and integrated photovoltaic system – and excess heat is stored in an on-site energy storage system, in what used to be the swimming pool in the basement.

Energy from waste

An interesting example of the building's sustainable energy production



▲ An extraordinary acoustic meeting room [Justine Høg].

is the pyrolysis plant that turns waste into energy. All food scraps and organic materials from the main building are fed into a stationary pyrolysis plant, heating the waste and breaking it down to produce natural gas and biochar, which is also valuable as a soil additive for the gardens.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Local available materials

Bornholm has many natural resources, so whenever possible local materials have been chosen rather than transporting materials and services from afar. This means that raw materials like granite, wood and glass are used in the landscaping. All

wood used stems from the woods' of Bornholm, including oak, cypress, douglas fir and larch – just as glass is used to make a paved path in the Green Footprints Park. Concrete elements for the entrance area were cast five kilometres from the site, and the granite is sourced from a quarry ten kilometres away.

As sustainability is a systematic parameter for materials, focus has been on choosing materials that are eco-labelled or cradle-to-cradle certified.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Circular business model

The building adopts a circular business model. This means that profits are reinvested into improving continuously the green solutions and implementing new green technologies that demonstrate state-of-the-art developments in the building industry. In this way, the hotel becomes a green laboratory that will constantly develop in the future.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Test lab for innovation

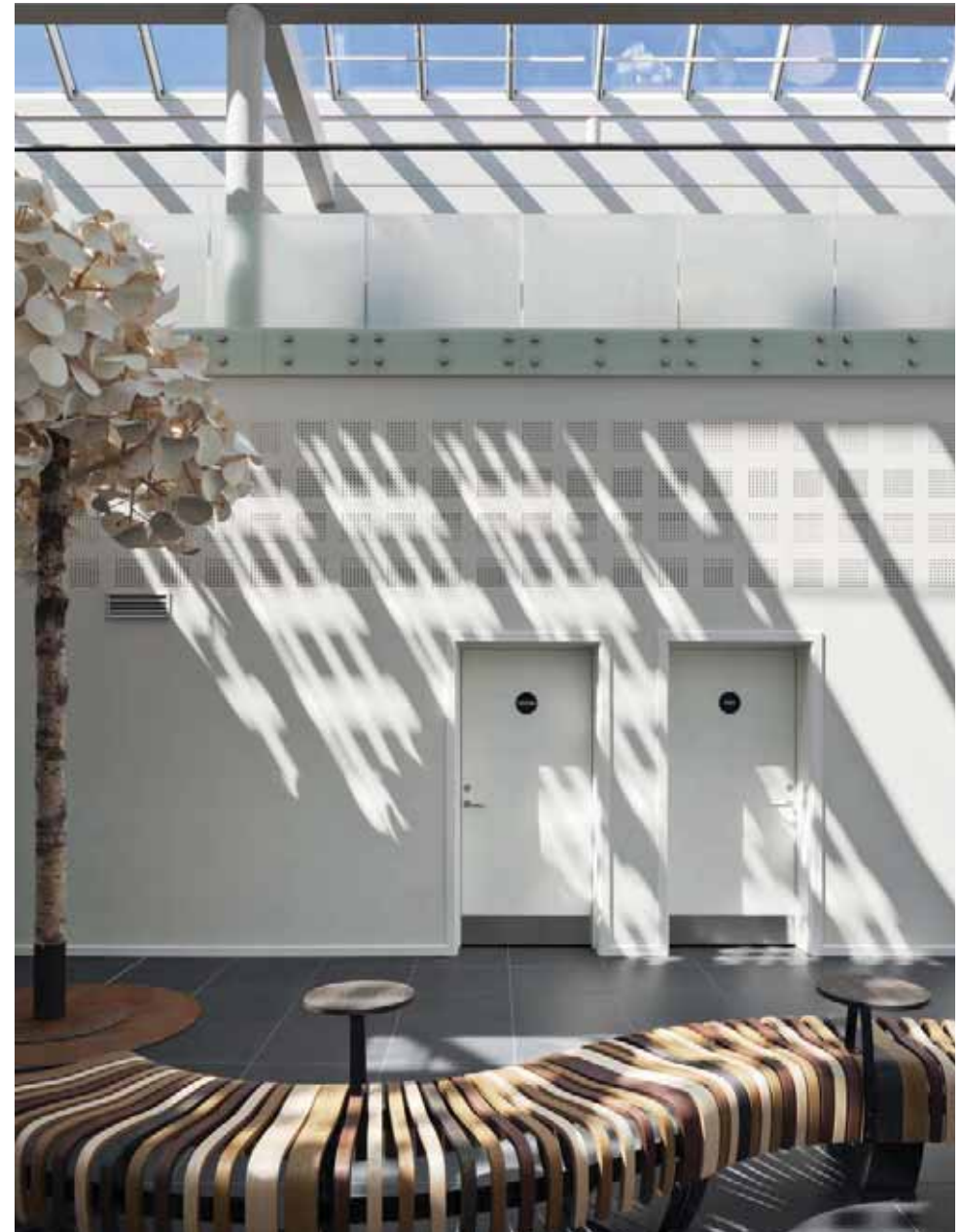
Being a 'test laboratory' for innovative sustainable solutions, Green Solution House is a cutting-edge project that demonstrates design solutions that can be reproduced and implemented in a different scale in other projects. The idea of testing and demonstrating sustainable technologies and designs is in itself a reproducible concept that can be adapted to the actual context.

Certified building project

Owing to its holistic approach to sustainable design solutions and outstanding building quality, Green Solution House has achieved various certifications and validations. Green Solution House will be the first hotel in Denmark to achieve a DGNB certification and has received an Active House validation.

Green Solution House also holds the Green Key, an international ecolabel awarded to hotels, hostels, conference centres and other leisure organisations meeting a number of environmental requirements. Additionally, cradle-to-cradle inspired systems form the basis for design solutions and many cradle-to-cradle certified products and materials are used in the building.

► Aesthetics and functionality combined in playful architecture [Laura Stamer].



'THE MOST ACCESSIBLE OFFICE BUILDING IN THE WORLD'

This is the motto of the new domicile of the Disabled Peoples Organisations of Denmark (DPOD). The building showcases that it is possible to build a 100 percent accessible – and not least highly sustainable – office building at a price that does not exceed the cost of an ordinary office building.

The new DPOD headquarters west of Copenhagen house 17 disability organisations with about 265 employees and six non-profit organisations. Around a fifth of the employees have a disability.

Built on the principles of 'universal design', the office building is the first of its kind both nationally and internationally that strives to offer 100 percent accessibility and inclusion of all regardless of disability. The house acts as a dynamo for the disability cause and demonstration project for future office buildings, showing how much more you can involve people with disabilities in work and society.

With its more than 12,000 m² the building exhibits a number of sustainable dimensions. Besides accessibility, the building integrates climate considerations and energy savings. The focus on adherence to future standards has enabled the house to meet the Danish requirements for low energy class 2015.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Collaboration models and innovative business models |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high level experience | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



The domicile of DPOD proves the value of thinking accessibility and sustainability right from the start, so that these features become a natural and integral part of the architecture and not something that needs to be introduced subsequently.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

A house for everyone

The domicile of DPOD deserves the title: 'The world's most accessible office building'. As a house for everyone, a focal point of the project was

▲The main entrance draws attention from the parking space where all arrive [Martin Schubert].

to remove all the barriers that many disabled people encounter in their daily life. This means that several individual solutions take into consideration various accessibility needs and in every detail throughout the house, accessibility is integrated. The house proves that accessibility does not mean a clumsy, un-aesthetical design; rather it powers ease, elegance and transparency - nothing short of a conventional office building.

The park adjacent to the house mirror the principles of accessibility and equality. The public 'sense-park' is designed to provide visitors with manifold impressions, recreational areas and spaces for different activities, such as meeting places, exercise and motion.

Atrium providing easy orientation

The house is built around a pentagonal atrium that connects four office wings with each another. The atrium's distinctive shape makes it easier to comprehend the layout of the big house, and helps blind and partially

BASIC PROJECT INFORMATION

Project

> Domicile for the Disabled Peoples Organisations of Denmark

Client

> Disabled Peoples Organisations of Denmark (DPOD)
www.handicaporganisationerneshus.dk

Principal design contact

> CUBO
www.cubo.dk

Location

> Høje-Taastrup, Denmark

Building type

> Offices, new construction

Project stage

> Completed in 2012

Gross area

> 12,500 m², 4 levels

Local neighbourhood

> Urban area

<< sighted people to orient themselves, as the distances between the individual wings are shortened by a common space.

Independent mobility

Visually impaired are also helped by a knob embedded in the handrail, which marks that you are located at one of the four office wings. The core of the four wings have different colours supporting the orientation for all. At the entrance to each wing, a characteristic colour-scheme and tactile written signs provide an overview of the organisations located in the wing.

Where there is a staircase, there is also a lift so that people with different needs can accompany each other all the way, and resume the conversation when each has reached the floor. The lifts open on both sides, so nobody needs to turn around in the elevator.

Reaching safety on one's own

The house has established three security zones around the elevators and stairs. In case of fire, one can stay in these fireproof zones for up to one hour. Fire-resistant walls and high air pressure in the zone ensure that smoke and fire do not enter the zone when the doors open to the corridor. The doors close automatically when the fire alarm is set off, but door operators make it possible to get into the



zone after the doors are closed. This allows wheelchair users to reach the safety zone without help from others.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Innovation at no extra cost

While the office building represents the inclusion of accessibility as both concept and ideology, it equally shows that it is possible to do so without making it more expensive than a

building without full accessibility.

Just as important, the building meets all the latest demands like a good working environment, high quality indoor climate, low energy consumption, good design, efficient facility management etc. The building is also designed to meet the highest Danish energy standard (energy class 2015 at the time). Energy savings are approximately 40 percent compared to other buildings that do not have the same high demands, but only adhere to minimum building regulations.

◀ A characteristic colour-scheme, directrices on the floor, lighting etc. help people find their way from the atrium to their destination [Martin Schubert].

Useful first-hand knowledge

One of the key elements in the politics of DPOD has always been to involve disabled people who have so to speak first-hand experience and knowledge in the field of accessibility. For this reason, the end-users formed a reference group that was involved throughout the design phases. Their input was used to design key features that responded to physical, sensory and all other social barriers.

At the start of the project, the design team was invited to a two-day workshop. Here they tried themselves what it was like to be blind or in a wheelchair.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Multiple intuitive features

Instead of searching for mediocre compromises and creating one solution for all, the project team consistently sought to meet different user needs in individual solutions, e.g. there are seven different toilet layouts.



What is more, all passageways in the house are well lit, especially at eye level, so that the hearing-impaired and deaf are better able to lip-read. The flexible reception desk has two heights and matches all needs at eye level - pedestrians and wheelchair users, guests and employees.

Lifts open by activating either a hand-operated button or a skirting board at foot-level. Similarly, there is talk and tele-coil inside indicating

▲ The 'sense-park' at the rear of the building adds value also to the local community [CUBO].

which floor you are on and allowing messages to be heard by all. The pronounced contrasts in the materials and colours used help the visually impaired, just as the handrails in the atrium act as a natural guideline with small metal studs acting as attention fields.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Symbiotic partnership

The involvement of end-users to reveal and qualify user needs has contributed considerably to the development of the preliminary design, building schedule and other competition parameters in the project.

During the process, the involved actors became more and more enthusiastic and engaged in the interdisciplinary, and not least symbiotic, partnership. Together, the reference group were not only able to ensure the required accessibility features, they were also able to describe to the builders their aspirations and generate many new and innovative ideas.

Value-based strategy

The new domicile of DPOD is a result of a value-based design strategy where universal design and accessibility for all rest on concepts such as dignity and equal solutions. The consistent focus on knowledge, attitude and values, rather than minimum rules and performance targets, have throughout the process served as a common beacon in both cooperation and problem-solving.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

A role model

As the new domicile of DPOD has been built as 'the world's most accessible office building', the building serves as a demonstration and inspiration project for other developers focusing on accessibility. In addition, it stands out as an example of optimal integration of accessibility solutions in a construction that can be reproduced in other contexts. On a broad scope, the project exhibits comparative advantages, and is a role model for the building sector in the future.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

The building stands as proof that it is possible to create an accessible office building where the needs of a wide range of impairments are not in conflict with each other. It also shows it is possible to build accessible office buildings, which meet the highest standards of design, reduction of energy consumption, respect the climate challenges and at the same time provide a very high standard when it comes to the work environment.

SINGLE-FAMILY HOUSE BUILT OF WASTE

Upcycle House is part of a large development project, the MiniCO₂ Houses. The project investigates and demonstrates new ways of reducing the carbon footprint of buildings – in this case by building a house of recycled materials.

In Nyborg, Denmark, the philanthropic foundation Realdania Byg has built six new single-family homes. Each house illustrates various means of reducing CO₂ emissions in the construction, operation and maintenance of a house. In five of them, of which Upcycle House is one, different ways of reducing CO₂ emissions were explored, while in the sixth the lessons learnt were combined to form a prototype of the single-family home of the future.

Upcycle House proves that it is possible to reduce a carbon footprint in construction to a minimum by using recycled and upcycled building materials processed into new materials. It all began with two used shipping containers.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Recycled elements, conventional look

From the very start of the project, it was important that the upcycled house did not look homemade

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE
✓ Pleasant and comfortable

O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE
✓ Extraordinary sustainable performance
✓ Involvement of high level experience
✓ Interdisciplinary teams

O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE
✓ Embedded carbon in product

O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS
✓ Sustainable and local resources

O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES
✓ Collaboration models and innovative business models

O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY
✓ Reproducible and adaptable

10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT



▲ Almost every detail in Upcycle House is recycled [Jesper Ray].

in the style of colourful slum settlements. Much effort was put into creating a universally appealing house in contemporary architecture in which any family could see themselves. With excellent results. The project team managed to design a house that does not radiate a recycled look – instead it looks and functions like a contemporary house built of conventional materials.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Using experts and LCA

Motivated by finding state-of-the-art sustainable recycling solutions, the Upcycle House project involved a large pool of knowledge partners and manufacturers of e.g. innovative insulation materials, eco-friendly paper-based composites and brick upcycling during the design and construction process.

The architects cooperated closely with the Danish Building Research Institute and DTU Management Engineering to conduct analyses of the carbon footprint and environmental impact of possible building materials, using the Life Cycle Analysis (LCA) method.

BASIC PROJECT INFORMATION

Project

> Upcycle House

Client

> Realdania Byg
www.realdaniabyg.dk

Principal design contact

> Lendager Architects
www.lendagerark.dk

Location

> Nyborg, Denmark

Building type

> Housing, new construction

Project stage

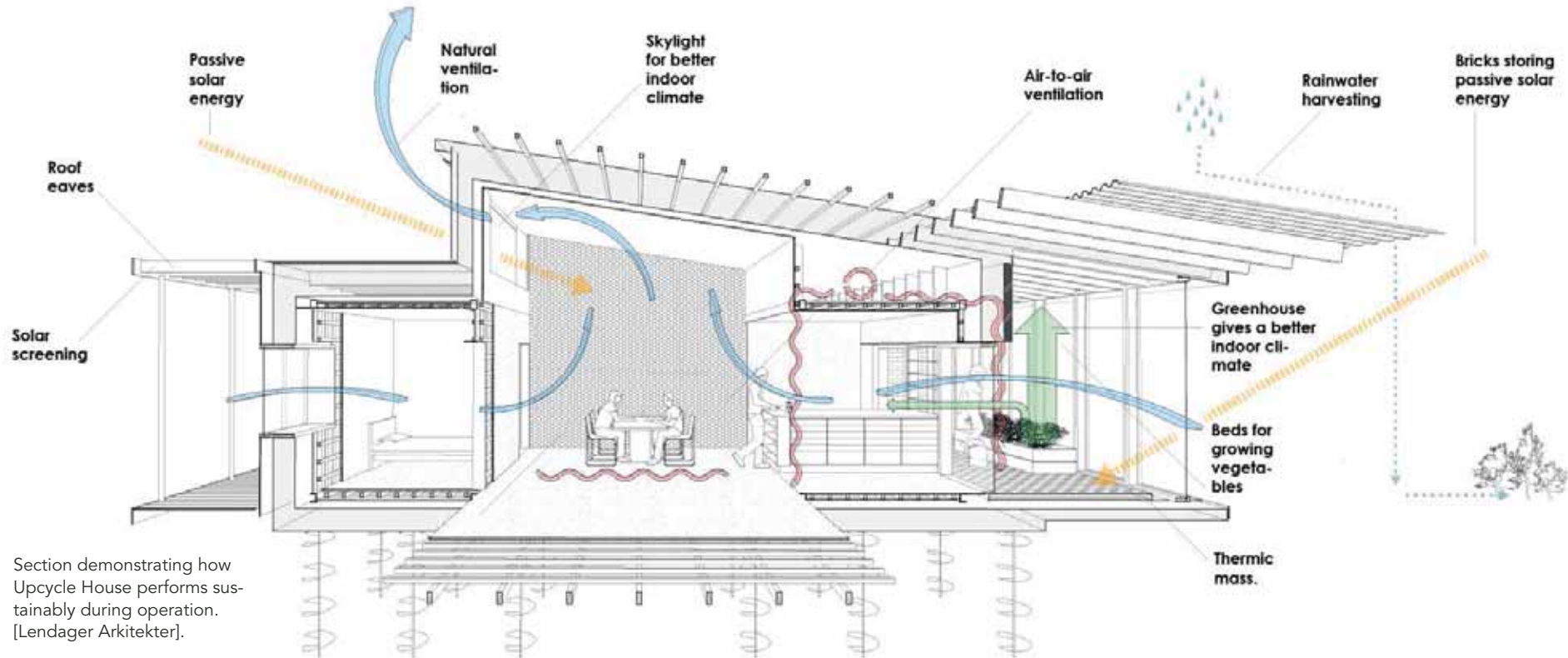
> Completed in 2013

Gross area

> 129 m², 1 level

Local neighbourhood

> Suburban area



Veto right

In the design process, an assessment of the carbon balance of the materials and their recycling qualities came before their aesthetic qualities. For this reason, the PhD student who made the LCA calculations could veto a material chosen by the architects, if the analysis showed that it was detrimental to the CO₂ balance.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Minimal carbon footprint

The goal of the experimental project was to build a home with a minimal carbon footprint by using recycled and upcycled building materials. Built of processed recycled materials, Upcycle House investigated how much it is actually possible to reduce

the carbon footprint by using upcycled materials to the extent possible. In the case of Upcycle House, CO₂ emissions have been reduced by 86 percent compared to a reference house.

An array of recycled materials

The list of recycled and upcycled materials is long: The loadbearing structure consists of two prefabrica-

ted shipping containers drawn apart and creating an almost square space in between, while the roof and façade cladding is made of recycled aluminium soda and beer cans. The terrace cladding consists of composite boards made of plastic and waste wood. Insulation facing the ground consists of torn styrene from large packaging from a local furniture dealer. Façade panels consist of



▲ Ventilation shutter and fixed windows [Polfoto].

► The exterior shows no sign of the shipping containers [Jesper Ray].



post-consumer recycled granulated paper compressed and heat-treated. The kitchen floor is clad in tiled champagne cork-leftovers, and the bath tiles are made from recycled glass, among other things.

Passive means

In addition to reducing emissions through eco-friendly materials, Upcycle House aimed at compliance

with current energy standards in Denmark by using passive means such as optimal orientation, temperature zones, daylight optimisation, shading and natural ventilation.

The compact building volume is in itself a feature, as it has a small surface and therefore uses less energy. Moreover, an integrated greenhouse creates a double façade, which con-

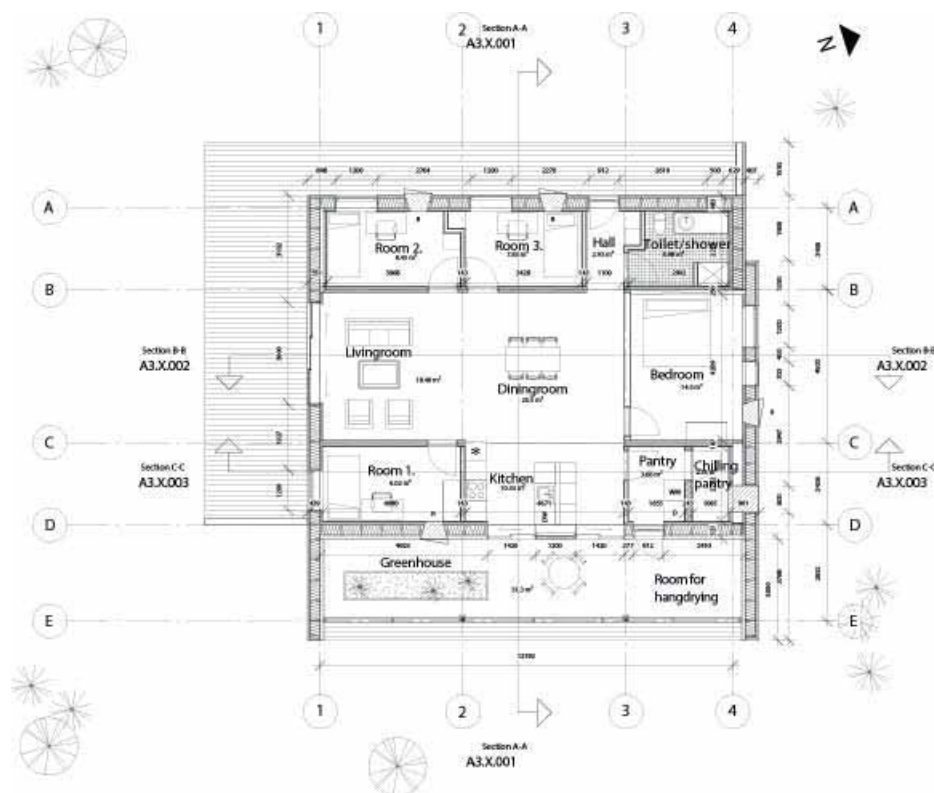
tributes to energy reduction, improved indoor climate and extension of the indoor space in the autumn and spring for recreation, vegetable growing and drying of clothes.

The house also features a translucent partition wall constructed in water-filled plastic bricks made of water bottles, curtained on both sides by white cotton fabric. Besides allowing

daylight deep into the living room, it doubles as a thermal mass, releasing heat when the temperature drops outside. In addition, the house gives revival to the traditional larder for storage of food in cool and dark conditions.



▲ Recycled and carbon-neutral wood surfaces dominate the interior [Jesper Ray].



07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Holistic selection criteria

The project team based their selection of materials on four factors: reduced embedded carbon compared with new and standard materials, overall cost, optimal operational performance with minimal maintenance, and not least accessibility of materials

in sufficient amounts at a relatively close location.

Think global, choose local

The use of old shipping containers serves as a clear example of this rationale. The idea of using containers came, because there is a mismatch in imports and exports between Asia and Europe. This means that thousands of containers fill up the local ports. Therefore, they can be

◀ The common room is the heart of the family home. [Lendager Arkitekter].

obtained at a relatively low price and get a new use and purpose in a project like this. Otherwise, most of the containers are shipped back to Asia empty with a large carbon footprint as the result.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Green knowhow

With more than 30 years of experience with eco-friendly buildings, the contractor in the project played an important role in selecting building materials working closely with the architect and the client. The contractor's solid experience meant that they could help sort out materials asserted to be CO₂ friendly, but which actually were not. Materials were also deselected, if they had to be shipped from the other side of the world and local materials were available.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Problem-driven project

As one of the six MiniCO₂ Houses, Upcycle House serves as a demon-

stration project put to life in order to obtain solutions for future sustainable buildings in all possible contexts. Together with four other types of sustainable houses, Upcycle House was used as a basis for developing the sixth house, a single-family MiniCO₂ standard house, combining all the lessons learnt.

Showing the way for others

The idea is to show, e.g. standard house companies, that it is possible to choose materials with a lower carbon footprint and longer life span while still making the house appealing and easy to live in, and without changing production or the economy significantly. In doing so, it may be possible to build houses with a lower climate impact in the future. This will definitely account for something, as thousands of houses are built every year.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

This house, made of waste, clearly showcases that it is possible reduce CO₂ emissions substantially by using recycled and upcycled building materials while at the same time creating an excellent architectural setting for a family's everyday life. Even the most optimistic emissions calculations have been surpassed by what has proved achievable within a given economic framework for a single family home.

ZERO ENERGY BUILDING AT HARBOUR FRONT

The new environmental centre in the harbour of northern Copenhagen is not just a place, which handles millions of cubic meters of contaminated soil. The building also produces enough energy to meet requirements to be a zero energy building.

Situated in a coastal development area north of Copenhagen in Denmark, the environmental centre, KMC Nordhavn, operates the depot for excavated soil from large construction projects in greater Copenhagen. Through its 10 m² solar panels and 140 m² of photovoltaic cells, combined with heat storage and thermo-active covering, the centre produces enough energy to be a zero energy building.

The KMC Nordhavn handles millions of cubic meters of excavated soil from construction and underground construction sites around Copenhagen, which is used for reclaiming land for the new city district Nordhavn (North Harbour). Before the soil becomes new city ground, the centre staff analyses and handles the contaminated soil, ensuring that the deposit of soil is done in an environmentally sound manner.

Just as important as a sound environment on the new peninsula is caring for the KMC Nordhavn staff working there.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|---|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable | <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ High quality solutions ✓ Flexible design, adaptable materials |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product | <p>O10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ KMC Nordhavn is situated on the edge of a fastgrowing artificial peninsula [Adam Mørk].

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

A peaceful oasis for staff

Placed in the windy coastal landscape of Nordhavn, the new environmental centre KMC Nordhavn, with its unique shape and characteristic rust colour, both blends in with nature and stands out as a clearly manmade object. On one side of the building lies a scenic landscape, on the other side are heaps of contaminated soil and heavy traffic. The office section represents a peaceful oasis with views to the countryside or across the nearby water through the carefully placed windows. Sound proofing, skylights and greening indoor add to a healthy indoor climate.

The façades of the KMC Nordhavn are clad in corroded corten steel plates. The building supports the area's natural diversity. On the roof grows tall grasses, small shrubs and small trees, planted to replace precisely the landscape that is now occupied by the building.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Award for outstanding architecture

Comprising aesthetics and sustain-

BASIC PROJECT INFORMATION

Project

> KMC Nordhavn

Client

> By & Havn
www.byoghavn.dk

Principal design contact

> Christensen & Co
www.christensenco.dk

Location

> Copenhagen, Denmark

Building type

> Mixed use, new construction

Project stage

> Completed in 2013

Gross area

> 1,763 m², 2 levels

Local neighbourhood

> Urban development area

Certification

> DGNB Bronze



ability, the zero-energy building was in 2013, the year it was completed, awarded for its outstanding architecture and energy performance by the Improvement Society of Copenhagen. The building is DGNB-certified to bronze. However, in the environmental part of the screening, the project scored 78,5 percent, very close to gold certification (highest) at 80 percent. Life cycle analysis (LCA) of construction materials performed as part of the design process contributes largely to this score.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

A sheltered outdoor environment

The location of KMC Nordhavn on the edge of new land is windy and exposed. The characteristics of the surrounding environment are sought integrated into the building design. To provide a sheltered environment for outdoor activities and recreation, there are two spacious roof terraces lowered into the grass-covered roof.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Skylights reduce energy consumption

Daylight was a key design parameter in the building project. All workplaces are located on the first floor.

The combination of large and highly placed façade windows and skylights, eliminating the need for artificial lighting at the workplaces during the day, greatly reduces the building's energy consumption.

The building envelope of the centre is highly insulated and airtight to insure low energy consumption for heating. Exposed materials with high thermal mass, such as concrete for the outer walls and floors made of floating mortar, dominate the interior, which is why the building has considerable heat capacity. This helps reduce the sudden temperature oscillations, thus saving energy and improving the indoor climate.

▲ The shape and colour of the building resemble sloping hills [Adam Mørk].

Solar collectors and geothermal system

The building is located on a site without district heating. Local energy efficient production of water-based heat provides space heating and domestic water. 10 m² solar collectors and a geothermal heat system supply the building. Surplus heat can be stored in a buffer-tank daily underground via the geothermal system for seasonal storage.



05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Adapted to the landscape

Situated at the tip of an artificial island in Oresund, with dust and heavy traffic on one side and the sea on the other, KMC Nordhavn blends in with its surroundings – though clearly a man-made object. Bearing this in mind, the architecture of the centre also evolves from the diverse functional demands to the building, giving high priority to a healthy and comfortable workplace. Once the area is developed, the building will also adapt well to an urban context.



06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Built to change

The robust building design ensures the centre a long life and low level of maintenance. The façade is made of corten steel which in addition to the beautiful red colour offers a robustness against the dust and dirt in the harsh environment surrounding the centre. The materials used for the centre's interior are mainly raw concrete used for the outer walls, wall plates and fittings made of plywood while floors are made of floating mortar. All of these materials are robust, durable and adapted to the actual



▲ Bright and green indoor environment [Adam Mørk].

use of the building and require minimal maintenance.

Once the landfill project is completed, the need for the KMC Nordhavn may disappear. For that reason, the building is constructed in a way that makes it easily adaptable to change its function. With only minor adjustments, the building can be transformed to serve other functions that are more public, such as cultural activities or a visitor's centre for the future Nordhavn.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

A strong concept

The KMC Nordhavn is DGNB-certified, and the first certified construction in the Nordhavn urban development area. Both the architectural and the energy concepts of the centre are scalable and reproducible, and hence exportable, to places with similar climate conditions and lack of energy supply systems.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

The building has high focus on sustainable and robust materials and a pleasant indoor environment which benefits employees in their everyday work. The combination of passive and active energy initiatives in the building design has resulted in extremely low energy requirements for the centre. The energy used is locally produced geothermal energy, energy produced by solar collectors and PV panels integrated in the ground and on the sloped surfaces of the green roof. KMC Nordhavn is also characterised by its robustness and flexibility, thus reflecting a holistic and energy efficient approach emphasising both social, economic and environmental sustainability.

SOCIAL HOUSING INTEGRATED IN THE LANDSCAPE

The Future Sustainable Social Housing project exhibits the way in which a future innovative building embraces and interacts with the surrounding scenic nature and its values, instead of confining them.

In a small countryside pocket, just on the border of one of Kolding's suburbs in Denmark, lies the site of the Future Sustainable Social Housing project. The project, being the winner of an architectural competition launched by the Danish Ministry of Housing, Urban and Rural Affairs in 2013, includes 35 wood-based houses produced on-site. These innovative single-family low-rise homes will be ready for use in 2017.

It is the architectural vision of the project to merge sustainable residences with the landscape. The site offers many qualities, such as a terraced terrain, meadow areas as well as a wood north of the site. The buildings will be placed so that they form a natural part of the landscape. They will follow the ground's natural terracing and movement, making only minor adjustments to the landscape. Furthermore, the design connects the area with the nearby town and natural areas by a network of public paths.

A focus point of the project is to optimise outdoor space to encourage

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable | <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building & design traditions ✓ Industrialised production |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Interdisciplinary teams | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ Flexible design, adaptable materials |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Embedded carbon in product | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |
| | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



Life between the houses plays an important role in the project design [DISSING+WEITLING architecture a/s].

BASIC PROJECT INFORMATION

Project

> Future Sustainable Social Housing

Client

> Lejerbo

www.lejerbo.dk

Principal design contact

> DISSING+WEITLING architecture

www.dw.dk

Location

> Kolding, Denmark

Building type

> Housing, new construction

Project stage

> To be completed in 2017

Gross area

> 3,600 m² housing, 2 levels

Local neighbourhood

> Suburban area

Certification

> Aiming at DK-DGNB Gold



3D visualisation of low-rise homes
[DISSING+WEITLING architecture a/s].

connectivity and communal life among the residents. This is why views and access to courtyards and the surrounding natural areas are prioritised. What is more, small private terraces on the side of the house – a bit away from the common courtyard – will allow the residents to switch between the private and public realm.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Social life

The idea of creating an open space that facilitates communal life and connectivity is fundamental to the project design. It is fostered through the construction of courtyards for each cluster of dwellings, in the shared spaces for activities and social events in the surroundings, and the way in which the entire housing area is integrated with the encompassing nature.

The notion is to prepare the ground for strengthened relations and well-



▲ Daylight and natural materials dominate the interior [DISSING+WEITLING architecture a/s].

being, which results from running everyday errands, random meetings with neighbours and recreational opportunities in the so-called 'common room' that merges into the meadow area.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Printed wood-based houses

A key aspect of the project has been to combine environmentally sustainable solutions with an architectural setting for living the good life. This means that the houses are produced without concrete. They will have steel foundations instead. At the same time, all constructions above ground, such as façades, walls and roofs will be wooden, using Nordic pinewood, which is a renewable resource. Secondly, the project entails the on-site production of building elements,



▲ A network of paths encourage people to sports and cycling as daily means of transport [DISSING+WEITLING architecture a/s].

where the elements are 'printed' in plywood and timber on site with a CNC tool. The CNC machine acts as a printer in which a metal drill replaces the ink cartridge and plywood replaces paper. Hence, the name of the method: to print a house. The 'print a house' method defines a new mind-set and a new way of building houses with production taking place onsite with minimal wastage.

Both solutions lower the embedded carbon in building materials and the economic cost of the project, while giving a high flexibility in designing the individual houses.

Joint forces

The close interdisciplinary collabora-

tion between the architects and the suppliers producing the wooden housing elements onsite is what makes the innovative project design feasible. This collaboration has influenced the overall design, and it has resulted in individual buildings.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

The perspective on nature

Putting people and nature in focus, the project design creates a completely new and visionary landscape experience. The fluid landscape perspective connects the groups of houses on the outskirts of the town with the protected natural areas. Paths through the area integrate the

natural area with the built environment and link up with the grassland area. By adding a new set of paths and activities to the natural site, the suburb gains a special place that unites people and environment – a place with respect for nature.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Low carbon footprint

Material choices are based on an ambition to keep the building's carbon footprint at a minimum. For this reason, all the main elements and fit-out components of the buildings, i.e. constructions, insulation and interior, are made of Finnish PEFC labelled plywood. PEFC is the world's

largest forest certification system and the labelling entails that the products come from certified sustainable forestry and are subject to controlled production. Moreover, concrete is not used for the foundations of the buildings. However, an exception is the bathrooms, which are prefabricated elements of lightweight concrete.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Human and natural

While the Future Sustainable Social Housing design may differ from other current Danish 'steel and glass' building designs, the architectural



Getting the best of all – being in
the midst of countryside and yet
close to the city.
[DISSING+WEITLING architecture a/s].

expression and design approach of the building remains very Nordic. The design of the houses celebrates Nordic design tradition and aesthetics in its human, social approach and the use of simple and robust materials to create bright, inviting and yet minimalistic residences with a good indoor climate. In addition, most materials are wood-based, which is typically Nordic.

On-site production and assembly

The 'print a house' approach is a model for an industrialised design and construction method, in particular in the case of the manufacture of building elements. Not only are the elements assembled on-site, the building elements are also produced on-site. CNC machines will manufacture on-site the buildings' walls, ceilings and part of the building envelope.

Because all the elements are made of wood, assembly is relatively easy. This means that a typical house can be built within three days, followed by insulation, façade cladding (thermos-impregnated pinewood), windows and doors.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Flexible modular system

A flexible modular design makes it easy to change the number of residence types, the layout of the individual houses and the adding of extra rooms, balconies, terraces, windows, doors etc. With only few modifications of the basic modules, it is possible to achieve great variation in the design expression as well as the accommodation quality. This flexible modular system not only lowers economic costs, but also it includes the residents in the development process, in that they are able influence the layout of their homes.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Life cycle assessment

The design team has put great emphasis on striving to use locally available materials and in this way base their choice of materials on Life Cycle Assessment (LCA) – a perspective that take into account environmental impact. Along these lines, the choice to use pinewood and plywood as the main building elements is one of the key sustainability measures of the project, as these types of wood are local and renewable resources.

Generally, the material choices are based on the LCA approach. Robust and low-emitting materials in the interior ensure a good indoor climate and minimal maintenance. Also the exterior is dominated by robust materials, and the foundations are a so-called screw foundation. Steel poles screwed into the ground are a very gentle and reversible foundation method as the poles can easily be removed once the houses are demolished or moved to another location.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Modular design and construction

The modular design approach of the Future Sustainable Social Housing project stands out as an innovative feature that can easily be adapted in other design solutions, also beyond the housing sector. In particular, the modularity of the building process is scalable and reproducible.

Also the human and social design approach stands out as an example for future social housing – as intended in the competition.

Eligible for certification

On top of this, the project has the potential to achieve the DGNB GOLD certification - the highest possible DGNB certification. At this stage,

the project is screened to achieve a score of 80.6 percent, corresponding to GOLD. The final certification relies on further processing of the project. However, it is estimated that the project at the very least is eligible for a SILVER certification on the current basis.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

This projects aims at improving quality of life as well as environmental performance through a number of sustainability measures. The strong focus on social sustainability creates a housing area that integrates buildings in the surrounding landscape while retaining the link with the town city. Publically available paths through the area connect the housing area and landscape to the town. And the fact that there are common courtyards and green areas to interact and meet with each other paves the way for strong social bonding among the residents.

Environmental and economic sustainability is addressed primarily through the 'print a house' initiative, which significantly reduces the economic costs of the project, while contributing to environmental benefits, because of the very low embedded carbon in pinewood compared to traditional building materials.



A KINDERGARTEN FOR ALL AGES

Blending naturally into the sloping terrain and nestling in an old grove with apple trees, the new Fallpakka Kindergarten in Finland will provide inviting and green facilities for day-care activities as well as local community events.

Situated between old farms and an expanding housing area, the eastern part of Helsinki adds a new kindergarten to its stock in 2016. A kindergarten with a highly social and eco-friendly profile that will house around 125 children in total.

As Fallpakka Kindergarten is the only public building in the area, it will provide more functions for the local community than just day-care facilities for children. During the day the building will be used as a kindergarten, and in the evenings and on weekends the premises will be transformed into meeting facilities for the local community.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

More than a kindergarten

Although the design of Fallpakka Kindergarten is compact, it has room for many kinds of activities due to the multi-functional use of floor plans. Passage areas and common spaces are designed also to function as dining areas, play spaces and working

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|---|
| <p>01 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Accessibility | <p>06 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ High quality solutions ✓ Flexible design, adaptable materials |
| <p>03 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |
| <p>04 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase | |
| <p>05 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions | |



▲ The deep window bays are white and sloped to improve daylight and view to the outside [A-Konsultit Architects].

areas for small groups. The hall will be used as an exercise space for children, for the kindergarten's various activities and for local community meetings and events. Moreover, the adjoining park and playground will be open to the public outside day opening hours.

Respecting the surroundings

A key element in the design strategy is to adapt the building to the cultural and natural environment of the location. The building is designed to fit naturally into the sloping terrain. The ten meter height difference on the site is used to push the building

towards the slope and enables a connecting two-storey hall in the middle of the building. The building's wooden façades complement the neighbouring farm buildings while at the same time demonstrating a modern interpretation of traditional Finnish wooden houses.

Family-friendly routes

The kindergarten is within walking distance of the nearby housing area making it easy for families to reach the facility. As part of the design, an additional pedestrian path and bicycle access are planned in order to create more and safe routes.

Furthermore, the building is easily accessible by public transportation. Being placed on a sloping site, the building will also offer two entrances at both levels – high and low ground. Inside the building, lifts and restroom facilities will consider accessibility for disabled people.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Outdoor areas - for all

Green recreational areas are an integrated part of the project. Especially the kindergarten's green playground and the nearby park are important

BASIC PROJECT INFORMATION

Project

> Fallpakka Kindergarten

Client

> City of Helsinki, Real Estate Department

Principal design contact

> A-Konsultit Architects
www.a-konsultit.fi

Location

> Helsinki, Finland

Building type

> Institution, new construction

Project stage

> To be completed in 2016

Gross area

> 1,100 m², 2 levels

Local neighbourhood

> Suburban area



The two-storey hall is the multifunctional heart of the building. In the evenings and weekends it is open for the community use.

Wooden facades and structures bind the building to the old finnish building tradition.

Insulation in the walls, roof and windows is extremely efficient. The building has also an advanced mechanical ventilation system with heat recovery.

The shelters and special glass windows prevent the overheating during summertime. There is no need for refrigeration.

design parameters to promote outdoor activities. A sheltered playground area will be situated on the upper level of the site and connected to the street level via an accessible

The whole design exploiting bim, according theifc standard

All the home spaces for the groups have their own unique color themes.

Dining as a part of the passage area. Dining in shifts, one group at a time.

Office spaces are compact but bright.

Passage areas are spacious enough to be multifunctional.

[A-Konsultit Architects]

In fact, the local community has been involved in the design process from the very beginning to ensure a multi-functional facility.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Supreme energy performance

Fallpakka Kindergarten is designed in line with the low-energy construction guidelines of the City of Helsinki. Once it is built, the facility will hold the highest-ranking Finnish energy class A. The compact shape of the building is in itself a key feature that reduces energy consumption. In this way, the compact layout utilises every square metre effectively and optimises the spaces according to the needs.

Multiple energy solutions

The primary reason for the fine energy classification is the design approach that has aimed to find the best passive measures and energy solutions right from the start. The results are multiple and besides the compact and effective building layout, the design has ensured a highly insulated building envelope, optimal utilisation of daylight and not least sheltering to prevent overheating during the summer period. The building will also be equipped with an advanced mechanical ventilation system with heat recovery.

nature trips. The fact that the building and its outdoor areas will be open to the public makes the building an important social contribution to the local community in several respects.



▲ The natural sloping terrain challenges the children's creativity and muscular activity [A-Konsultit Architects].

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Finnish building traditions

The project is a good example of respect for the traditional use of Finnish wood in architecture. It combines modern design with a highly Nordic expression. The use of pine and spruce as the dominant materials ties the building to the Finnish wood-building tradition and the neighbouring farm buildings. In addition, the design team has put great

effort into ensuring a contemporary architectural form.

In harmony with nature

Not only does the new building respect local aesthetics, it also respects the surrounding nature. Located in an old garden with an apple orchard, an old, preserved grove and the remains of a historical stonewall, the building integrates the surrounding green areas and cultural heritage. These features maintain and demonstrate aspects of traditional Finnish lifestyle in a modern urban area.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Fitted to an entire community

Flexibility has been an important design parameter in the sense that the building spaces are multi-functional. This is clearly seen in the dining areas, play spaces and working areas. The rooms can be used for many different purposes in the kindergarten context, while the local community can use them for hobby and leisure purposes outside opening hours.

Applying local insight

The project demonstrates great know-how on building sustainably with local materials such as wood, and this can inspire other building owners in the area. In particular, the choice to include large eaves in order to protect the building's façade against ageing and the Finnish climate reflects a design tradition that considers local conditions.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

Fallpakka Kindergarten stands out as a project that successfully integrates social, economic and environmental sustainability aspects in its design concept. Being a public building, the kindergarten is designed within a tight budget. Taking into account both economic and environmental considerations, the project aims to create an energy efficient building that will also result in low maintenance costs and low operational costs.

Notably, the project integrates social sustainability exceptionally well through many different design features. The fact that the building is so much more than simply a kindergarten, offering versatile functionalities and multiple options for the local community, says it all.

FINLAND'S TALLEST WOODEN HOUSES

Puukuokka, meaning wooden mattock, are the highest wooden houses ever built in Finland. They are also an energy-efficient, inviting and affordable option for house-hunting Finns.

In the Finnish city of Jyväskylä stand three wooden houses. However, these are by no means traditional forest cabins or simple shacks. Quite the opposite. The buildings are an energy-efficient, modern trio of multi-storey timber-framed blocks of flats. Known as Puukuokka, wooden mattock, the buildings comprise three blocks of six to eight storeys, housing 150 flats.

Located in the Kuokkala suburban district of Jyväskylä in the middle part of Finland, Puukuokka was designed by the OOEPA Office for Peripheral Architecture. The project intends to provide affordable, eco-efficient and easily adaptable housing that also enhances the townscape visually.

The focal points of the building design include utilising renewable building materials as well as energy sources. On top of this, Puukuokka offers a low-cost, low-risk funding alternative for buyers, which makes the dwellings available to more people and supports a diverse local community.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Extraordinary sustainable performance | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ High quality solutions |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Embedded carbon in product | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Collaboration models and innovative business models |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions ✓ Industrialised production | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| | <p>O10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ The yard façade is made from untreated larch that will gradually turn silver [Mikko Auerniitty].

High quality materials

The prefabricated constructions in Puukuokka are modular cubical elements made of massive wood. This ensured a uniform high standard of quality and minimised delays and other weather-related problems during the construction process. The modular cubical elements made of cross-laminated timber (CLT) are dry, adaptable, lightweight and ready to install. The CLT frame serves as both a load-bearing and stiffening element, and provides also a vapour barrier and partial heat insulation.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Related, yet independent buildings

The Puukuokka blocks range in height from six to eight storeys and house 150 flats. Each building incorporates a single kink in plan creating a spacious triangular entrance hall. When grouped, the blocks provide an oscillating series of façades, appearing as a group of related, but independent buildings.

The layout of the flats provides efficient homes, and the presence of wood in the interior surfaces adds an element of warmth and quality to the living spaces. A sense of openness and wealth of light is present also in the shared hallways providing an open, light, and welcoming entrance

BASIC PROJECT INFORMATION

Project

> Puukuokka Housing Block

Client

> Lakea Oy
www.lakea.fi

Principal design contact

> OOEAAA Office for Peripheral Architecture
www.oopeaa.com

Location

> Jyväskylä, Finland

Building type

> Housing, new construction

Project stage

> First building completed in 2014. Next stage to be completed in 2016

Gross area

> 15,450 m² plus 3,200 m² carpark in basement. 3 buildings, 6, 7 and 8 levels

Local neighbourhood

> Suburban area

and meeting place for the occupants. The hallways are spacious and offer a rhythmically arranged series of views opening out to the surrounding landscape of forest and hills.

A unique architectonic atmosphere

On the courtyard side facing a small

<<



grove of spruces, the façade is clad with larch which left untreated will weather to a silvery grey. Protruding balconies make the façade lively, and large windows provide daylight into the flats and winter gardens. With moveable glass panels, they offer a semi-tempered space, which can be opened in summertime.

The use of wood promotes not only good thermic performance, but also soft and cosy acoustics that are sensed even on the staircase and the intimate atmosphere of the dwellings.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Cutting down construction time
As mentioned, Puukuokka is con-

▲▲▲The hallway and stairway is a pleasant shared space for the residents [Mikko Auerniitty].

structed with prefabricated cross laminated timber modules (CLT). This makes it possible to achieve a high quality result with good fitting and dimensional stability. Being a dry construction, it cuts the construction time on site down by 50-70 percent compared to a similar concrete construction, a valuable advantage considering the Finnish climate.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

High fire-resistance – low carbon footprint

Fire regulations had previously prohibited wooden buildings of this height from being constructed. However, a change in Finland's building

code in 2010 – largely prompted by the high fire-resistance of CLT – has now made it possible to build an eight-storey block with a wooden frame, as long as this load-bearing structure is coated, and an automatic sprinkler system fitted.

This means that compared to similar buildings the carbon footprint of the materials in such a building – primarily wood – is very low.

Furthermore, the modular system enjoys the environmental benefits of cross-laminated timber that include low levels of embodied carbon and a reduction in site waste.

When harvested responsibly, wood is the only carbon-neutral building material that can reduce greenhouse gas emissions and actually sequester carbon for the life of the building.

▲The winter garden adds semi-outdoor space and passive heating to the flat [Mikko Auerniitty].

Wood is the structural material that aligns with the innovation required to address the environmental challenges we are facing today.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Visionary architecture

Puukuokka serves as a prime example of how to create an original and individualistic housing design using new production and manufacturing techniques. Winner of the Finlandia Prize for Architecture in 2015, it represents high quality visionary architecture.

As an example of its user-friendliness, the piping for heat, water and electricity for Puukuokka's apartment units is installed in the shared hallway spaces where it is integrated in the wall structure. In that way, it is easily accessible for maintenance and repair.

Prefab all around

Puukuokka's prefabricated modules are fully prepared and finished under controlled indoor conditions. They are then brought to the construction site ready to be plugged in much like building a structure out of LEGO pieces. Even the façade is made using prefabricated and finished elements that are installed on site in phases corresponding to the progress of the installation of the modular elements. In fact, the central hallway is the only part of the building that is constructed on site.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Wood, but not too much wood

The Puukuokka buildings are characterised by an overall fine quality of the wooden surfaces and by carefully thought-out, yet straightforward detailing.

The flooring of the hallway areas is made of bridge-like CLT elements. Indoors, the wooden CLT structure

has been left exposed in the ceilings and in the floors and staircases of the hallways. However, the walls are covered by gypsum board, on the one hand to avoid an appearance of too much wood in the interior and on the other to ensure that legal regulations on fire safety are met. The flats have parquet flooring.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

The many advantages of CLT

The modular cubical CLT elements of Puukuokka are dry, adaptable, lightweight and ready-to-install. The CLT frame serves as both a loadbearing and stiffening element while also serving as a vapour barrier and partial heat insulation. There are fewer joints, and fewer materials are needed compared to conventional timber buildings. All prefabricated CLT modules are made of locally harvested and certified spruce. Furthermore, CLT is easy to reuse or recycle in the future.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Affordable housing

The Puukuokka project not only visually enhances the townscape. It also offers Jyväskylä citizens affordable, eco-efficient housing that is easily adaptable to changing needs over time.

This is due to the piloting of a low-cost, low-risk financing model for homebuyers. Before moving in, the future owner pays a modest down payment (7 percent of the total value of the home). The remaining amount is covered by a state-guaranteed bank loan. The occupant then pays off the loan in the form of rent over a 20-year period, after which the flat becomes his or her own. The sales price is negotiated and agreed upon when the lease is signed.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Clear export potential

Puukuokka demonstrates how productive collaboration among architects, engineers and manufacturers can result in new concepts applicable in many other contexts. Parts of the final design solution offered are spe-

cific to the case of Puukuokka. Other parts or conceptual ideas may implemented or replicated elsewhere.

Less energy consumption and speed of construction, good acoustics and thermal performance, earthquake safety and comfort are among the qualities that can be added to the traditional environmentally sound characteristics of wooden building materials.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

The project stands on all three pillars of sustainability, but most notable is the primary building material, wood. Today very few high-rise buildings are made of wood – often due to national building codes, where a maximum of four storeys is often the limit due to fire regulations. Building high rises in wood is a very sustainable and needed solution in order to produce the necessary number of new sustainable buildings in the cities. The project also demonstrates how the characteristics of wood can result in healthy and attractive buildings designed for people.

The second most notable feature of this project is the low-cost, low-risk financing model for homebuyers. That is truly an example to follow.

MAXIMUM ENERGY EFFICIENCY

The new Skanska House is part of Skanska's Green Initiative. The initiative entails strong commitment to greener solutions in buildings and in building projects. Achieving several certifications, the Skanska House demonstrates high sustainability standards.

Skanska House is Skanska Finland's headquarters in Helsinki. It was designed to achieve LEED (Leadership in Energy and Environmental Design) Core & Shell Platinum certification, which is the highest level attainable.

The building will also be certified according to the EU GreenBuilding Programme, a voluntary initiative that requires buildings to use at least 25 percent less energy than the national standards demand in order to be certified. This framework has proved useful in the design and execution of a project that fulfils Skanska's own Green Initiative principles.

This means that Skanska House has taken into account sustainable development, a healthy working environment, green energy use and environmentally responsible materials. As a result, the new building uses around a third less energy than the Finnish energy code requires. It is also equipped with the necessary infrastructure to accommodate a photovoltaic solar system in the future. The building uses about half the amount

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

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|---|---|
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ Flexible design, adaptable materials |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product ✓ Material emissions | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Industrialised production | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |



◀ The sculptural staircase in the atrium invites staff to walk rather than using the lift [Kuvatoimisto Kuvio].

of water of a typical Finnish office building, and is equipped with a rain-water harvesting system.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Efficiency measures

Energy consumption is by far the largest operational building cost in an IT-heavy office building like Skanska House. Through careful analysis and calculations on energy efficient measures, the project has managed to reduce energy consumption in the operation phase as well as its carbon footprint - without compromising functionality or the working environment. Consequently, Skanska House uses around a third less energy than required by the Finnish building code.

Financial savings

The energy efficient solutions not only contribute to environmental sustainability, they also lead to major financial savings for the building's tenants. The additional investment for the demand-based energy efficient ventilation system will be repaid in

BASIC PROJECT INFORMATION

Project

> Skanska House

Client

> Skanska AB
www.skanska.com

Principal design contact

> L Architects
www.l-ark.fi

Location

> Helsinki, Finland

Building type

> Offices, new construction

Project stage

> Completed in 2012

Gross area

> 9,100 m²

Local neighbourhood

> Urban area

Certification

> LEED Platinum



◀ Skanska House is situated in the Manskun Rasti quarter of Helsinki, 3 km northwest of the city centre [Skanska].

the materials and the long-term building residents.

Solar system and hydroelectricity

Having installed solar panel mounting framework, Skanska is ready to facilitate the future installation of a photovoltaic solar system. The building's roof can accommodate up to 1,000 m² of panels. Skanska has also signed a renewable energy contract to supply the building with 100 percent hydroelectricity, which is in accordance with Renewable Energy Certificate System (RECS).

12 to 24 months, depending on occupancy rates. The airtight building envelope yields around US\$ 6,000 per year in energy savings, with minimal investment costs. The occupancy and daylight sensors have a payback period of about 10 years, and the LED garage lighting a payback of about 20 years.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Carbon footprint

The building includes several passive energy efficiency features. These

include a well-insulated, very airtight and compact building design as well as optimal window placements and sunshades to avoid excessive solar heat gain and the need for additional cooling. The building is also equipped with efficient water fixtures and a rainwater harvesting system that collects water for toilet flushing.

During the design phase, a pioneering 4D BIM model (Building Information Modelling) was used to calculate the building's embodied carbon emissions from various construction materials. The model established a

carbon footprint benchmark that will be used to promote carbon savings on future projects.

Low-VOC materials

The project has put focus on avoiding harmful pollutants in building materials. Low Volatile Organic Compound (VOC) substances and materials with recycled content have been used in the building, e.g. sealants, adhesives, paints, coatings and flooring. VOCs can affect human health or have adverse effects on the environment. Low VOC materials on the other hand benefit both the individuals installing

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Precast elements and 4D modelling

The use of precast and prefabricated elements in the building adds to the sustainability approach by promoting resource efficiency and work safety. In this connection, the BIM model was used to simulate and visualise construction processes and to verify the quantity of precast elements in production.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Flexible office design

Skanska House is designed to be functional and flexible to meet the requirements of present and future tenants in order to promote a long, useful lifespan. Open plan office floors allow tenants to customise their office spaces easily to suit their requirements.

Skanska has compiled tenant design and construction guidelines, which aim to facilitate building redevelopment and upgrade work that future tenants might undertake.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Local workforce and materials

As part of the project's sustainability strategy, Skanska has as much as possible used workers and materials from the region during construction. About 75 percent of the workforce was based in the Helsinki area. A significant proportion of the construction materials was sourced from within 800 km of the site. Regional construction materials included the insulation and gypsum boards. The hollow concrete slabs were sourced from the Helsinki area. In addition, as



high as 99 percent of the construction waste was diverted from landfill through efficient waste management at a local waste sorting facility.

Recycling during building lifecycle

Recycling constitutes another green feature in the project. Recycled material content accounted for 11 percent of the total construction materials used. Materials with recycled content included steel bars, gypsum boards and insulation. The waste insulation accumulated on site was collected by the insulation supplier, who recycled

the material back into their production process as part of a pilot project. The project's ready mixed concrete also contained pulverised fly ash, which is a by-product from coal-fired power stations. By introducing fly ash, embodied carbon was reduced by up to 30 percent compared with conventional concrete mixtures.

Comprehensive waste sorting facilities throughout the building promote waste sorting and recycling from offices, the restaurant, the IT department and operation facilities.

◀ The building envelope makes a large contribution to energy performance and comfort [Kuvatoimisto Kuvio].



09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Scalable and reproducible office design

The office design demonstrated at least three aspects with scalability potential in many contexts: 1) The use of BIM modelling in the design and construction taking carbon footprint design, construction scheduling, safety and site logistics to higher standards. 2) The broad effort to minimise energy and resource consumption during operation. 3) The functional and flexible design and layout that supports a prolonged lifespan of the building without need for extensive retrofitting programmes.

Internationally recognised certifications

Having achieved the highest, platinum-level LEED (Leadership in Energy and Environmental design) Core & Shell certification and being certified according to the EU Green Building Programme, the project emphasises its commitment to a sustainable built environment as well as to green and energy-efficient initiatives.

MULTI-PURPOSE QUARTER FACILITY

Not only is Korttelitalo Kanava a combined kindergarten and primary school, it is also designed to house hobby, leisure and cultural activities for the local community after school hours.

The Finnish word 'Korttelitalo' means 'Quarter House' – it is a combined kindergarten, school and community hall. From the beginning, the goal was to create a compact building, which at the same time could meet the widespread user requirements of kindergarten children and schoolchildren as well as the local community.

In August 2012, the new facility in Helsinki welcomed three kindergarten groups, 63 children in total, and a primary school with 150 children and two special education groups. In the evenings and on weekends, the building is open to local residents for meetings, courses and hobbies like carpentry, cooking, art, etc.

At one and the same time, the new building is designed to be inviting, robust, cost-efficient and energy-efficient. With good results. The building meets the low-energy construction guidelines and targets defined by Helsinki City in 2010.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety | <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance | <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase |
| | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ The corten steel facade and sun shading [Arkkitehtitoimisto Lehto Peltonen Valkama Oy].

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

All-inclusive facility

The facility combines kindergarten and school activities during the day while the ground level transforms into an activity centre for the local community outside the institution's opening hours. The common facilities range from an assembly hall/dining room and adjacent kitchen, a stage, a technical handicrafts area, a gym to classrooms for evening classes and similar gatherings.

School classrooms, a library, and student service facilities are located on the upper floor and placed round the high central assembly hall. The playground area offers primarily urban play facilities for e.g. skateboarding and street basket as an alternative to the neighbouring natural playgrounds.

Guided by the light

The building layout aims to optimise the daylight level according to the room's function. Spaces that benefit from natural light, like learning

facilities and children's play areas, are mainly located on the building's south side. The corten steel façade is transformed into a horizontal grille on the entire south façade to protect the children from direct sun. Spaces that require little or no natural light are on the other hand placed on the north side. The two-storey high, lit-up dining and assembly hall is located in the middle of the building.

Good acoustics

Much thought has gone into a layout design that provides space for several

BASIC PROJECT INFORMATION

Project

> Korttelitalo Kanava School and Kindergarten

Client

> Helsinki municipality
www.hel.fi

Principal design contact

> LPV Architects
www.lpv.fi

Location

> Helsinki, Finland

Building type

> Institution, new construction

Project stage

> Completed in 2012

Gross area

> 3,115 m², 2 levels

Local neighbourhood

> Suburban area

activities taking place at the same time without interfering each other. For instance, the assembly hall is acoustically separated from the classrooms and playrooms despite its central position. Similarly, the gym is easy accessible, but acoustically separated from the rest of the building. The dining room and the stage are acoustically isolated from the kindergarten and school premises,

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▲ The assembly hall for gatherings and events [Arkkitehtitoimisto Lehto Peltonen Valkama Oy].

so parallel activities do not disturb each other. Added to this, many of the walls have a 25 mm thick injected acoustic membrane, which is an innovative feature in a large building like this.

Healthy indoor climate

The indoor climate in both classrooms and office spaces is automatically adjusted to a set-point temperature and maximum concentration

of carbon dioxide. The temperature and carbon dioxide concentration set-points can be set individually for each room. Luminaires are energy efficient lamps, and lighting is controlled by light switches in almost all areas. In addition, there are presence detectors and brightness sensors that regulate lighting according to the natural light from the outside.



▲ The multi-purpose gym [Arkkitehtitoimisto Lehto Peltonen Valkama Oy].

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Functions for children and adult alike

The building design was originally planned as a bigger school, but studies showed that there was no need

for a big school in the area. On this basis, the result was a compact, yet nevertheless a connected and flexible building that contains all three functional purposes in one facility: kindergarten, school and community hall. This 'three-in-one' solution ensures that the community can maintain these vital functions within its own territory.

With a design solution where the school and kindergarten operate in the same areas and the young children play alongside the school-children, the small ones are already accustomed to the school world next door, which makes the transition process later on much easier.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Shared urban space

Korttelitalo Kanava is a shared property for all. In addition to the local residents being able to use the facilities for evening activities, they also have access to the courtyard outside school hours in order to stimulate physical activities. As the local neighbourhood is characterised by several natural playgrounds and green outdoor areas, the school's outdoor space seeks to offer the urban perspective to outdoor activity, providing possibilities for e.g. skateboarding and street basketball.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Low-energy construction

The space-efficient form reduces the building envelope area to a minimum and thus reduces the loss of heat to the outside. The fact that the building has a very compact, almost square, layout does not challenge its primary



▲ The playground is open to everyone
[Arkkitehtitoimisto Lehto Peltonen Valkama Oy].

purpose. It still meets all functional requirements.

Moreover, the building has a relatively large thermal mass in the concrete walls and slabs that reduces the indoor temperature variations. The exterior walls are mainly of steel frame (thermo-frame) with an insulation thickness of 200 mm and with a low U-value. The building's heat transfer coefficient is only 55 percent of the Finnish reference value. The require-

ment for a low-energy building is 85 percent of the reference value, which means that Korttelitalo Kanava is significantly better designed and insulated than a standard low-energy building.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

By offering various functions under one roof for both children, young people and adults, the Korttelitalo

Kanava building in Helsinki stands out as a project that integrates social sustainability to a high degree. In particular, the aspect of combining kindergarten and primary school has clear advantages. Integrating these two functions allows the young children to play side by side with schoolchildren and in this way, they grow accustomed to the school world right next door, which makes the later transition much easier.

SUSTAINABLE URBAN-RURAL LIVING

A colourful and ecological district is rising in the outskirts of the City of Helsinki. Housing blocks, streets, plazas and parks will shape the new pedestrian-friendly area named Kuninkaantammi. Wrapped in green surroundings, the Siena and Umbra housing blocks will rise between city-scape and nature in this unique and sustainable urban environment.

In the north-western corner of Helsinki bordering the Vantaanjoki river and the Central Park, Kuninkaantammi – The Royal Oak – is a new quarter being converted from an industrial area into a residential district with more than 5,000 inhabitants.

Kuninkaantammi will be a dense, central urban cluster with low-rise homes and blocks of flats in line with the ecological, experimental and social requirements of modern housing. A coiling network of car-free streets will lead from the main streets to a maze of alleys, plazas and park areas. Furthermore, the best natural environments in Helsinki for all kinds of outdoor recreation are within arm's reach.

Kuninkaantammi will also be a pilot project for storm water management in Helsinki, incorporating conspicuous new technical designs on streets, in parks and on housing plots.

As part of the Kuninkaantammi area, are the Siena and Umbra projects comprising 138 flats located in 4 level residential blocks and 12 terraced-

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|---|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high-level experience | <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Embedded carbon in product |
| | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Adapted to local condition |



BASIC PROJECT INFORMATION

Project

> Siena and Umbra housing blocks

Client

> Skanska Oy
www.skanska.fi
 > ICECAPITAL REAM Oy
www.icecapital.fi

Principal design contact

> Ark7 Architects
www.ark7.fi

Location

> Helsinki, Finland

Building type

> Housing, new construction

Project stage

> To be completed in 2016

Gross area

> 9,160 m², 2 – 5 floors and cellar

Local neighbourhood

> Suburban development area

houses of 2-3 levels. In addition, two small business premises are included in the project. The Siena and Umbra buildings exemplify the overall concept of Kuninkaantammi, which will

be pursued in all building projects in the area. In combination with the urban planning concept of the area, they represent a holistic approach to urban development and housing.

▲ Softly earth-coloured Siena and Umbra have French balconies or ordinary windows with a cushion edge providing views to the streets but leaving the noise out [Tietoa Finland].

<< 01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Privacy and shared facilities

The Siena and Umbra blocks consist of three blocks of flats and two entities of attached houses or so-called town villas. This setting allows all types of inhabitants from singles to families and senior citizens, thus creating a diverse community and encouraging people to meet with each other in an urban place. Added to this, a mix of rental and owned-occupied housing ensures people with different income levels.

The complex will form a closed city quarter with a sheltered courtyard. Parking lots will mostly be located underground, under the houses and courtyard decks, keeping the area relatively car-free.

Playground and seating areas are placed around the courtyard pond and open water flows. A leisure room, sauna, laundry and drying facilities are available in the annex adjacent to the business premises. Also, bicycle storage is available in the basement, while bicycle sheds and maintenance areas are in the courtyard.

► The planning of an entirely new urban area has made integration of all aspects of sustainability possible [Helsinki City Planning Department].





The balconies and garden terraces for the ground floor apartments provide the inhabitants with a private outdoor zone. If they seek company, they can go to the central common yard, which is crisscrossed with paths and alleys. These paths connect the buildings to each other and allow the habitants to meet in their daily routines.

An urban country village

The design concept is based on providing a personal touch to the site,

a small country village community, a colourful and experimental urban place. Each part of the blocks and urban houses have their own carefully harmonised façade colour, making them resemble individual houses. This feature also helps people to recognise their own dwelling, thus making it 'their own'.

Also daylight features and acoustics are key parameters in the design. The façade facing the street has French

balconies or ordinary windows with a cushion edge providing views to the streets, whereas the courtyard façades are more open and glazed. The balconies on the gables facing the common courtyard are acoustically screened from traffic noise by the blocks. In addition, the glass in the balconies as well as windows also shades the sun during summer and lets it in during wintertime.

◀ The common yard in the Siena and Umbra complex is a protected, car-free area for social activities and biodiversity [Tietoa Finland].



Free movement

In the centre of Kuninkaantammi, the pedestrian is king. A large pedestrian zone is designed in a spiral structure with curved alleys and small squares. In this way, traffic noise is minimised in most of the residences. Moreover, housing blocks in the periphery and newly constructed office buildings along the highway to Hämeenlinna improve further the acoustic environment indoors as well as outdoors.

The large pedestrian zone contributes to a safe environment, where everyone can play freely and spend time on car-free streets, in squares and parks. The main streets will have safe pavements, and bicycle lanes will line the streets. At the same time, the green areas between the residential blocks will include pathways leading through the blocks to the surrounding recreation areas.

Excellent connections

All necessary services and two train stations are located within a short cycling distance of two kilometres. In addition, a public transport tunnel for a new bus route to and from Kuninkaantammi is being planned, just as good connections by car, bicycles

<< ▶ Terraced houses, urban villas and apartment blocks will merge into a diverse cityscape [Petri Rouhiainen Architects].

and for walking will be provided. Since the Central Park begins almost at the doorstep, one can ride all the way to Helsinki City centre in a wonderfully verdant environment.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Climate-proof urban planning

The Kuninkaantammi pilot area was selected for testing the Helsinki Green Factor in practice, a part of the Climate-Proof City – Tools for Planning (ILKKA) project. The aim of ILKKA is to create planning tools and best adaptation practices for urban planners and the construction and landscape industry regarding climate-proof urban planning. This plan has determined the design of the two Siena and Umbra blocks.

Siena and Umbra are situated in an area where precautions against climate impacts are fully integrated from the start. Thus, the small pond and open water flows in the yard are made not only for aesthetical and social reasons, but also to manage natu-



ral storm water. The pond controls the flow to the rainwater drainage and prevents flooding of the roads in the area.

Natural methods

In general, natural storm water management methods will be visible in the entire area as solutions integrated in the urban landscape. Various pools and stone streams along the streets, vegetation dents, large trees, green rooftops on the buildings and rain gardens on the plots cover some of the initiatives. The most important goals of the various methods are to utilise flow peaks, decrease the total run-off and potentially improve the water quality.

The storm waters of Kuninkaantammi are led to a wetland park, Helene Schjerfbeck Park, which lies next to the residential area. Based on the cost comparisons made of the storm water management options for the park, a natural method of storm water management would be up to three times more economical to implement compared to the traditional pipe methods.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Living with nature

Kuninkaantammi will be surrounded by recreation and green areas and

the immediate presence of nature will surely attract outdoor types. Bordered by the vast and lush Central Park on the eastern side of the district and the Vantaanjoki River with its adjoining recreational areas on the northern side, there is plenty of natural forest in and around the district.

A district with its own beach

Kuninkaantammi will also have an excellent beach when Palettilampi Pond, no longer used by the local waterworks, is taken into recreational use. A footpath circles the pond, and a picnic park will be developed on the western bank. With cabins, saunas and sport facilities, Palettilampi Pond will be the pinnacle of recreational bliss, serving local residents of all ages as well as visitors to the Central Park. The water for the pond, part of the water treatment process, is led in through the Päijänne Tunnel.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Ecological mindset

Ecological sustainability and low carbon emissions are principles guiding all construction efforts in Kuninkaantammi. The area is supplied with district heating from a combined power and heating plant and will house low energy buildings, and preparations are being made to produce electricity by renewable means. Similarly,

wooden houses and buildings will also be constructed to provide low carbon housing and improve energy efficiency.

Another measure includes the rock debris generated by the excavation of a new bus tunnel from Kuninkaantammi. The excavated rock will be used for landfill and street construction at Kuninkaantammi in the preliminary construction phase to reduce transport-related emissions.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Aesthetic climate solutions

The ecological processing of rain and melt water will be a prominent feature in the urban landscape as new aesthetically pleasing solutions have been devised. Courtyard areas will contain gardens irrigated by rainwater, and the streets will be lined with pools, stone-paved brooks and large trees. In addition, buildings and other structures will have green roofs.

Protecting local habitat

The storm water from Kuninkaantammi will be led into dammed ponds in the wetland park before being channelled to two rivers, mainly to Mätäjoki River and less so to Vantaanjoki River. Vantaanjoki River is home to the rare Thick Shelled River

Mussel. This is an EU directive protected species whose habitat may not be disturbed by the construction at Kuninkaantammi. This has been taken into account in the storm water management plans. Retention ponds in green areas will filter impurities out of the storm water and in this way help safeguard the habitat of the Thick Shelled River Mussel.



IN THE HEART OF ICELANDIC NATURE

The Snæfellsstofa visitor centre at Skriðuklaustur overlooks the world famous Vatnajökull glacier and the national park surrounding it. Designed to look like a glacier itself, the visitor centre blends the essence of nature and architecture.

Vatnajökull National Park is Europe's largest national park. Founded in 2008, the park is particularly famous for the gigantic glacier after which it is named. Positioned in the high country north of the glacier itself, at Skriðuklaustur, one finds the Snæfellsstofa visitor centre right in the heart of Icelandic nature.

The look of a glacier

The visitor centre, designed by Arkís arkitektar, opened in June 2010 and is the first BREEAM certified building in Iceland. In the shape of a large X, the building features two different functional elements: the public exhibition and education axis and the staff and service axis. At the cross in the middle lie the shared facilities such as the café, library and restrooms.

Set on a slope, the building's X-shape and design were inspired by the formation of a glacier. Visitors approach the centre from below almost as if they were climbers ascending a

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|---|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <p>✓ Pleasant and comfortable</p> | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <p>✓ Sustainable and local resources</p> |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <p>✓ Carbon emissions in operation phase</p> | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <p>✓ Reproducible and adaptable</p> |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <p>✓ Reflects Nordic/local building and design traditions</p> | |



▲ Designed to copy nature
[Birgir Teitsson].

BASIC PROJECT INFORMATION

Project

> Snæfellsstofa Visitor Centre

Client

> Vatnajökulsþjóðgarður – Vatnajökul glacier
www.vatnajokulsthjodgardur.is/english

Principal design contact

> ARKÍS arkitektar
www.ark.is

Location

> Fljótsdalur, Skriduklaustri, Iceland

Building type

> Cultural building, new construction

Project stage

> Completed in 2010

Gross area,

> 750 m²

Local neighbourhood

> Rural (National park)

Certification

> Aiming at BREEAM 'Very Good'

<< glacier. To strengthen this feeling, parking and service areas are hidden in the landscape.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

A two-in-one solution

The Snæfellsstofa visitor centre was built with two purposes in mind: to serve as a visitor centre for tourists and to be the headquarters for the Vatnajökull National Park's eastern territory. To make this duality possible, the layout design is flexible and can serve several functions in a relatively small space.

Staff access and technical facilities are separated from the visitors' access to the building, but inside the offices and meeting facilities flow into the public areas. As a rule of thumb, the design of exterior spaces has focused on accessibility and universal utilization.

Designed to mimic nature

The building's form is inspired by the eternal creative force of the glacier. The two axis of the visitor centre – the exhibition and education areas – rise up from the rock foundation to mirror a living and ever-changing glacier. One axis is built from insitu-cast concrete intertwined with locally sourced larch wood panels, while the other axis is plated in dark-brown copper and features a wooden inte-

► Copper, larch wood and concrete unified in the glazier shaped building [Sigurgeir Sigurjónsson].

rior. Where the two axes cross each other lie the shared facilities, opening towards an outdoor amphitheatre.

The 750 m² visitor centre also houses a café, exhibition areas, offices, a shop, a library, as well as meeting areas. Generous ceiling heights allow for permanent exhibitions in parts of the exhibition space, and temporary exhibitions in other parts.

The location of Snæfellsstofa was carefully chosen to ensure shelter from wind, ample daylight and stunning mountain views. The turf roof together with the larch wood and copper axis merge the building into the landscape's colour scheme. The indoor environment is characterised by daylight and views to the outside, thereby connecting exhibition spaces indoors and outside.

Visit by foot

Visitors are intended to approach the building, much like climbers approaching a glacier. Cars and other vehicles are kept to the side in the parking and service areas, screened off by vegetation and landscaping walls, thus reducing their visual impact. Facilities are provided for visitors to enjoy the site's exterior spaces,



giving walking-impaired an opportunity to experience the scenic nature. Pedestrian paths, ramps and decks are made of local wood, and their forms steer the ascent of the visitors to the building. Staff facilities such as workshops, garages and technical rooms are located so that they are hidden from the approach.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Following the seasons

The building is designed to withstand

Icelandic weather. Divided into three parts, the building can be used in different ways, depending on the season. A thick layer of insulation separates the exterior layers from the interior, and the turf roof provides additional insulation for one of the axes.

Let the daylight in

Different spaces have different lighting concepts depending on their use and how the design can fulfil requirements for exhibition design, ergonomics and energy use. Indoor and outdoor lighting is designed to



minimize light pollution, while maximizing the use of daylight reduces the need for artificial lighting. At the same time, the lighting design is used aesthetically, inspired by the ever changing light reflections of the glacier.

Towards Icelandic sustainable buildings

The Centre is designed and built according to BREEAM 'Very Good', which requires considerable attention to energy design. In this way the centre differs from most buildings

▲ Though situated in nature, accessibility has a high priority. [Karl Vilhjalmsón].

in Iceland due to almost unlimited access to natural hot water, harnessed from geothermal fields as well as power produced by hydro-energy. Snæfellsstofa Visitor Centre is regarded as a first step towards Icelandic constructions according to environmental standards.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Set on top of a hill

The visitor centre lies on top of a hill, and architecturally it follows the change in elevation, so that the building gently glides over the terrain. As often in the wilder landscapes in the Nordic countries, care has been taken to shelter entrances and outdoor facilities against wind and snow while at the same time ensuring that as much sunshine as possible can reach the wooden terrace.

The 'Rock Foundation', on which the visitor centre stands, is a concrete structure cast on site with wooden board texture inside and outside, and insulation in between the concrete layers. Larch panelling is woven into the concrete walls inside and outside.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Local products all around

The visitor centre is the first BREEAM certified building in Iceland, intended to help visitors engage with the park while educating them about sustainable design.

Material palettes are clear and simple, and composed largely of local materials: local larch, turf roof and landscaping walls of local rock. The nearby forest will become apparent in the building's texture. In addition, horizontal and gently tilted tertiary lava layers are reflected in the building with pronounced angles, and the deep valley is reflected in its appearance, especially in its colours.

Furthermore, pedestrian paths, ramps and decks are built from local wood, and the visitor centre also has a souvenir shop that focuses on locally produced products.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Designed for the Arctic climate

All design solutions of the Snæfellsstofa visitor centre are adaptable to arctic or cold climate zones, especially in contexts where the building should respect and merge with a natural environment.

The shape of the building, design and position of entrances and other exterior functions as well as material choices are directly or conceptually reproducible in similar climate conditions.

A SUSTAINABLE PRISON

Holmsheidi Prison is Iceland's new ground-breaking detention facility. It is designed in line with the latest building standards. In fact, it challenges conventional functional architecture by adding the aspect of human betterment into the design approach.

The construction of a new prison has long been overdue. The country's current detention facilities are over-filled, and convicts are waiting to serve their sentences. In 2012, the Icelandic Ministry of the Interior launched an architectural competition on the design of a new, joint prison facility at Holmsheidi near Reykjavik.

The winning design is centred on three key elements making the prison a modern, sustainable facility that, just as important, takes the people it houses into consideration. A cylinder formed main guard station surrounded by daylight will contrast the sharp edges of the building's wings housing the cellblocks. Internal courtyards will be the heart of each cellblock allowing outdoor activities and daylight. Not least, alcoves inside the cells provide each convict with a view and daylight while limiting the view to the next prison cell.

The new prison will have 56 cells for people serving custody sentences, shorter sentences and substitute punishment. The prison also includes a ward for female prisoners. Reception and shared facilities such as work

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | | |
|---|---|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety | <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high-level experience | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ High quality solutions ✓ Flexible design, adaptable materials |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources ✓ Adapted to local condition |
| | | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| | | <p>O10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ View to the outside but still imprisoned [ARKÍŚ].

places and fitness are placed in the centre of the building. The building will be completed in January 2016. The aim is that by then it will be certified according to the BREEAM environmental system as 'Very Good'.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Prison with a human touch

A prison is obviously not an open, accessible institution with unlimited connectivity neither inside nor towards its surroundings. Not confined by this premise, the project makes use of several innovative design solutions to create a sense of open envi-

ronment with a pleasant atmosphere. Thus, both inmates and staff are provided with good and safe physical conditions leading to a framework for betterment of the inmates in the long-term and good working conditions for staff.

Inside the prison, this goal is reached through a simple layout with functional modules with accommodating

BASIC PROJECT INFORMATION

Project

> Holmsheidi Prison

Client

> Iceland Ministry of the Interior

Principal design contact

> ARKÍŚ arkitektar
www.ark.is

Location

> Reykjavik, Iceland

Building type

> Institution, new construction

Project stage

> To be completed in 2016

Gross area

> 3,595 m² - 1 level

Local neighbourhood

> Countryside

Certification

> Aiming at BREEAM 'Very good'

<< interior and exterior spaces. Well-defined boundaries for each division ensure physical and visual separation of the different categories of inmates. Maximum daylight is provided by the courtyards that distribute natural light into the wards. Moreover, easy connectivity for staff is ensured by a centrally located main guard station. This shortens communication routes and provides good connections to common facilities.

Sensing the outside world

The bay window or alcove in each cell has a dual purpose. It provides prisoners with a view to the outside and daylight into the cell on the one hand, and limits views to the window of another cell or the yard of another ward on the other hand. The alcoves are both an expression of the prisoner's will to be free again outside the walls of the prison and at the same time the limits in which the prisoner must stay.

On the exterior, the design focuses on tuning the building and material palette to complement the earth tones of the Holmsheidi landscape. In addition to this, emphasis is placed on selecting materials that contribute to a healthy indoor environment for inmates, staff and visitors.



▲ Bright and inviting shared facilities are beneficial to both staff and prisoners [ARKiS].

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Freedom within confinement

Social factors have been paramount in the development of the design. Architecture has a dual role in this aspect. While taking all safety measures and social precautions into account in the design solutions, the aim

has been to create a prison environment, which grants the prisoners the possibility of betterment and a sense of normality, though detained. This not only benefits prisoners, but also society at large, as the architecture seeks to introduce reintegration into society's freedom, and thus supports the suppression of criminal behaviour when re-entering mainstream society.

The design process has entailed close collaboration with the building's users

- prison authorities, guards, councilors and police. Furthermore, the design team and client have sought advice and references from recent Nordic prison buildings and Nordic corrections authorities.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Room with a view

Views to greenery and access to outdoor areas are key design features in the project. The entire building will have a green roof and most wards will have an internal courtyard with small trees and an exterior exercise yard for recreation. This way, opportunities for outdoor recreation are maximised within the limits naturally set by a prison. Each cell has a view to the outside – either to the internal courtyards or the surrounding rural landscape. The purpose of the courtyards is not only to allow for outdoor recreation, but also to distribute daylight deep into the wards and cells, and give the inmates something pleasant to look at. The recreational areas form a pivotal part of enhancing people's wellbeing and thus their mental health.

Integrating natural elements

The building is surrounded by nature and every effort is made to preserve the natural surfaces surrounding it. An arboretum is planned adjacent



◀ The prison radiates robustness and security in the layout, still with a human touch [ARKIS].

>>

to the prison's main entrance as part of the building's art installation. Two retention ponds for surface water are planned around the building, both for the visual enjoyment of building users and as integral parts of the site's sustainable drainage.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Optimised for low energy use

To reach the BREEAM 'Very Good' score, the building must be optimised for low energy consumption. Already, the energy solutions exceed by far the Icelandic building code's requirements for insulation. The building envelope holds primarily closed parts in the façade, as the window area is limited due to the function of the building. The fact that windows cannot be opened adds to a very tight, airtight and well-insulated façade.

LCC-based material choices

In line with the BREEAM achievement, the design must go through a Life Cycle Costing (LCC). The structural core of all exterior walls is concrete, while interior surfaces in inmate areas consist of linoleum flooring, painted concrete walls and special security ceilings made of metal in

<< common areas. Inside the cells, ceilings are painted concrete and fixed furnishings are made of wood.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Human values in centre

Holmsheidi Prison is indeed a building that seeks to promote quality of life in the best meaning of Nordic design tradition. In spite of its functional purpose, i.e. to house people punished for crime against society, the focus on sustainability, indoor environment and architectural qualities in the best Nordic sense is never compromised.

Notably, the layout and installations have been designed in close collaboration with the users, so that the building itself in its layout solves as many logistics issues for the user as possible. In effect, the layout works as a machine for effectively controlling the prison, maintaining security and facilitating daily routines.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Operational flexibility

As the building is in fact a collection of three prisons – a protective cus-



tody prison, a short sentence prison, and a women's prison – operational flexibility is one of the key goals. The design enables the easy changing of one cellblock from a short sentence ward to a women's ward, or the changing of a custodial ward to a

▲The cell interior is simple, durable and functional [ARKÍ'S].

short sentence ward. Thus it is easy to use each ward individually in periods of few inmates. Similarly, the modular cell furnishing can easily be upgraded

or disassembled, as required. This allows much better use of the prison and lowers the operating costs.

High architectural quality

The building's overall character, form and material selection fits the function and reduces operating costs. Materials are simple and clear, with an emphasis on durability and robustness. Two types of material are used for the exterior surface. One is corten steel and the other is concrete (pre-cast sandwich panels). Both are characterised by a long life span and minimal maintenance.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Local solutions

Life Cycle Costing and climate modelling are methods to evaluate materials and maintenance – also used as part of the BREEAM assessment. For this reason, locally available materials adapted to local conditions have been prioritised, just as recyclable materials have been used when possible. The building is mainly made of precast concrete elements, which is among the very few locally produced building elements in Iceland. Furthermore, locally produced insulation is used and all windows are assembled locally along with all furnishings, also locally produced.

The selection of building materials and the building's design itself are tailored to the extreme weather conditions of the site in a relatively high altitude above Reykjavik. In addition to a rigorous material selection process, the building and site employ sustainable drainage solutions for handling surface water on site, where all refuse water is filtered and treated on site, before being funnelled into the ground.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Exporting a social concept

A sustainable prison that embraces human betterment in its architectural concept is a vision, which could – or should – be used everywhere. Accordingly, the layout strategies, shared facilities and detailed cell designs developed for the prison could easily be used by other institutions of the same nature.

Displaying sustainability features

Aiming at creating also an environmentally sustainable prison, the building is undergoing BREEAM assessment, reaching for 'Very Good'. The plan is to provide an information panel in the prison's reception area on the building's key sustainability features and on meeting BREEAM requirements as a learning resource.



10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

The Holmsheidi Prison embodies the Charter principles, not only in its design and function, but also in the fact that the client and the entire design team signed the Charter in the early phases of the design. Consequently, the prison building integrates great environmental solutions as well as taking economic factors into account through careful analysis.

However, all exemplary principles boil down to the fact the building is made in respect of people, despite their criminal status. Though the architecture facilitates detainment, it also seeks to provide a sense of freedom and incorporate a fundamental human respect within this framework.

▲ The women's courtyard is large and can facilitate exercise as well as relaxation [ARKiS].

A FAMILY HOUSE OUT OF THE ORDINARY

Plus House Larvik is a single-family house that generates more energy than it consumes – enough to run an electric car year-round. The demonstration house was built to facilitate learning on building methodology for plus houses with integrated sustainable solutions.

Plus House Larvik in Norway is the result of a remarkable experiment showing that a zero emission or plus house can be aesthetic, comfortable and functional. Just as important, it demonstrates that it is possible to generate almost three times the amount of electricity it requires to serve the energy needs of a family.

The development project has involved leading researchers in sustainable buildings, designers and suppliers. In close cooperation, this multidisciplinary project team has created a building that gives equal priority to homely qualities and high energy standards.

In 2015, Plus House Larvik won the WAN Sustainable Buildings Award for embracing sustainability to a high degree without compromising the usual qualities found in good design.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Pioneering family house

Despite being a demonstration house with the primary intention of learning

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|--|
| <p>01 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety | <p>08 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Involvement of users and stakeholders |
| <p>02 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high-level experience ✓ Interdisciplinary teams | <p>09 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| <p>04 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |
| <p>05 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions | |



and monitoring, the Plus House Larvik remains homely and comfortable and generates a sense of wellbeing. At the same time, it is a highly energy efficient building with zero emissions. By optimising architectural qualities and technological solutions, the house generates more energy than it needs to serve a family's consumption. It proves that living sustainably does not necessarily mean living a Spartan life with daily precautions.

Transition between inside and out

The house is designed to encourage a lifestyle in close contact with its surroundings. Almost integrated in the building, between the kitchen and living room, an outdoor atrium with a fireplace surrounded by stacked firewood and recycled bricks contributes to a cosy and pleasant atmosphere. The smooth transition between inside and outside is generally provided through several glass surfaces and openings to the outdoor environment.

Adjacent to the atrium, there is a swimming pool made of a 40 foot reused container warmed up by solar heat. Further away, the garden with fruit trees and a vegetable patch surrounds the house and terrace.

◀ Creative thinking and constant focus on the agreed sustainability goals have made room for luxury [Paal-André Schwital].

BASIC PROJECT INFORMATION

Project

> Plus House Larvik

Client

> Centre of Zero Emission Buildings (ZEB)
www.zeb.no

Principal design contact

> Snøhetta
www.snohetta.com

Location

> Larvik, Norway

Building type

> Housing, new construction

Project stage

> Completed in 2014

Gross area

> 200 m², 2 levels

Local neighbourhood

> Countryside

<< Depending on time of the year, family life can be spent outside.

Great daylight exposure

Daylight, lighting and outdoor views are used strategically to contribute to a pleasant and healthy indoor climate. Maximum natural light streams in from the many windows as well as skylights in the house. Daylight intake is supplemented with LED lighting indoor as well as outdoor. The gentle outdoor lighting evens out the contrast between inside and outside, and provides a sense of being connected to nature even in the dark winter.

High air quality and thermal comfort

Excellent air quality and thermal comfort are additional features contributing to the healthy indoor climate. Besides aesthetic and sustainable qualities, materials were chosen based on their ability to contribute to good indoor air quality. The atrium brick wall is also an interior brick wall, and combined with mainly wood-based or natural stone surfaces the interior is literally emission free. These materials also promote good acoustics and provide a pleasant light.

The house is mechanically ventilated with efficient heat recovery. This is combined with floor heating at ground level and in the bathroom on the second floor. Thermal mass in the interior brick wall is utilised to



▲ A skylight lightens up the centre of the house [Paal-André Schwital].

even out the temperature and gently distribute energy to the rest of the second floor.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Relatable building concept

Most people can relate to a family home, which makes the demonstration effect so much more effective.



▲ The wall of recycled brick not only takes effect as passive energy storage but also highlights the sculptural staircase [Bruce Damonte].

Combining attractive architecture, functionality and comfort with a high standard of environmental sustainability in an 'out of the box' manner only enhances the effect.

Raising the standard

The high environmental ambitions have created new parameters in the design process. Plus House Larvik pushes the limit of energy efficient buildings by focusing not only on energy consumption during operation, but also embedded energy in

materials. Unusual materials such as the atrium wall covered by firewood and a 40 foot container reused for a naturally heated swimming pool demonstrate that 'luxury' can be obtained in a sustainable manner.

The house meets the highly ambitious ZEB-OM target defined by the Norwegian Research Centre on Zero Emission, which entails that the building can verify 100 percent CO₂ offsetting.

Collaborative research project

Plus House Larvik is a research project developed in a partnership among researchers, designers and suppliers. Their collaboration through workshops was an enabling factor in thinking differently throughout the programming, design and construction phases, not only with regard to energy consumption in the operation phase, but also embedded energy in building materials.

The house is open to professionals and the public. It serves as inspiration to those who wish to learn more about optimal solutions for a better and more sustainable living environment. Additionally, results and lessons learnt from the research project will be published.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Advanced energy concept

The project demonstrates an energy concept of very high standard – a result of a combination of passive measures, optimised technical installations and own produced energy. The house has obviously moved beyond passive house standard, as it produces more energy than it requires. The compact, square geometry of the building, orientation and placing of glass surfaces all contribute to tempering the house.



◀ Recycled brickwork and firewood create a cosy feeling in the outdoor atrium [Bruce Damonte].

>>

Heat is recovered from grey water, drain water and indoor air in ventilation systems. Excess heat from the indoor air is used to heat both incoming air and tap water, reducing energy needs for hot water by 50 per cent. Floor heating and warm water is provided by solar heating and underground heat stored in a large tank. A boiler plays a central role in this diverse heat storage and production concept.

CO₂-friendly materials on the agenda

Focus on embedded carbon in building materials represents a new direction towards a sustainable construction industry. For the research team, the calculated embedded carbon in materials was a highly prioritised design factor, resulting in materials with low environmental impact. The fact that the entire construction in itself is compact and light reduces material consumption and thus embedded carbon.

Timber and recycled elements

Natural materials such as wood, stone and bricks dominate the list of building materials. Wood is used on walls, ceilings and floors inside as well as on the façade. To reduce the use of concrete the building's



▲ Large fins protect the bedroom windows from solar heat [Paal-André Schwital].

terrace deck is similarly a wooden construction combined with a newly developed vapour and wind barrier, which also reflects heat.

Recycled materials are used too. Recycled bricks form the wall facing the outdoor atrium as well as the inside wall in a double-high hall. Railway sleepers form the walls of the

garage, and the PV panels are made of recycled silicium.

Despite a very low energy requirement in operation, corresponding to 18,300 kWh including charging the family electric car, the calculated embedded carbon in building materials and PV panels is just over half of the figure: 9,500 kWh.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Nordic appeal

Nordic tones and design traditions are woven into the entire house, from the use of light, local natural materials, warm and earthen colours to

clean lines and spacious layout - all of it appealing to a comfortable life.

Though the building is a high-end single family home in Nordic standards with a very modern expression, it demonstrates a design approach, which prioritises functionality and aesthetics while also putting user's needs first.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT

Holistic partnership

For this house to become a successful reality there was a clear recognition from the beginning that research, architecture and technology must come together. Apart from ZEB, the project involved Scandinavia's largest independent research body, SINTEF, The Foundation for Scientific and Industrial Research. Together with the architecture and design firm Snøhetta, partner Brødrene Dahl, and Optimera new design tools supporting zero emitting buildings, new products and building design were developed.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Concept with great potential

As a research project piloted in close collaboration with also the construction industry, many innovative solutions emerged from Plus House Larvik that are adaptable in other contexts – and even in other climate conditions. Overall, the actual design solutions can be reproduced together or in new settings, and so can the design and building methodologies. Both have potential not only in a Nordic climate context, but also in other regions.



◀ The atrium separates the kitchen and dining room on one side of the atrium and living room on the other, yet in visual contact [Paal-André Schwital].



10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

Plus House Larvik is truly a house out of the ordinary. It embraces all aspects of sustainability in one go by combining excellent architecture with future-proofed sustainable solutions benefitting people and the environment. Economic sustainability is reflected in low operating costs due to the positive energy balance and low maintenance stemming from passive solutions and eco-friendly materials.

The project reaches further into a sustainable future as it demonstrates an energy concept in which the building's own renewable energy production more than covers a family's needs.

◀ Recycled railway sleepers are yet another visible feature contributing positively to the carbon footprint account [Paal-André Schwital].

OSLO'S FIRST PASSIVE HOUSE SCHOOL

The rebuilding of Bjørnsletta School has turned the building into the first passive house school in Greater Oslo. While the school is known for its natural science profile, the new facility and its qualities endorse this profile.

Bjørnsletta School was built as a primary and secondary school for about 200 students in 1981. To meet today's needs for a school of that size with space for 792 pupils, the existing school was demolished and replaced with a 10,000 m² new building. Schoolchildren were welcomed into the new building in 2014.

The new school is laid out so that the natural landscape on the edges of the property can be retained. The school building has been kept in the style of the neighbouring buildings, with natural stone and wooden cladding as façade materials. The ground floor of the school is set into the earth with three smaller building volumes above. The division into smaller volumes creates sight lines between the buildings and good sun and shade conditions. Parts of the roof of the first floor are used as outdoor play areas for the children, and the roof over the auditorium is a playing field.

Being a model project in the Future-Built scheme, the project has aimed at meeting high environmental stan-

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

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| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable | <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high level experience ✓ Interdisciplinary teams | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Involvement of users and stakeholders ✓ Collaboration models and innovative business models |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product | |



▲ Shared space with a variety of settings for learning, gathering and break-out in a light and airy atrium [Daniel Clements].

dards and passive house criteria. The project has focused on optimising the technical regulation systems and using climate-friendly materials to reduce carbon emissions as well as energy consumption such as heating, cooling and ventilation.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Bridging functionality and user experience

From an architectural and functional perspective, Bjørnsletta School de-

monstrates that it is possible to build a passive construction where buildings are divided into smaller volumes rather than a compact complex. The divided building structure allows more windows and more daylight as well as excellent sun and shade

BASIC PROJECT INFORMATION

Project

> Bjørnsletta School

Client

> Undervisningsbygg Oslo KF

Principal design contact

> L2 Arkitekter AS
www.l2.no

Location

> Oslo, Norway

Building type

> Institution, new construction

Project stage

> Completed in 2014

Gross area, levels

> 9,677 m², up to 3 levels

Local neighbourhood

> Suburban area

Certification

> Passive House standard



The building complex follows the natural sloping terrain, thus benefitting from daylight access and minimising interference with nature [L2 Arkitekter AS].

conditions for playing children. Just as important, outside spaces have become great living spaces with a natural connection to the school grades.

The division of the building into three volumes means that the infant, primary and secondary years each have one building. These function as three small schools, each with its own identity and direct entrance on the ground floor. An internal hallway makes the wings easily accessible from the main entrance. The outside area between the wings is customised for each age group. Outdoor play areas and fields have been established on the roof of the first floor and the auditorium.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Cooperative development and learning

The planning and construction of Bjørnsletta School is characterised by a unique interdisciplinary teamwork among consultants, contractor, subcontractors, users and builder. Through close collaboration in the entire process, the team has contributed to finding optimum architectural, material and technical solutions – thus achieving FutureBuilt objectives.

While aiming at creating and applying the best sustainable solutions in current building, the project has also focused on a learning perspective. Throughout the process, in-depth

material analyses to reduce greenhouse gas emissions have been carried out to gather experience for future school projects. Some of the tools used include environmental product declarations (EPD) and the Norwegian design tool 'klimagassregnskap.no', which is a carbon accounting tool.

Unique solutions

The cooperation has led to many innovative and sustainable design solutions. For instance, material choices rely on low CO₂ emissions and durability. Stone and wood were chosen for façade cladding. In addition, three classroom wings are clad with Accoya®. Accoya® is a highly durable eco-labelled wood material thanks to a modification process that minimises maintenance requirements and enhances the stability of product significantly.

In spite of higher emissions than other wood-based coverings, Accoya® was chosen because due to its low maintenance requirements and the preservation of its bright colour over time, it is suitable for a cost-effective design.

Another focal point has been to reduce the amount of materials – and specifically the use of gypsum. Initially, glued woodblocks were planned for the interior surfaces, but the environmental declaration (EPD) showed that they had higher emissions than gypsum and thus fibre gypsum became the final choice.

Safe and green transportation

Safe mobility and good transport solutions have also been key elements in the project. The school is located at Åsjordet subway station and near the bus at Vækerøveien.



▲ The schoolyard is an invitation to activity and relaxation [Daniel Clements].

To provide a safe route to school, a sidewalk from the subway and a new footpath with lighting was established north of the school. A drop-off zone ensures a safe traffic flow by the school.

Car parking for the staff is held at a minimum. To motivate greater use of

sustainable commuting, cyclists are offered roofed bike parking in the school yards. Moreover, the school is developing a mobility plan with additional safety measures for the pupils.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Inviting to greater use of outdoor space

Bjørnsletta School lies on a sunny hillside adjacent to woodland. Being situated on a sloping terrain, there is a height difference of 18 metres

from the school's lowest to its highest point. Thus, it follows the natural landscape and the entire property benefits from good solar and daylight access. The school is organised so that it retains and includes the natural landscape bordering up to the school. A small wood lies to the south and deciduous woods and private

<< gardens are located to the east, west and north.

The school's playgrounds, areas for ball games, benches and bicycle parking will be open to the public outside of school hours. A new paved and lit walkway with public access has been established round the school. This path will prevent students walking on heavily trafficked roads.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Meeting passive house requirements

Bjørnsletta School is built according to the Passive House standard as the first school in the Oslo area, and the energy use for heating, lighting and cooling in the building is well below national standards. Consequently, greenhouse gas emissions for the completed building has 44 percent lower emissions than a reference building with the same geometry.

Saving energy with passive means

The building design includes several passive strategies. The building's heating requirements are reduced due to good insulation and good windows, minimised cold bridges and high air-tightness values. The ventilation system has very efficient heat



recovery units, and energy needs are minimised through demand controlled and energy efficient fans. The lighting system, mostly LED based, is likewise energy efficient and demand controlled.

Conscious material selection

Use of climate-friendly materials, evaluated by using EPDs, have been prioritised in the project. Much of the buildings' inner constructions and surfaces are made of concrete and left uncovered, which means the concrete will function as thermal mass and save energy. Low-carbon cement is used in the structure, in addition to the use of a bubble deck system that reduces

▲ The robust and yet inviting interior matches the target group of youngsters [Daniel Clements].

the quantity of concrete by 22 percent, compared to traditional floor slabs. The school's multi-purpose hall and ground floor consist of heavy materials, while the three blocks above have wood cladding, giving a lighter expression.

In 2016, when the school has been in use for two years, an internal climate study will be carried out together with close monitoring of energy use to evaluate and optimise the systems in the building.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Respecting local style and aesthetics

Bjørnsletta School fits naturally into the local area. The divided building form relates well to the green spaces and small houses of the area. Similarly, the school building is the style of neighbouring buildings, as natural stone and wooden cladding have been used as façade materials. This material use is aesthetically well suited and similar to the material character found in the local area.



08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Interdisciplinary start-up workshop

The conceptual basis for the entire project as well as the realisation of the ambitions rests on the interdisciplinary partnership. Great emphasis has been put on participative work sets in both design and production stages. For this reason, FutureBuilt arranged a start-up workshop for Bjørnsletta School with developer and design team to ensure a common

understanding of FutureBuilt's quality criteria and objectives. The workshop also contributed to interdisciplinary integration in the design process - ensuring good strategic decisions early on.

User involvement

Additionally, user involvement has taken place after the building's completion. The pupils have access to information boards on the environmentally friendly materials used, and on the daily use of energy and water in the building. The use of alternative energy sources is part of the school's curriculum.



10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

The new infant, primary and secondary school demonstrates a convincing integration of social, economic and environmental sustainability aspects in the design solutions. Not only can Bjørnsletta School boast of being the first passive house school in Oslo, reducing carbon emissions as well as energy consumption - it also scores highly on involving stakeholders and prioritising sustainable and safe transportation for schoolchildren.

▲ Kitchen facilities and comfortable furniture create a homely atmosphere that makes schoolwork a bit more attractive [Daniel Clements].

A BRIGHT NORDIC UPGRADE

Substantial reduction in energy consumption, more office space and an upgrade of the areas surrounding the building. These are just some of the gains from the retrofitting and extension of an office complex at Fredrik Selmers Vei 4 in the centre of Oslo.

The 1982 office building at Fredrik Selmers Vei 4 by a local transport hub on the city centre of Oslo was found to be outdated in functionality, design and energy performance. 4,000 m² were added to the original 34,000 m², so the retrofitting project today houses 1,500 workplaces. By involving sustainability experts early on in the process, the retrofitting project succeeded in creating a new sustainable, functional and aesthetic building with extensive energy saving solutions, meeting the targets for the Passive House standard.

The retrofitting and extension of the office complex involved an upgrade of the indoor environment by new green interconnecting voids and the provision of new possibilities for flexible office layouts. On the outside of the building, the façade was renovated and replaced by a wooden structure façade. Most of the materials used were sustainable. While all wood used for the façade came from sustainable forestry, 50 percent of the steel used in the retrofitting came from recycled steel.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

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| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ Flexible design, adaptable materials |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high level experience ✓ Interdisciplinary teams | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product ✓ Material emissions | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Collaboration models and innovative business models |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions ✓ Industrialised production | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| | <p>O10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ Car parking facilities are to one per four employees due to excellent public transport [Placebo Effects].

01: IS MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

New facilities

By upgrading the building exterior, the building changed from a dark red brick façade to a light Nordic look. Re-cladding the façade with perforated aluminium plates has made the façade less imposing, and contributed to an improvement of the overall impression of the area. This is also in line with the general development in Oslo, where many new modern buildings

have been built in the past 10 years. By adding floor space between the blocks, a variety of spaces were established that extend the functionality of the building. A new informal meeting place with café, restaurant and meeting centre is available to all tenants in the two level high hall.

Light and airy interior

The upgrade of the building also led to an improvement of the indoor climate. All floors are sound insulated in order to optimise the acoustic in-

door climate. Interior walls in spaces spanning several floors have been fitted with sound regulating panels. Rooms with double height ceiling add more daylight further into the building, which is enhanced by the bright perforated façade panels reflecting light in between the blocks. Ventilation is optimised so as to provide a good atmospheric indoor climate and building materials certified as ECO products were used in order to reduce harmful substances in the air.

BASIC PROJECT INFORMATION

Project

> Fredrik Selmers Vei 4

Client

> Entra Eiendom
www.entra.no

Principal design contact

> LPO Arkitekter AS
www.lpo.no

Location

> Oslo, Norway

Building type

> Offices, retrofitting

Project stage

> Completed in 2013

Gross area

> Total area 38,000 m², 11 levels
plus basement

Local neighbourhood

> City centre

Certification

> Passive House standard,
BREEAM-NOR 'Very good'.



02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Thorough analysis to support sustainability

Before the renovation, sustainability experts analysed the building thoroughly. By focusing their analysis on

heating and daylighting requirements, a sustainability agenda was identified, which could help reduce the need for heating/cooling and electricity.

On top of that, the building is retro-fitted according to the Norwegian FutureBuilt concept which also has a number of goals that had to be taken into account.

The final layout of the facades, the choices made regarding windows and window area were all a result of this thorough analysis of building insulation, daylighting versus heat gain from sunlight and lighting levels in the office areas.

Promoting new knowledge

The refurbishment of Fredrik Selmers Vei 4 received funding from the public

▲ New double high extensions between the buildings provides new workplaces connected to the existing offices [LPO Arkitekter AS].



funding body, Enova (funded through the Energy Fund). It was also part of the research project, SmartTES, which is focused on the development and documentation of the methodology for energy-upgrading and modernisation of existing buildings based on prefabricated wood-elements. By engaging with these projects, the building project contributed valuable knowledge about prefabricated

wood-elements in refurbishments to the construction industry.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Significant energy savings

With the upgrade of Fredrik Selmers Vei 4, the need for heating has been reduced by the high level of insulation. The average heat loss (U-value)

of the roof is less than $0,12 \text{ W/m}^2\text{K}$, for the walls it is under $0,16 \text{ W/m}^2\text{K}$ and for the passive house windows it is $0,8 \text{ W/m}^2\text{K}$.

District heating heats the building, but it also uses heat pumps to reuse energy. Small windows and good sun shading reduce the need for cooling, and various automated measures, such as demand-driven ventilation,

◀ The extensions also improves connectivity between the office blocks and add daylight into the building [LPO Arkitekter AS]. >>

automated control of the artificial lighting and automated solar shading enable significant energy savings.

Before the refurbishment of the building, the building's energy usage (heating and electricity) was 190 kWh/m^2 a year. After the refurbishment, the building's calculated usage is 103 kWh/m^2 a year, of which approximately one third is produced on site by e.g. heat pumps and the reuse of surplus heat from the data centre.

Recycling and sustainability

The building is retrofitted according to a number of low-energy class building design standards such as: Passive House, The FutureBuilt criterias, Energiklasse A and BREEAM-NOR. Almost all new building materials used in the extension and retrofitting were submitted to severe quality control in order to avoid harmful pollutants and minimise embedded carbon in the new building.

As a result, carbon emissions from the building materials were reduced by

<< 78 percent, and embedded carbon in the building by 48 percent, compared to a reference building (calculated according to TEK 10). With regard to the building materials, the CO₂ emissions are only 2 kg CO₂ -eq/ m² a year.

The existing façade on the blocks was replaced by a new wooden structure with aluminium cladding mounted on the existing building structure. The aluminium façade panels cover the entire building, and 95 percent of the aluminium is recycled. The wood used for the structure is made of wood from sustainable forestry, and 50 percent of the steel used in the entire refurbishment comes from recycled steel.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

A modern flexible workplace

The exterior of the building has changed from a traditional red brick façade to a modern look aligned with its rational and functional appearance. Inside, the retrofitting has made the building more interesting and compact with new possible spatial connections through voids, added shared space and flexible office space. Open space offices replace corridor-office layout and make the

utilisation of floor space more efficient, while at the same time supporting cooperation and communication. All installations were upgraded, and are now fully automatic.

The new façade is made of steel, aluminium and wood-based panels. They are manufactured in an industrialised production and assembled on site.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Easy reconfiguration

The building contains new modular elements, which are easy to change/ retrofit. Internal partition walls are gypsum board walls or demountable wall systems, e.g. glass walls which allow easy reconfiguration of the building to comply with changing requirements. In addition, the façade is clad in aluminium, fastened onto a steel structure. Both aluminium and steel can easily be recycled and reused.

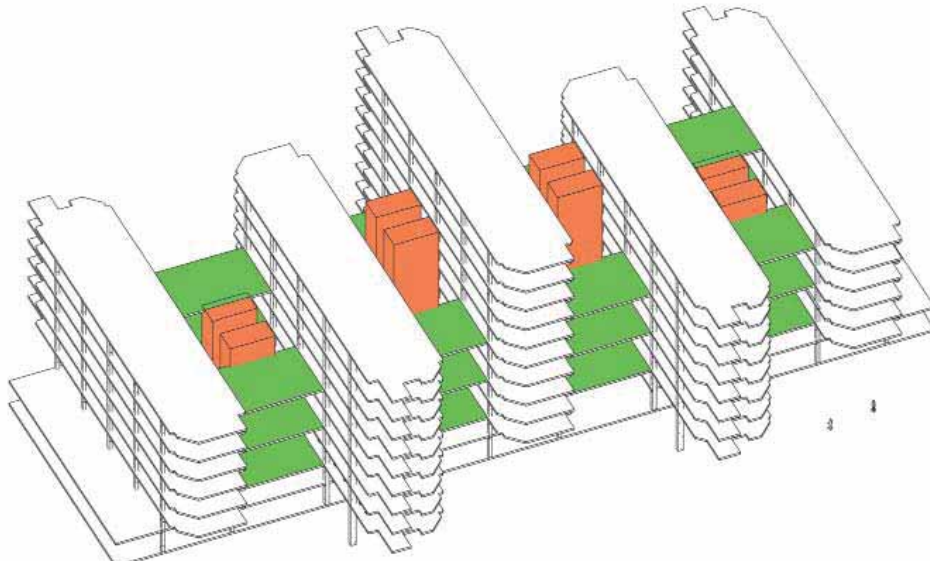
07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Prepared for future retrofitting

As previously described, recycling and sustainability have been cornerstones in the building process. This implies that most materials used in



▲ The new perforated aluminium façade is part of the new energy efficient building envelope and creates a bright entity in the cityscape [Tove Lauluten].



▲ The bridging extensions demonstrate a simple and successful way of upgrading an office building [LPO Arkitekter AS].

the building can be recycled, reused or retrofitted into the building when further changes are required. In addition, the building design is adapted to meet local climate conditions in regard to heating, cooling, daylighting and building installations.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

New connection and spaces

With the retrofitting of the building, the design project has managed to create solutions which are useable in

other contexts and exportable too. Among these is the technique of cutting out voids in existing buildings and creating new connections and spaces, and the creation of outdoor areas, which have been made friendlier for pedestrians by inserting extensions between the existing buildings.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

The refitting and extension of the building is a boost to the sustainability agenda. It has led to more office space in a densely populated area, close to public transport, and an up-



▲ Good acoustics are a prerequisite for a comfortable indoor environment [Tove Lauluten].

grade of the areas surrounding the building. The retrofitting and extension of the existing office complex have also enhanced the surrounding local area, kick-starting further up-

grades of other buildings in the area. A substantial reduction in energy usage has been achieved and lead to significant financial savings.

OUTSTANDING SHOPPING CENTRE OF THE FUTURE

Fornebu S calls itself 'the world's most sustainable shopping mall', and with good reason. A great deal of thought has gone into creating a building that meets future environmental requirements at the highest level. The result is the BREEAM 'Outstanding' tribute.

On the outskirts of the Norwegian capital, Oslo, lies the new Fornebu S shopping centre. Not only is the centre a sustainably built new hub and meeting point for Fornebu residents, it also has a convincing strategy with regard to communicating environmental issues to visitors and offering physical as well as digital tours about the centre's environmental measures and results.

Fornebu S houses 80 retail and interior stores, restaurants, a grocery store, bank, parking with e-parking facilities, and very soon a gym. The building sits on a large site, which will eventually contain a medical centre and living accommodation. The green profile is a result of incorporating environmental considerations in every step of the project – right through the choice of materials and technical solutions during the construction phase, the high efficiency waste recycling process, the underwater heating system and energy efficiency infrastructure, to the encouragement of green behaviour among tenants and customers.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high level experience | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements | <p>O10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Embedded carbon in product | |



▲ The Nordic and sustainable design approach is visible even before entering Fornebu S [KLP Eiendom].

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Green centre of attention

Located in beautiful surroundings within a stone's throw from the Fornebu Park and magnificent beaches along Oslo Fiord, Fornebu S aims to be the main attraction of this fast-growing area just outside Oslo.

The green roof and subtle wood façades of the building are an unusual design approach for a large shopping mall. Nevertheless, these features emerge as aesthetically appealing providing both visitors and residents in the apartments above the roof with something colourful and pleasing to look at. In this pleasant atmosphere, people are welcomed to the centre

and its services. Even the parking facilities in the basement have brightly coloured walls and ceilings to create a safe and inviting environment.

The stores and services are carefully picked to ensure that the inhabitants of Fornebu can get almost all their daily services and shopping without having to move outside the local

BASIC PROJECT INFORMATION

Project

> Fornebu S

Client

> KLP Eiendom AS
www.klpeiendom.no/oslo

Principal design contact

> AMB arkitekter AS
www.arkamb.no

Location

> Oslo, Norway

Building type

> Shopping, new construction

Project stage

> Completed in 2014

Gross area

> Shopping area: 24,000 m² - 2 levels
 Parking garage: 36,000 m² - 2 levels,
 Offices: 2,000 m²
 4 apartment buildings built on top
 – 3 levels
 Total project area: 78,000 m²

Local neighbourhood

> Suburban area

Certification

> BREEAM 'Outstanding'
 Building of the Year Norway, 2014
 Retail New Construction, 2015

<< area. This aspect aims to reduce further carbon emissions by cutting down on transportation between services. As part of a holistic approach to sustainability throughout the project, the building owner has strived for a mix of shops aspiring to sustain and maintain an environmental viewpoint and structure in their business.

Sustainable commuting

Ensuring sustainable modes of transportation is one of the many green focal points in the project. The building houses 120 sheltered bike parking spaces right at the main entrance, and well-fitted changing facilities provided for the employees. One can jump on a bus straight outside the main entrance, where there is real-time information about the buses' timetables. And Fornebu S hopes to welcome a metro station in 2020.

Modern parking system

The building has 20 parking lots with charging stations for electric vehicles. The commercial parking lots have single space recognition to reduce search traffic inside the P-house. LED signs outside and inside the facility guide the customers to the nearest available parking space. Even animals are paid attention to, as a dog parking facility with lockable cages are provided for the shopping customers.



02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Aiming high

At an early phase, BREEAM was found to be a good framework for creating a project with a broad range

▲ Daylight, natural materials and LED lighting reflect Fornebu S' green profile [KLP Eiendom].

of sustainable solutions. The building boasts of the 'Outstanding' title due to its dedicated effort to integrate many different sustainability features. Furthermore, Fornebu S won two prestigious BREEAM prizes – Retail New Construction and Your BREEAM

Award – and it is built according to Passive House standard.

Eco-friendly waste management

Particular attention has been paid to a sustainable waste recycling process in the project. 100 percent of the construction waste was reused or recycled into new materials or energy. Besides, more than 80 percent of all

the main building elements are responsibly sourced from suppliers with an effective environmental management system, which focus on waste management and recycling among other issues. During operation of the building, the stores in the centre sort waste into 11 fractions.

Education for all

Education is a crucial factor in promoting sustainable buildings and spreading awareness, which is why efforts are also made to display the qualities of Fornebu S to the public. The local community is therefore welcome to use the centre as a learning facility for energy and environmental issues.

A display at the centre shows how much solar power the building has generated in the last 24 hours. The display puts the information in perspective by comparing it to the energy consumption of household appliances to give visitors a better sense of the importance of renewable energy. There are also physical tours available. For instance, the public can enjoy a trip to the visitor platform next to the solar panels at the roof with elevator access for the disabled. Games and treasure hunts for kids are also a part of the learning aspect.



▲ [KLP Eiendom].

▼ Bicycle parking for staff and customers in a dry, bright and well-lit environment [KLP Eiendom].



03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

>>

Replicating local nature

The public green roof on Fornebu S is not just a green roof. It is a replica of the nationally rare natural habitat called 'Lowland Calcareous Grassland', found naturally in the Fornebu area. 84 different plant species make up the green roof, some of which were cultivated from seeds collected in the natural habitats around Fornebu. As a result, the roof helps maintain ecological diversity and supports local biodiversity. At the same time, the green roof garden with its criss-crossing wooden paths serves as an aesthetic and social feature for visitors and neighbouring residents as well as climate prevention.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Smart light measures

Being the 'world's most sustainable shopping centre', the building fulfils energy class A. This means that Fornebu S uses 50-70 percent less energy than regular shopping malls in Norway. Several features are associated with the high energy performance.

For instance, 99 percent of the lighting in the shopping centre is of LED type, which solves two problems at once. LED lights use little energy

<< and emit little heat, which reduces the energy demand for cooling.

Additionally, the lighting in many areas is controlled with presence and daylight sensors. One large store has a special light control solution, adjusting light by activity level and the number of visitors throughout the day. By doing so, energy usage in the building has been lowered even further. In addition, bright colours have been used on walls and ceilings in the parking garage so that the LED luminaires operate at lower light levels and still produce a good lighting atmosphere.

Renewable energy sources

Energy for heating and cooling comes from district heating and a cooling system that draws energy from the Oslo Fjord. Moreover, the heat from the refrigerators in the grocery stores is reused to heat the building. On the roof of Fornebu S lies one of the largest photovoltaic parks in Norway, covering an area of approximately 2,000 m². The solar cells produce around 148,000 kWh/year, which corresponds to the consumption of six single-family houses.

Low carbon materials

The strong focus on sustainable solutions recurs in the selection of materials. Consequently, environmentally-friendly materials have



reduced the carbon footprint by about 60 percent – compared to a reference building. Only documented low emitting surface materials (floors, walls, ceilings and sealants) have been used, providing the centre with a non-hazardous environment and a good indoor climate.

Virtually all the in situ cast concrete at Fornebu S is of low carbon type,

▲ Apartment blocks are built on the roof of Fornebu S [AMB arkitekter].

while also various wooden materials make up a major part of the building materials. Low carbon concrete means that fly ash – a waste product from coal combustion – replaced parts of the cement.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Choosing local solutions

In line with the BREEAM scheme, locally available building materials were prioritised and sourced whenever possible. For this reason, Norwegian spruce covers both the outer and the inner façade. Transportation to the construction site was another focal point. Prior to the work, a material list was submitted to the contractor and client. Once the list was approved products could not be replaced by other products with a risk of entailing more transportation. Mileage and vehicle type for all material deliveries were recorded in order to translate them into CO₂ emissions. One thing is material coming in – another is material going out. Very little material has left the Fornebu local area, as most of the excavated mass was either reused as backfill in the project or deposited elsewhere in Fornebu. What is more, all construction waste was reused or recycled into new materials or energy.

09: EMPLOYS IN CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

'Outstanding' accreditation

Fornebu S is the first shopping centre to reach the 'Outstanding' classifica-



tion in BREEAM, with a total score of 93 percent. This aspect is likely to be noticed by business developers planning new malls in countries with a clear environmental agenda.

The major achievement is the sum of many different sustainability features from the start of the development all the way through the building

▲ The green roof with local plants improves climate adaption [KLP Eiendom].

phase, displaying a constant focus on sustainable solutions, suppliers and products. Because of this, the project has scored high in all of the different BREEAM categories - ranging from 67 percent in the Materials category to 100 percent in Landscape & Ecology and Management.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

Fornebu S proves that there is no contradiction between user-friendly and environmentally-friendly solutions. Hence, the centre demonstrates that a shopping mall can be sustainable in both construction and operation while remaining attractive

to shops and customers. The green standards at Fornebu S are the result of the best use of sustainable design and environmental functions, and have led to a green flagship project and future-proof building.

AN ENERGY-PRODUCING KINDERGARTEN

A connective and robust architectural design provides the new energy-plus kindergarten Solbyen Kistefosssdammen with a unique spatial concept. It enhances movement, stimulates curiosity and encourages physical activity.

Passive and technical solutions merge seamlessly with architectural design and spatial solutions in an integrated symbiosis. The new building for the kindergarten Solbyen Kistefosssdammen is energy self-sufficient and produces in fact more energy than it uses. The kindergarten is part of the Norwegian FutureBuilt programme, which is a major collaboration scheme among three municipalities in the Oslo-region. FutureBuilt has a grand scale vision of demonstrating the possibilities of creating carbon neutral buildings with outstanding architectural qualities.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

High ceilings and natural daylight

A particular focus point for the building project is to secure a healthy indoor climate. Although much attention has been paid to advanced indoor climate technologies, the aim is to strike the perfect balance between these technologies and an exciting architecture creating a stimu-

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

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| <p>01 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety | <p>06 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ Flexible design, adaptable materials |
| <p>04 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product ✓ Material emissions | <p>09 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| <p>05 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions ✓ Industrialised production | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ Attractive outdoor facilities are crucial for children at all times of the year [Christensen & Co].

lating and flexible environment for the children and the staff.

Bright and high-ceilinged rooms with north-facing skylights invite the daylight and provide the indoor environment with an exceptional character even in the winter. The layout and various spaces stimulate children's learning and development, but also support comfortable acoustics and natural ventilation. With wood's ability to absorb moisture from the air and release it again, the massive

wooden elements in the building will also contribute to a comfortable indoor climate.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

'Plus-House for Power-Kids'

This was the title of the winning project in the architectural competition for Kistefosdammen Kindergarten designed in accordance with the Energy+ concept. Plenty of initiatives have been taken to minimise the

nursery's energy requirements, ensuring effective systems and exploiting renewable energy. An overall sectioning of the ventilation and heating system optimises the use of fresh air, heating and lighting matching each department's usage pattern. Added to this is a compact building design, natural lighting, solar panels and the utilisation of geothermal energy via underground ducts. Bottom line: a building that produces more energy than it consumes.

BASIC PROJECT INFORMATION

Project

> Solbyen Kistefosdammen Kindergarten

Client

> Asker Municipality
www.asker.kommune.no

Principal design contact

> Christensen & Co
www.christensenco.dk

Location

> Oslo, Norway

Building type

> Institution, new construction

Project stage

> To be completed in 2017

Gross area

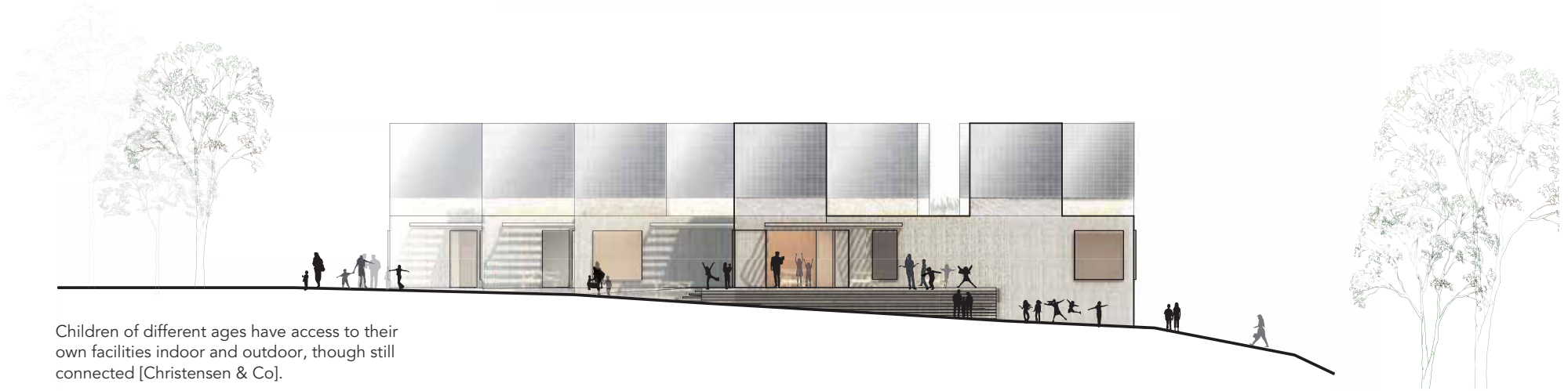
> 1,360 m²

Local neighbourhood

> Suburban area

Certification

> Passive House standard
> Aiming at BREEAM NOR 'Very Good'



Children of different ages have access to their own facilities indoor and outdoor, though still connected [Christensen & Co].

The roof's distinctive design is also a key element in the building's energy design. The flat green areas of the roof surface will have a positive effect on the lifespans of the roofing materials. Rainwater is naturally stored in open reservoirs, where it helps to cool the building and surroundings in hot weather. The tilted skylight areas of the roof supply the building with three times more light on days with overcast skies, than a vertical window could provide.

Healthy, robust and sustainable

The materials used to build Solbyen Kistenfosdammen are all healthy and sustainable, both with regard to manufacturing and construction, and with regard to the subsequent use, maintenance and later disposal. Wood is the predominant building material for

construction as well as for interior surfaces and façades. The foundations are made of concrete, and the floors covered with linoleum.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

A small Nordic village

The Norwegian and Nordic building tradition is clearly reflected, both in the choice of natural materials and in its scale and well thought functions. Though the kindergarten is a large building, it resembles a small village, inviting, connecting and robust. The predominant use of wood is traditional, but in a modern design, meeting all aesthetic, environmental and energy requirements.

Simple construction on site

The elements supplied for the building are 98 percent ready for use. They arrive at the construction site by truck and are immediately set at the right spot in the building. The procedure provides an opportunity for optimisation of the construction process and reduces resource consumption as well as construction period. The items involve only simple and inexpensive joining of construction elements such as bearing walls and roof elements and fixing of technical installations.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Walls can be moved

The inner walls are easy to move or replace and can be put where needed

in the kindergarten or be kept for future use. The compact geometry can easily be adapted to new functions. Also, the unheated transition zones between indoor and outdoor add flexible space to the daily activities in the kindergarten.

Both indoor and outdoor constructions and materials are selected for their robustness and low maintenance. The playground areas are to a large extent covered with grass, and there are areas and paths with hard surfaces for bicycle racing, running and other activities.

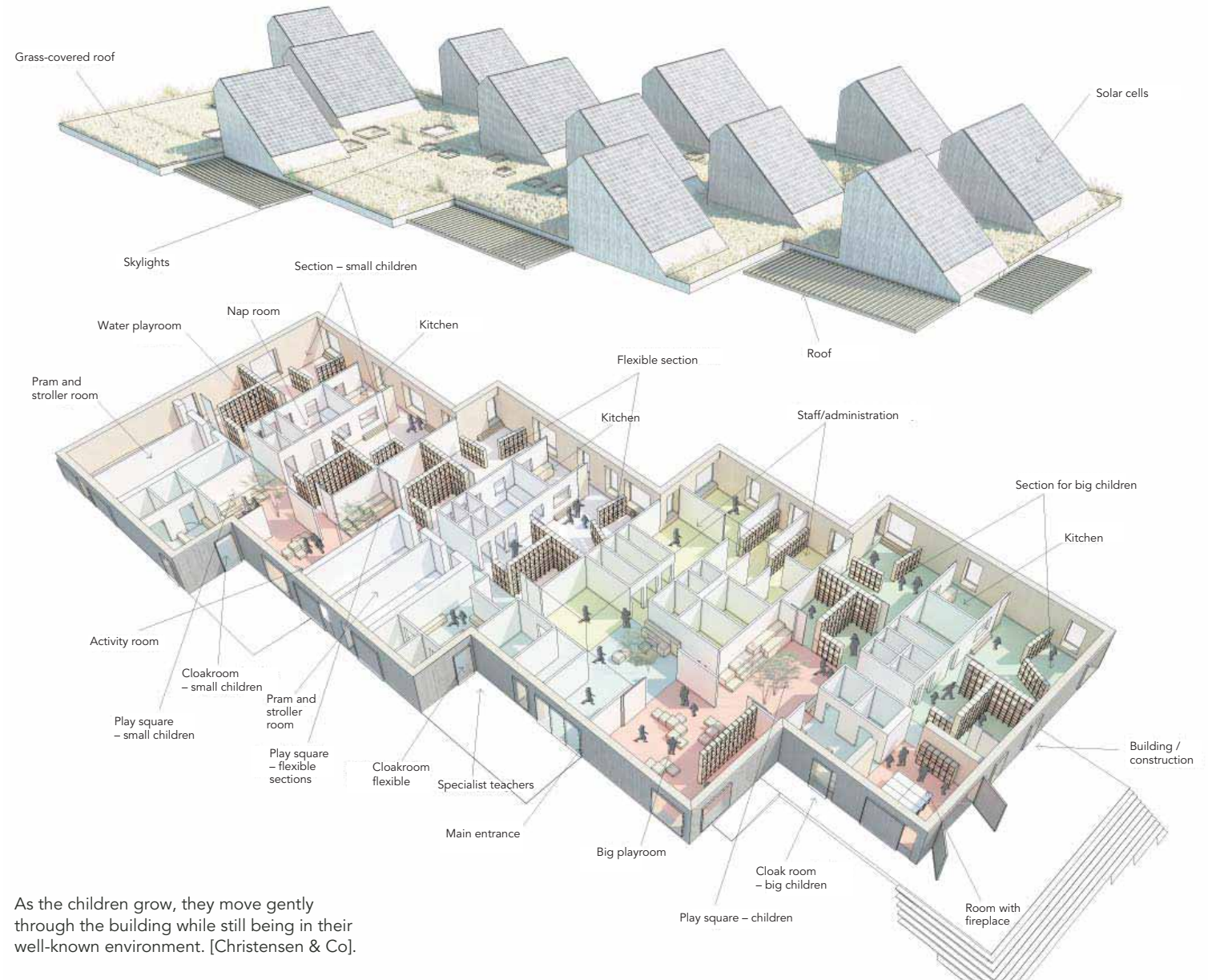
09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Value to the industry

Throughout the development of the project, there has been a continuing emphasis on solutions providing not only value to Solbyen Kistenfossdammen, but to kindergarten design as such. All technical installations are in the roof to allow as much free floor space as possible. The roof modules are suitable for prefabrication and designed as separate products that can be used for new buildings and for renovation.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

Solbyen Kistenfossdammen Kindergarten is both an interesting and exciting resource efficient project. The project successfully merges and integrates environmental, social and architectural design solutions so that the building appears as an integral whole. Hence, an interoperable architectural design combines architectural, environmental, structural, and technical measures enabling the creation of synergies covering social, economic and environmental sustainability.



As the children grow, they move gently through the building while still being in their well-known environment. [Christensen & Co].

A SHOWCASE FOR SUSTAINABLE OFFICE BUILDINGS

Atmosphere, effectiveness and flexibility are key words for the office building on Østensjøveien 27 in Oslo, which meets tomorrow's requirements for a modern workspace. The project integrates fascinating architecture and energy efficient design with functional office solutions.

Østensjøveien 27 is centrally located at Bryn in Oslo. It houses the headquarters of NCC, who rents about half the area. Several tenants occupy the remaining office space. Since its completion in 2013, this modern passive house has stood out as one of Norway's spearhead projects in sustainable construction.

The list of innovative and green features is long. In particular, the project has focused on minimising material use, selecting CO₂-friendly building materials and designing a spatial layout. The result is a compact building form and optimised geometry.

The building consists of two six-storey office wings, and includes an unheated basement level with car and bicycle parking, storage and technical space. A glass-covered atrium connects the wings with cubical meeting rooms cantilevered into the atrium thus giving the effect of plenty of activity. The office areas lie round the atrium and are a mixture of open office landscape and individual offices. The external permanent solar

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ Flexible design, adaptable materials |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Collaboration models and innovative business models |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product ✓ Material emissions | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ Open and bright working spaces and meeting areas [kolonihaven.no].

shading contributes to the character and identity of the building. The façade also functions as a solar shelf, reflecting daylight deeper into all floors and offices. Additionally, the building offers training facilities on the first floor as well as bicycle parking inside and outside.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Open space community

Østensjøveien 27 is characterised by its open and inviting space. Corridors and traditional closed offices are replaced by open floors with various office landscapes. The central atrium of the building provides extra break-out space, informal meeting areas and access to the courtyard open to the public. In addition, the atrium ensures visual connection between workplaces in the wings. A staircase winds its way up through the atrium, so the users experience contact with the individual office floors.

The building includes the surrounding urban space as part of its spatial qualities. At the same time, it reaches back by opening up to the city so the in-house activities enrich city life.

Maximising daylight in-take

An important sustainable initiative has been to utilise daylight as a parameter in the design of the façade and

BASIC PROJECT INFORMATION

Project

> Østensjøveien 27

Client

> NCC Property Development AS
www.ncc.no

Principal design contact

> Henning Larsen Architects
www.henninglarsen.com

Location

> Oslo, Norway

Building type

> Offices, new construction

Project stage

> Completed in 2013

Gross area

> 13,500 m², 6 levels + parking basement

Local neighbourhood

> City centre

Certification

> BREEAM 'Very good'

calculation of energy use. Daylight and shading from neighbouring buildings were the basis for designing the shape and structure of the façade. The façade's light shelves constitute the integrated energy design by increasing daylight penetration deeper into the building and optimising utilisation of floor space. Conse-

<< quently, the daylight design ensures low energy consumption for lighting as well as a good thermal and optical indoor climate and user comfort.

Accessibility and mobility

The nearest metro station is only 350 metres from Østensjøveien 27. There are excellent bus connections not far from the building coupled with easy access to the bicycle network. The building has 72 parking places, of which at least 20 are prepared for electric cars.

The building allows for an overall active lifestyle. It facilitates cycling with 100 lockers and 120 bicycle parking places inside and out. A fitness room and shower facilities are centrally located at the main entrance.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Sustainable energy

In terms of energy supply, the ambition of the project was to find a sustainable alternative to fossil fuels. The best solution turned out to be a win-win situation on many levels: Waste heat from the neighbouring production facility, Nordox, which produces additives for marine paint, is sufficient to cover 100 percent of the annual

► The external solar shading is also the building's signature [kolonihaven.no].

energy demand for space heating (through ventilation) and hot water.

Based on the cradle-to-cradle philosophy, waste is in that way used as a resource: The building gets heated, the production facility receives an income from their waste heat, and it leaves a zero impact on the environment as there are no carbon emissions in the building's operation phase.

All in all, energy consumption has been reduced by 55 percent and greenhouse gasses by 60 percent compared to a reference building.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Recreational space

Østensjøveien 27 takes into account urban nature elements and access to recreational areas. A roof terrace on the sixth floor along with the large courtyard adjacent to the canteen to the south provide outdoor facilities on the premises. Additionally, the open and green courtyard is a new place of refuge in the city.

Inside the building, the heated atrium makes an impression of 'outdoor' interior breakout space during winter



due to daylight and volume. In this way, the atrium improves natural ventilation, provides light, and enhances areas.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Minimising carbon footprint

Overall, the project has worked to minimise embedded carbon in the building itself and in the building materials. Several initiatives have been undertaken in order to reduce greenhouse gas emissions. The building's compact form and simple geometry

constitute a pivotal variable as material quantity and use is reduced. The optimisation of the static system and outer wall constructions combined with prefabricated façades also resulted in reduced material use and wastage. Finally, low-carbon concrete and recycled steel have been used in the load-bearing structure.

Environmentally responsible purchasing contributes to reducing the carbon footprint. As for the interior, the building is furnished with jointly purchased environmentally sound furniture. And several tenants have

their own environmental ambitions for using the building.

Documented material use

Being BREEAM certified, Østensjøveien 27 meets environmental and indoor climate requirements for materials. This means that the building has implemented greenhouse gas accounting, obtained Environmental Product Declarations (EPDs) and documented that materials do not contain hazardous substances. All materials used in the building are chosen according to BREEAM and is evidenced by the collection of EPDs, emission tests and ECO product analyses. In 2013, the building received the FutureBuilt prize.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Nordic design traditions

The architecture reflects indeed the Nordic design traditions – focusing on openness, transparency and functionality in combination with high architectural standards.

06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Flexible building

As a municipal regulation requires



that a proportion of the industrial area in the district can be turned into a housing area later on, the design allows the building to be converted into residences should the necessity arise. As a result, the chosen open planning and the building depth can easily be adapted to residential purposes. Additionally, extra lift shafts are in place, so that the building is ready for a changed use of the building in the future.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Integrated Energy Design

Sustainable solutions have been incorporated through Integrated Energy Design (IED). IED is a prerequisite for achieving high performance energy-

efficient buildings. The design process identifies the right design premises and goals involving a wide range of professional skills from the very start.

For Østensjøveien 27, the IED in fruitful combination with a functionality analysis has been crucial to the building's final form and layout, organisation of functions, position of windows, etc. Interdisciplinary collaboration and close dialogue among the project developers, contractors, environmental and energy engineers and architects have been important to support the IED, for understanding the meaning of various measures and to ensure that the right evaluations were made prior to final decisions on the project.

Promoting sustainable transport

To promote sustainable means of transportation to and from the workplace, the tenant has prepared a

◀ The layout in office is a 'dance floor' open office where meeting rooms and individual offices can be arranged [Henning Larsen Architects].

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mobility strategy that will introduce measures that motivate greater use of public transport and bicycle commuting. The plan is to introduce higher travel reimbursement for using public transport versus travelling by car. The introduction of mileage for travel by public transport is believed to be an offer that many will avail themselves of, as additional parking on site is expensive. Moreover, the tenant has established an electric 'car pool' with three cars that can be booked online through Outlook.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

Østensjøveien 27 is a showcase project integrating social, economic and environmental sustainability in the Charter spirit.

The remarkable and innovative sustainable features manifest themselves especially in the strategies for low energy consumption and passive house standard (energy class A rating), daylight usage, CO₂ reductions in construction and operation of the building, flexible design and selection of solutions with high robustness, long life and high reliability.

GREEN URBAN LIVING

When Greenhouse Augustenborg in Malmö is ready for tenants in 2016, Sweden can add yet another sustainable building to its stock. The building will add new innovative space to the social housing estate.

Greenhouse Augustenborg is a social housing estate aiming for greener and more climate-smart everyday living. It is a spearhead project for developing sustainable housing. In particular, it is innovative in its approach to energy use, incorporating the use of environmental techniques, urban gardening as well as creating inspiration for a modern, healthy life style and social cohesion.

Approaching the project with a holistic view, MKB Fastighet AB - the social housing provider – aims to achieve high environmental standards while at the same time achieving long-term financial goals. The project is a continuation of the Augustenborg Eco-city urban sustainability project that seeks to turn the estate into a more socially, economically and environmentally sustainable neighbourhood.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

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|---|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high-level experience | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS - BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ High quality solutions |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Collaboration models and innovative business models |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase ✓ Embedded carbon in product ✓ Material emissions | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ A shared garden and glass dome on the lower roof take greening of a building an extra step [Jaenecke Arkitekter AB].

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

A green lifestyle

Greenhouse Augustenborg provides its residents with the opportunity of a green and sustainable lifestyle without having to move out of the city or compromising comfort. All the flats in the building are of modern standard with access to fresh air via balconies

and shared roof terraces. The partly glazed balconies, gardening workshops and shared facilities provide unusual amenities compared to similar social housing complexes, and support social life in the community.

Climate-friendly transportation

Based on the vision of promoting a healthier and climate-friendly lifestyle, Greenhouse focuses on facilitating

the best possible conditions for residents to get to and from the building in an environmentally-friendly manner.

The building offers an easily accessible and functional bicycle storage with a maintenance area where residents can pump up the tires, raise saddles, fix punctures and lubricate chains. Also, carrier cycles can be rented for bulk purchasing. Bus and

BASIC PROJECT INFORMATION

Project

> Greenhouse Augustenborg

Client

> MKB Fastighets AB
www.mkbfastighet.se

Principal design contact

> Jaenecke Arkitekter
www.jaenecke.se

Location

> Malmö, Sweden

Building type

> Housing, new construction and retrofitting

Project stage

> Expected completion in 2016

Gross area

> 8,500 m²

Local neighbourhood

> Urban area

Certification

> Miljöbyggnad - Gold
> Passive House standard



▲ Terrace and outdoor kitchen in one of the twelve terrace housing units. Rainwater is trapped for watering [Jaenecke Arkitekter AB].

train stops are near at hand, and there will be a car pool providing electric vehicles (EDVs). Parking space for traditionally fuelled vehicles is therefore reduced.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Social and environmental dimensions

The Greenhouse project integrates several social and environmental dimensions in its overall sustainability

concepts. The building takes into consideration local requirements for high standard housing payable for average incomes while also conforming to future-proof environmental aspects. All materials used for Greenhouse Augustenborg will meet long-term sustainable standards, including the products' life cycle and the manufacturing process.

An item of study

Greenhouse is also an item of study, research and inspirational visits. Being located in the Eco-city area, the social housing provider MKB offers guided tours and field trips to the Eco-city and the botanical roof terrace – and students are welcome to do work around the area. In addition, a research project financed by the Swedish Energy Agency will monitor the operation phase of the building in terms of both social and environmental performance. The studies will examine whether and how the Greenhouse housing solutions have an effect on the residents' behaviour, and whether and how the inflow of daylight has been affected by the environmental classification.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Fostering urban gardening

Green is an integrated part of both the shared and private spaces that contribute to the building's architecture and urban environment. Greenhouse seeks to foster urban gardening throughout the building's green areas. All of the building's 14 floors offer opportunities for cultivation and for frost-free winter storage of plants. Each flat has a 22 m² balcony with specially designed plant boxes so that residents can grow their own vegetables.

The flats are similarly equipped with a gardening workshop that can be used to manage the planting of plants, pots, soil and tools. The floor plan provides direct access to the plant workshop from the building's two lifts.

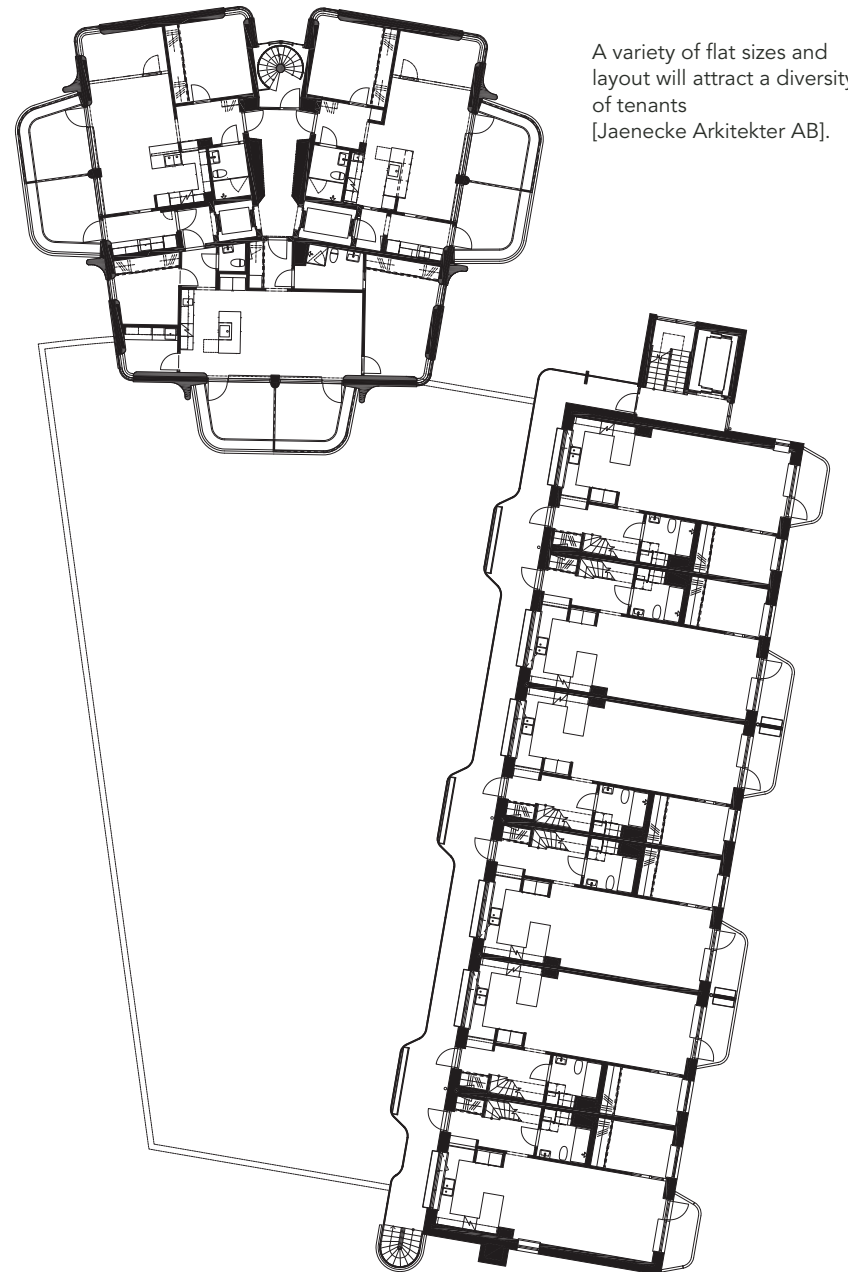
The building is designed to provide even the east and west-facing balconies with as much exposure to sunlight as possible to increase the gardening opportunities for most of the year. In addition, the roof terrace has allotments of over 200 m². A dome-shaped greenhouse is a natural meeting point, but it also provides an opportunity to grow exotic crops. Both the private as well as shared break-out space in glass covered areas extend the outdoor period.

Urban gardening communities

Two seven-room flats have been set aside for student gardening communities. The students take care of outdoor maintenance and serve as gardening coaches to other residents. All the tenants can take part in caretaking as part of MKB's self-administration model, an excellent way for the tenants to strengthen their sense of community, influence their living environment and to some extent reduce their rent.

Respecting local biodiversity

When designing the building's green



areas much emphasis has been put on creating a varied vegetation, which supports local biodiversity and attracts pollinators, i.e. insects and birds. Special attention has been given to species that today have difficulty finding food in the dense city, and so berry bushes and fruit trees form a framework for the roof garden's plant beds.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Smart energy-reducing solutions

Not only does the Greenhouse provide good conditions for a sustainable, green lifestyle, it is also a building designed to consume as little energy as possible during its construction and operation.

The residents can monitor their consumption of hot water and electricity as well as the building's total waste through an e-reader in their home. The e-reader also provides information as to whether solar energy is available. A convenient home/away button on the flat door lets the home 'rest' while residents are not there, and so the ventilation goes down and the lights go out. In kitchens and bathrooms, the electrical outlets are connected to timers configured for two hours.



Green electricity

The building produces its own eco-friendly power with 200 m² roof-mounted solar panels. With a single power account for the property, MKB can guarantee that all power in businesses as well as in households is green. When the solar electricity produced on the building is insufficient, electricity based on wind power is used instead.

▲ Large balconies offer open and glazed space for vegetables growing and relaxation [Jaenecke Arkitekter AB].

Materials

As part of being Miljöbyggnad certified, all built-in materials have been assessed and chosen on the basis of their environmental impact from a life cycle perspective. Product declarations have been collected and saved in a logbook. For instance, environ-

mentally-friendly concrete and substitution of hazardous or non-recyclable materials are ways of minimising carbon and other environmentally-negative impacts.

For this reason, the municipal kindergarten located at the ground floor of the Greenhouse has been designed completely without hazardous substances.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Intelligent and user-friendly installations

As previously mentioned, the design of the building and installations supports sustainable living through intelligent energy-reducing solutions. To some extent, the building is designed to act sustainably by itself, making it intuitive and easy for the tenants to optimise energy consumption and manage correct waste sorting through the home/away function and the e-reader in each flat. Also, the laundry room is a modern facility with energy-efficient machines and environmentally-friendly detergents. Machines can easily be booked using a mobile phone, a computer or the flats' e-reader.

06. IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Robust and sustainable materials

All materials used in Greenhouse Augustenborg are of high quality, with aesthetic value, the least possible environmental impact, robust and with low maintenance, e.g. façade materials in white concrete, brick and glass and stairwells with tile floors and concrete walls with banisters in oak and wrought iron.



◀ Greenhouse will become the landmark of Augustenborg Eco-city. [Jaenecke Arkitekter AB].

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Lean collaboration

To keep production costs at the same level as the rest of the housing estate, MKB integrates principles from Lean Construction into the design and construction process. As part of the lean work, BIM (Building Information Modelling) has been utilised by the project's planners and the main contractor in a partnering project. The models were used, for instance, as a base for communication at meetings, 3D coordination, cost calculations, planning of logistics and workplace disposition.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Exportable design solutions

Housing blocks like the ones in Augustenborg are found all over the world. This makes the design solutions of Greenhouse reproducible and scalable. The integration of sustainable social housing comprising a

<< variety of flat sizes - from one bedroom to shared flats for up to six students - with community facilities such as a kindergarten and cultural facilities, could prove to be very useful to similar urban areas.

Once the research project is completed, it will provide solid documentation of the actual social and environmental performance of the project. This again may support adaptation and adjustment of design solutions for other local environments.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

Greenhouse is a unique project that manages to incorporate both social, economic and environmental sustainability in its overall design concept – despite being governed by the strict economic framework of social housing.

Being a social housing project as well as a kindergarten and cultural centre the project's social sustainability has been a key design parameter. Additionally, the municipality's Eco-city urban sustainability project is well-reflected in Greenhouse as it integrates innovative solutions for a green and climate-smart lifestyle with environmentally-friendly material use and state-of-the-art production technology.

AN AESTHETIC MEETING PLACE

Aula Medica is the new signature building at Karolinska Institutet, Sweden's leading medical university. Aula Medica is built to meet the university's need for hosting lectures as well as large international events like Nobel lectures. It is also the everyday meeting place for students, researchers and the public.

Karolinska Institutet's newly constructed Aula Medica is an impressive building, with an auditorium that can host no less than 1,000 people. The auditorium is built to meet the world class university's need for its own premises for seminars, lectures and for hosting major events on its Solna campus.

While wooden materials generally dominate the interior with a beautiful, Nordic touch, the spectacular façade appears in steel and glass. The auditorium is built with high standards of acoustics, fire safety and accessibility. The result is an aesthetic building and an inviting, open auditorium, stimulating two-way communication.

The energy efficient Aula Medica is environmentally certified according to both Green Building and the Swedish Miljöbyggnad.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Collaboration models and innovative business models |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions ✓ Industrialised production | |



▲ With its magnificent curved glass façade, Aula Medica will be a landmark for Karolinska Institutet [Tord-Rikard Söderström].

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Unique and spacious

Karolinska Institutet had long wished for a conference hall with the possibility of assembling large numbers of students and scientists. When the world class university was created in the 1940's, no large auditorium

was built and none had been added since. This changed in 2013 when the new auditorium, Aula Medica, was completed. The auditorium with room for up to 1,000 people and additional meeting facilities create a dynamic environment allowing researchers and students to meet for lectures and the execution of scientific symposia.

With its central location along Solnavägen opposite the new Karolinska Universitetssjukhuset, the geometric lecture hall complex of Aula Medica opens up the campus Solna area to the main public thoroughfare. Though the building has an eye-catching curved and slightly crooked façade, it merges with its surroundings in a natural and respectful way. In addi-

BASIC PROJECT INFORMATION

Project

> Aula Medica

Client

> Akademiska Hus
www.akademiskahus.se

Principal design contact

> Wingårdh Arkitektkontor AB
www.wingardhs.se

Location

> Solna, Sweden

Building type

> Mixed use, new construction

Project stage

> Completed in 2013

Size

> Approximately 13,700 m² in 7 floors

Local neighbourhood

> University campus area

Certification

> Miljöbyggnad Silver
> EU Green Building

<< tion, it points to the future with its rich palette of facilities and focus on indoor climate.

The lecture hall complex provides a unique and spacious environment conducive to innovation. Triangular glass panes covering the façades cast tessellated patterns of light on the floors inside and reflect light onto the surrounding paving. The large windows facing both east and west open up the auditorium to the sunlight. Harmonious colour schemes and the extensive use of wooden surfaces create an intimate and calm atmosphere.

Much attention has been given to creating an auditorium that amply supports its intended functions. The auditorium's shape as an amphitheatre and the slots in the rear wall create proximity and good acoustics and makes it possible to speak to a packed auditorium without speaker support.

Opening up to the public

Aula Medica is a signature building for Karolinska Institutet. Almost 40 percent of all medical research in Sweden takes place at Karolinska Institutet, and the annual Nobel lectures in medicine and physiology attract people from all over the world. While the university previously lacked premises to arrange these public activities, Aula Medica helps convey the

message that Karolinska Institutet is a world-class university.

Besides the unique and spacious auditorium, Aula Medica also houses offices and conference rooms, as well as a restaurant and a large foyer area with an exhibition area and a café open to the public. By opening the building up to the public, Aula Medica not only provides a meeting place that benefits Karolinska Institutet, it brings value to the entire Stockholm region and all of Sweden.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Preventing the cold from penetrating

Much thought has been given to minimising Aula Medica's energy consumption through an effective insulation solution and an energy-efficient climate-shell. The façade consists of 6,000 triangular glass panels mounted on the outside of a structural glulam frame, a construction that has the advantage of being very tight. In addition, the wooden frames have the ability to stay warm and pleasant, thus preventing the cold from penetrating.

The glass panes in the façade consist of alternating transparent and opaque glass. The glass panes that are not transparent contain 5 centi-



▲ Though made of glass the façade is still energy efficient [Tord-Rikard Söderström].

▼ The interior is dominated by Nordic wood species [Patrik Lindell].



metres thick vacuum insulation with the same thermal insulation capacity as 30 centimetres of mineral wool. The roof of the building is covered with sedum plants placed on a special mat, which among other purposes insulates the building and saves energy. Heat losses and thermal joints were calculated by using energy models for high performance, and showed that the average value for the construction is 0,46 W/m²/K, which is excellent for a building envelope primarily made of glass panels.

Low energy demand

An environmental programme was made to ensure a green building. The programme consisted of objectives, requiring both an innovative and a holistic approach to the project. Energy efficient solutions were developed through life-cycle cost analyses. The environmental programme has led to the fact that Aula Medica now has a primary energy demand of 73 kWh/m² year, an energy saving of 29,10 percent in comparison with the reference value of 103,99 kWh/m² year in Sweden's Boverket building regulations. The considerable reduction in energy consumption, in comparison to the reference value, has led to an EU Green Building certification for Aula Medica. The installed power for lightning in the building is less than 8 W/m².

Aula Medica is supplied by district heating, which includes comfort heating, and services hot water. The purchased heat is transferred to the building's energy centre, which mainly consists of a heat exchanger and a control system. Outdoor air entering air handling units is first preheated by energy recovery from the warm return air. Cooling is purchased from district cooling, and the ventilation system is equipped with heat recovery (80 percent of efficiency).

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Promoting two-way communication

The foundation donating the money for the construction of Aula Medica wanted the building to have a Nordic look. In the effort to provide a Nordic atmosphere to the setting, spruce has been used extensively in the structures and surfaces of the building.

The Nordic atmosphere is also reflected in lay out of the auditorium. Though the conference hall is large, the architect has strived to ensure that the distance between speaker and audience is short to promote two-way communication. The same mindset of bringing people together and promoting communication lies behind the building's facilitation of

merging researchers, students and the public.

Elements assembled on site

Several elements of the building process of Aula Medica are well suited to industrialised production. The components used for the entire façade of Aula Medica are prefabricated and assembled on site. The assembly of both glulam constructions and glass elements is a 'dry', mechanical process, which supports health and safety on site, as well as producing minimum waste. In addition it shortened the construction period as there was no subsequent drying period.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

A collaboration contract

To design and build Aula Medica with its impressive design has been a journey filled with challenges. Interdisciplinary partnerships have been an important prerequisite for meeting the expectations. The building project was carried out as a collaboration contract, corresponding to a partnering model. All parties involved in the project have jointly resolved construction assignments through open and trusting cooperation with

the professional skills of the involved parties complementing each other.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Wood as a key component

Central to the construction of Aula Medica is the use of Austrian glulam made from conifer. In addition to being a sustainable and durable material in plentiful supply, wood also has other advantages. A wooden frame, as used in the construction of the façade, weighs only a third of what a concrete carcass would weigh, which affects the transport required for material. The interior is also dominated by oak wood, adding a beautiful, Nordic touch to the building. The Swedish Government has signalled that it wants to see greater use of wood in construction. The Forest Kingdom vision run by the Swedish Ministry for Rural Affairs since 2011 has wooden construction as a key focus area.

International certification

Aula Medica has been certified at level Silver in accordance with Swedish Miljöbyggnad and EU Green Building, meaning that the building meets requirements for energy efficiency, healthy materials, quiet indoor environment, good ventilation and high moisture resistance.

THE WORLD'S FIRST CLIMATE POSITIVE DATA CENTRE

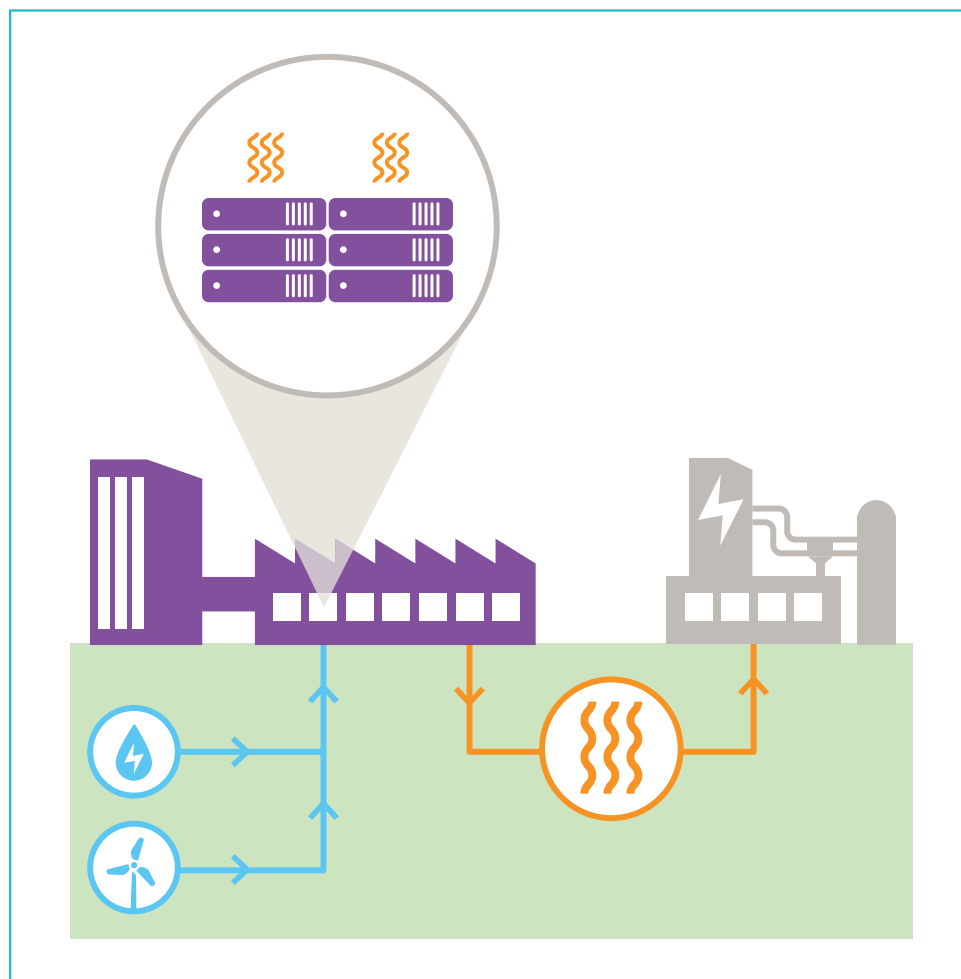
The new EcoDataCenter in Sweden reduces more carbon emissions than it produces. By integrating the data centre with the local energy system and ensuring an energy supply from sustainable sources, EcoDataCenter has managed to become the world's first climate positive data centre.

Situated in the city of Falun, Sweden, the newly constructed EcoDataCenter is the world's first energy-positive data centre. EcoDataCenter is a colocation data centre for customers with mission critical data requirements. Hence, security and reliability are key words for the centre.

The owner of EcoDataCenter, EcoDC AB, wanted to be more than just another data centre providing its core services to a fast growing market. It has managed to reduce more CO₂ than it produces through the sustainable sourcing of required power. It has entered into a partnership agreement with the local energy company, Falu Energi & Vatten, so that it can exchange excess energy either way, depending on the seasons and requirements. By doing so, the two companies have proved that with a bit of smart thinking energy savings, cost cuttings and reliability can walk hand in hand.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

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| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Collaboration models and innovative business models |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Interdisciplinary teams | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable ✓ Export potential |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase | <p>O10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Provides heat for the local area

Today, the information and communication technology sector consumes up to ten percent of the world's elec-

tricity. There are currently more than three million data centres globally, and a single data centre can easily use more electricity than a mid-sized town. Most of the power supplied to a data centre is, however, not actually consumed in the data processing. In-

◀ Winter season: The data centre supplies Falun District Heating. During summer excess district heating converts to power for EcoDataCenter [Sustainia 100].

stead, it is released as heat into the atmosphere, contributing to global and local warming and leaving negative impacts on the local environment.

EcoDataCenter's contribution to sustainability and quality of life lies, so to speak, outside its premises. While providing the world with one of the most secure and effective data centres, EcoDataCenter in addition offers digital communication to its clients in a climate-friendly way.

By integrating the centre with the present energy network, the symbiosis between the data centre and the municipal energy system allows the city of Falun to significantly reduce noise, carbon emissions and air pollution from fuel based energy production. Thus, EcoDataCenter contributes to helping Falun reach its vision of ensuring that all district heating stems from renewable sources by 2020.

Minimal impact on nature

Only limited areas of forest have been cut down to establish the construction site, and the roof is covered by Swedish grown sedum plants. Once construction is completed, the data

BASIC PROJECT INFORMATION

Project

> EcoDataCenter

Client

> Falu Energi & Vatten
www.fev.se

Principal design contact

> SWECO Architects AB
www.swecogroup.com
> Nordisk Kombination Arkitekter AB
www.nkark.se

Location

> Falun, Sweden

Building type

> Offices/data centre, new construction

Project stage

> Completed in 2015

Gross area

> 23,250 m², three buildings

Local neighbourhood

> Industrial area

Certification

> Aiming at LEED Platinum

<< centre will blend in with the terrain. A new access road from the main road and a new cycle path will connect the town of Falun to the centre.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Retaining a high security ranking

The designers and Schneider Electric have collaborated on developing energy efficient security solutions for the EcoDataCenter, while retaining its high security ranking. In terms of requirements for the data centre's infrastructure, the centre has, as one of 13 data centres in the world, attained a Tier IV certification, the most stringent level, from the Telecommunications Industry Association.

LCA and LCC tools

The building concept of EcoData-Center is a result of thorough life cycle assessments of design and building materials. The life cycle design tool has been a prerequisite for being able to build a sustainable facility that can provide customers with a secure and climate-friendly solution. Efforts have been made to cut costs without any negative effect on the environment.



04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

A holistic energy concept

A key element is the optimisation of the centre's energy consumption by minimising energy requirements and optimising installations. The centre uses a range of energy efficient systems and products that help minimise cooling requirements. The technical

▲ EcoDataCenter, Falun power plant and Falun city form a sustainable unity [SWECO Architects AB].

installations have led to a decrease in the internal power losses by about 70 percent.

To take the energy concept a step further, much focus was put on energy production and sourcing issues. All

power in the data centre comes from renewable sources, mainly hydro-power. By placing the data centre next to Falu Energi & Vatten's combined heating and power plant, it was possible to integrate the centre and the local energy system. The Falun heating and power plant was praised in 2013 by the Global District Energy Climate Award as one of the world's best energy systems.

During the cold season, all waste heat in the data centre is reused through the local district heating system to heat Falun by steam-driven absorption heat pumps. When it is warm, waste heat in the power heating plant is used to cool the data centre by steam-driven absorption chiller.

Overall, the energy expenses in operation are estimated to be 20–25 percent lower than a conventional data centre.

A positive impact on the environment

Climatic conditions in Sweden are extremely suitable for large scale data centres, as the cooling of equipment is 'free' from October to April. By vaporisation, the sedum roof helps keep the building cool in the summer. The colours of the building were chosen to be as energy-smart as possible.

Due to the fact that the building is a data centre, requirements for daylight are limited. Instead, focus has been put on efficient insulation and ensuring a high level of security, which is why the building is constructed in armed concrete.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Essential partnerships

EcoDataCenter is the result of an interdisciplinary partnership among several operators. It is based on a public-private partnership between the local energy company Falu Energi & Vatten and EcoDC AB.

The design of the building is the result of cooperation between two Swedish architect offices Sweco Architects and Nordisk Kombination Arkitekter AB. Their collaboration with Schneider Electric, responsible for the energy-efficient technologies and solutions in the project, was a prerequisite to integrating the building successfully into the local energy system.

A partnering agreement has been signed with Schneider Electric, Invest in Dalarna and Business Sweden. The partners have different areas of focus. While Invest in Dalarna is a locally oriented business development centre, Business Sweden focuses on making Swedish companies grow internationally and on attracting international companies to invest in Sweden.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

A unique exportable solution

Many solutions made for EcoDataCenter are applicable to other data centres. EcoDataCenter's close position to the power and heat production plant district heating infrastructure makes the project unique. However, the fast-growing market for data centres and other heat-producing plants could still benefit from the energy exchange concept, if other heat-requiring facilities are located nearby.

LEED Platinum

The building concept of the EcoDataCenter is a result of thorough life cycle assessments of design and building materials, which is a prerequisite to designing a sustainable facility. Much effort has been put into cutting costs without any negative effect on the environment. This in combination with its excellent energy performance enables EcoDataCenter to receive a LEED Platinum for the building concept.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT



EcoDataCenter is significantly more energy efficient and climate-friendly than regular data centres, because it integrates the centre with the district heating and cooling system. This has led to lower heating expenses for both the inhabitants of Falun and the data centre customers and a cleaner local environment. By creating a future-proof infrastructure, the centre contributes to a sustainable society.

PSYCHIATRIC CENTRE WITH HEALING ARCHITECTURE

Patients are put first in the new psychiatric rehab centre in Borås, Sweden. The new facility will provide a welcoming, healing and open environment with minimal traditional institutional characteristics.

The Psychiatry Quarters will be the new psychiatric unit at Södra Älvsborg Hospital in Borås. The project proposal won the international WAN Awards 2013 presented by the World Architectural News for the best future healthcare project. Openness and transparency permeate the design in a way that gives the impression of dignity and consideration. At the same time, a stimulating and friendly environment characterised by light, warmth and green are key elements supporting the patients' mental health.

The centre will consist of three interconnected buildings: The present building, a new building and an atrium building connecting the buildings and strengthening the links between them. Ambulatory treatment will take place in an existing, but renovated building nearby, while the new construction will house emergency cases and institutional care.

With a separate adult psychiatric section, an area for children and adolescents and a rehabilitation unit on the

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|---|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Involvement of high level experience | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Involvement of users and stakeholders |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban nature elements | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions | <p>O10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



▲ There is no resemblance of former psychiatric institutions in the Psychiatry Quarters [Paal-André Schwital].

premises, the project seeks to offer an inclusive public building reflecting respect, dignity and well-being for patients and relatives as well as therapists and nursing staff.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

People first

The architects behind the Psychiatry Quarters have followed a model they call 'architecture as medicine'. The design proposal puts the patients in focus by offering a welcoming, participatory and learning environment far from a conventional, institutional

architecture. In particular, the building makes patients, staff and relatives equal. They arrive through the same entrance and use the same facilities, such as the dining room and the atrium integrated in the building.

Freedom to choose

The building enables the patients to choose freely among different options for solitude and socialising. Various degrees of social situations can be chosen depending on the location – from a private room to the department's large dining room, the activity rooms or courtyard. The bedroom is the patients' private nest,

a single room with bath, a private balcony and windows overlooking surrounding green areas. Common rooms for socialising are dimensioned so that staff and relatives can spend time together with the patients.

Snuggled in green

The experience of greenery has been highly prioritised in the design, which is why the trees on the site will be preserved. While being located in an already exploited nature, the new building is designed to adapt to the site's natural slopes and take advantage of existing greenery. The contact with green surroundings aims to

BASIC PROJECT INFORMATION

Project

> The Psychiatry Quarters

Client

> Västra Götalandsregionen
Västfastigheter
www.vgregion.se

Principal design contact

> White Arkitekter
www.white.se

Location

> Borås, Sweden

Building type

> Health, new construction/retrofitting

Project stage

> Design phase, to be completed in 2019-20

Gross area

> 11,172 m²

Local neighbourhood

> Hospital campus area



▲▲▲ Visual calmness plays an important role in 'architecture as medicine' [White Arkitekter].

contribute to an increased sense of freedom and offer the recreational powers of nature.

Supporting health and safety

Basically, the premises are designed to provide an engaging, non-stigmatising and safe environment based on its bright, open and warm characteristics. As a result, the new premises gently instil normalisation into the patients and offer the staff an improved working environment.

The project team holds a reference to another remarkable facility, which has led their practise to formulate the 'architecture as medicine' model. Findings from here show a dramatic fall in patient sedations and use of physical restraints as well as a reduction in staff on sick leave.



02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Participatory development

Professionals and patients in the psychiatric rehab centre relate differently to the premises. With this aspect in view, the project has invited user organisations, health carers, doctors, nurses and patients to voice experiences, needs and wishes. This process has resulted in a building design that differs significantly from conventional hospital buildings.

Letting life in

The organic and compact building shape and the corridors along the façade are measures to get rid of the closed corridor-like feeling and to make the building easier to grasp and to navigate. The connecting atrium building will house several conferen-



ce rooms as well as a competence centre for students. This will enable healthcare and medical students to make in-house studies of the psychiatric rehab centre. By locating different functions such as check in, reception and café in the atrium, there will be a natural flow of people making the building seem lively.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Stimulating outdoor environment

From everywhere in the facility patients will have a view to the landscape – scientifically proven to accelerate healing. All patients have access to the outdoor environment, through courtyards or roof terraces. The outdoor environment offers both passive sense experiences and invites activity and physical exercise, while also stimulating social interaction.

For security reasons, some courtyards will be demarcated. To ensure that the patients do not feel trapped and enclosed by walls, the architects will use transparent materials for the demarcation to open up to the courtyards visually and towards the surrounding landscape.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Human scale design

The project's mantra is to create a homelike environment to make patients to feel safe and comfortable in the psychiatric rehab centre. Based on a human scale architecture, the new centre pays respect to the users and their needs. This is reflected, e.g. in the design of the atrium, which is only one storey high in contrast to many contemporary buildings with high-ceilinged atria. In this particular case it is important to maintain the human scale dimension that makes people feel comfortable and is natural to people.

07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Natural materials

Life Cycle Cost (LCC) and Life Cycle Assessment (LCA) are models that

are systemically used by the project to choose building materials with a low environmental impact and to add green values to the design. For this reason, natural and timeless materials such as stone, solid wood and plywood will be used as much as possible. Not only do these natural and renewable materials contribute to environmental sustainability, but they also contribute to creating a cosy and pleasant living environment.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Continuous user involvement

As early as during the competition phase in 2012, the design team involved future users of the centre. Health professionals, doctors and nurses participated in workshops and gave the team a deeper understanding of the users' needs. The workshops also helped identify barriers and challenges experienced by users in their current work environment.

The collaboration resulted in a number of focus areas that formed the basis for the design proposal. Based on the users' need and the notion to destigmatise the psychiatric service, the design presents what appears to be a small-scale building with a lot of

greenery, small and familiar rooms, opportunities for spending time outdoors and daylight maximisation.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Transferable design concept

The centre's new building will resemble a star. This shape allows the surrounding greenery to be drawn into

the core of the building, as there is lookout to the outside scenery from every wing in the building. What is more, natural light is able to enter deep into the building. The building shape offers various grades in the orientation of the building, which also creates different sun conditions during the hours of the day. Some patients may prefer bright light

whereas others seek a softer light. The building design demonstrates a great effort to use architecture as a parameter contributing to a healing process within mental health care - a model that has proved useful in similar contexts.

Inspirational project

The Psychiatric Quarters has already attracted attention internationally. It won the World Architecture Award in 2013 in the category Health Care Buildings. The jury was particularly impressed by the interweaving between form and function. Though not built yet, the building serves as an important model project. Representatives from different parts of the world have been in contact with the design team to learn by and get inspiration from the project.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

The project demonstrates that it is possible to achieve a free and open atmosphere for both patients and health carers by giving the buildings a friendly, respectful and welcoming character. While security aspects are always present, they are never allowed to drown the environment. Therefore, normality and destigmatisation are the keywords in the project team's work with the new psychiatric facility.



▲ Patients are grouped in small ward units [White Arkitekter].

A FLEXIBLE AND MODERN FACULTY

Thanks to its impressive size and combination of curves and straight lines, campus Ultuna's new Centre for Veterinary Medicine and Animal Science in Uppsala, is an eye-catching icon to the campus' many visitors. Here people and animals are gathered under one roof.

The VHC – Centre for Veterinary Medicine and Animal Science – provides lectures, tutorials and study groups for more than 1,000 students. The building also houses 700 employees and around 170 doctoral students. The large building contains research and teaching facilities, including animal premises, as well as a hospital for large and small animals.

The new VHC consists of six connected buildings. Yet they are easily distinguished from each other. The most noticeable part is the round main building with a façade generously glazed. The new premises were planned and built to facilitate future changes and needs, and so the two fundamental design parameters in the project have been to ensure flexibility and energy-efficiency.

By co-locating VHC's various activities, greater connectivity and collaboration among research, teaching and clinical activities are achieved. In this way, the building project is permeated by a striving for interactivity and flexibility to allow for optimal

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety | <p>O6 IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST</p> <ul style="list-style-type: none"> ✓ Flexible design, adaptable materials |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Interdisciplinary teams perform the building design and/or construction phase of the building | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Sustainable and local resources |
| <p>O4 ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE</p> <ul style="list-style-type: none"> ✓ Carbon emissions in operation phase | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Involvement of users and stakeholders |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



◀ A moment of relaxation in the courtyard promotes working and study life [Kjell Lundin].

conditions for science to thrive and develop.

01: MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Shared premises – meeting different needs

The new VHC building was designed to ensure functionality for all users in their everyday work as well as the efficient use of space in the shared premises: Teaching and research on the one hand and hospital treatment for sick animals on the other combined in one building complex.

The areas for students are imbued with life and movement, while the premises belonging to the animal hospital have a quieter atmosphere. Still, connections between the two ensure coherence.

All scientists, students and employees passing in and out of the building use the main entrance positioned in immediate connection to the square. When entering the main entrance, a beautiful, spacious atrium that is open all the way up to the top floor and full of natural light welcomes them.

BASIC PROJECT INFORMATION

Project

> VHC – Centre for Veterinary Medicine and Animal Science

Client

> Akademiska Hus
www.akademiskahus.se

Principal design contact

> Nyréns Arkitektkontor
www.nyrens.se

Location

> Uppsala, Sweden

Building type

> Education, new construction

Project stage

> Completed in 2014

Gross area

> 53,000 m², 1-4 levels

Local neighbourhood

> University campus area

Certification

> Miljöbyggnad Silver



The university animal hospital has its own entrance to avoid unnecessary stress for the sick animals and their owners. Similarly, two main routes run through the building, one for people and another for animals accompanied by people, thereby reducing the transport distances in such a large building.

Optimised indoor climate

Great emphasis is placed on providing a good indoor climate through

improved thermal, optical and acoustic solutions. Accordingly, the building has achieved Silver level certification in the Swedish Miljöbyggnad system.

The indoor climate is controlled automatically via the building's technical systems, and switches between economy mode and comfort mode depending on occupancy. Additionally, the lighting in common areas is automatic and presence-controlled

▲ Via the main entrance in the circular building students and employees are led to the entire building complex embracing the courtyard [Åke E. Lindman].

in order to save energy. All fluorescent lamps are equipped with high frequency ballast to avoid flicker-free lighting. To ensure a comfortable acoustic environment, the building has specially designed sliding doors that suppress noise very effectively.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Expert involvement

Right from the initial stages until the complex stood ready, stakeholder involvement has been a key activity. Mapping users' needs based on numerous investigations and surveys among students, teachers and researchers were vital input to the building program. Naturally, this continued during the design phases to ensure that the new facilities met all the requirements, e.g. very high protection against the spread of infection. In addition, close cooperation with the energy supplier, Vattenfall, resulted in a win-win energy concept.

04: ACHIEVES ZERO EMISSIONS OVER ITS LIFECYCLE

Green cooling system

Together with the Swedish energy company Vattenfall, which is one of Europe's largest energy suppliers, the building owner, Akademiska Hus, created a unique system of energy supply to VHC and the entire Ultuna Campus. The system provides 'green cooling' with minimal environmental impact. District heating in Uppsala is produced from waste incineration and power plant heat. During the

summer when cooling requirements are greatest and heating is unnecessary, cooling is produced using absorption technology, i.e. using heat as fuel rather than electricity. Cooling during the autumn, winter and spring is produced by using cold exterior air.

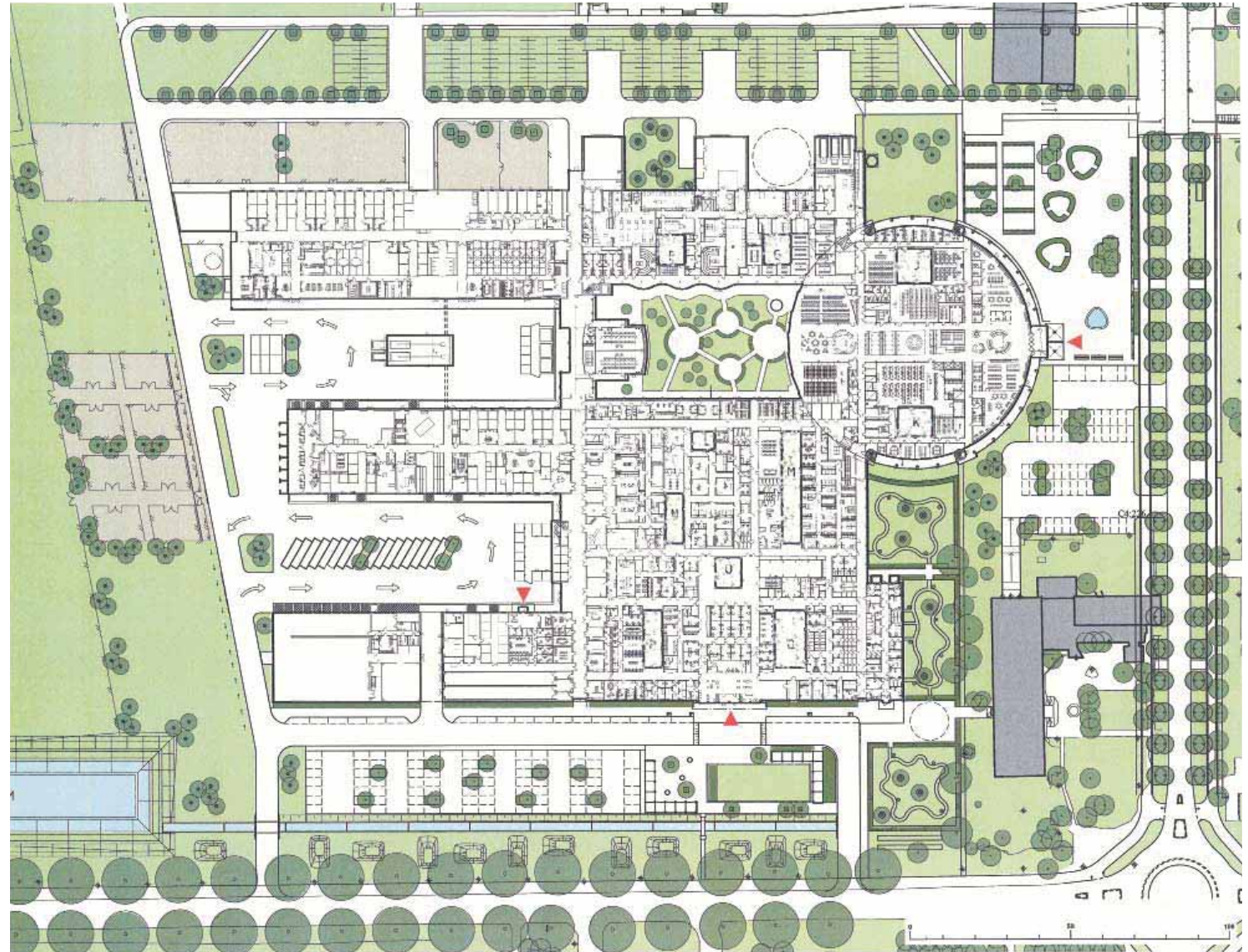
05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Respecting all under one roof

A focal point in the design of the building was to ensure a functional and flexible working environment for the various professions gathered in the building. The architectural approach combines openness and connectivity for students and staff with special attention to the animals in the veterinary functions of the building complex.

In addition, open planning with the many common areas and laboratories reduces physical and mental distance and constitutes the basis for a modern university.

The layout makes it easy for people to move between units while glazed areas and vantage points facilitate way finding in the building and keeping a sense of direction.



▲ The study and research facilities to the right are connected to the veterinary facilities for improved interaction, yet in respect for the animals in treatment [Nyréns Arkitektkontor].

<< 06: IS ROBUST, DURABLE, FLEXIBLE AND TIMELESS – BUILT TO LAST

Built to oblige changing needs

Since the keyword for the VHC building is flexibility, the building demonstrates several functional solutions that allow easy adaptation to different situations. For instance, the laboratory areas have a flexible layout to enable changes in line with technological developments and new research focus. As the faculty needs lab fittings that are easy to change, the fittings are constructed with horizontal rails in two levels, for upper and lower cupboards. The rails are equipped with slide mounts so that they can easily be moved.

Similarly, many conference rooms and lecture halls are equipped with block walls and folding walls in order to facilitate quick adaptation to different needs. The wide spans between the columns and walls offer open and flexible spaces that can be adapted to the activities taking place in the building, new developments and changing needs.

► Daylight penetrates the compact building complex via several greened atria [Mathias Nero].



07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Going for local resources

Locally adapted sustainable energy sources, like the green cooling system, were prioritised in the project, and so were local and well-proven building materials. At the same time, local available suppliers have been used when possible resulting in minimised transport of material and the creation of local jobs.

To the extent possible, the selection of materials for both the interior and exterior was based on sustainability features and life cycle costs. For instance, the facades consist of recyclable concrete and glass. Sliding doors, windows and glass frames of pine-wood and entrances made of oak are locally manufactured. Stained wood, painted concrete and rubber flooring were used for the interior – simple yet durable and functional materials with minimum maintenance.

08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANS-PARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Collaboration contract

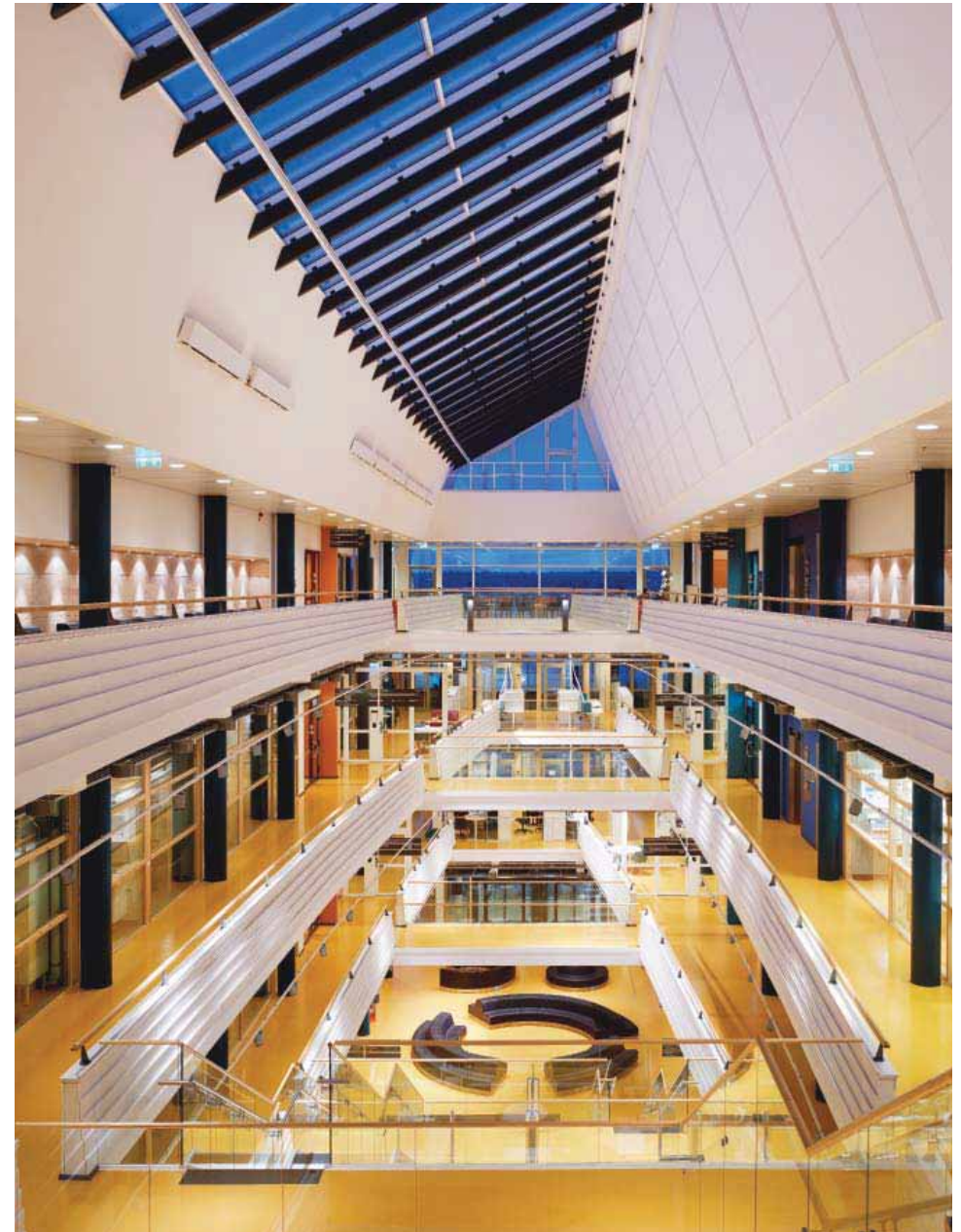
Throughout the process, the building owner, developer and building

contractor were in frequent and close contact to ensure effective management of the construction. A jointly formulated partnering contract was signed, with high requirements on all key persons to be cooperative throughout the project. As a result, all project managers worked from a common project office located in close connection to the building site promoting the easy interaction and smooth cooperation during the process.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

VHC has successfully managed to combine the requirements of people (and animals!) with environmentally sound design and a good business case. A modern building complex facilitates the basic functional and social requirements of research, teaching and treatment in an environmentally sustainable layout and indoor environment. At the same time, both the production and operation phases have economically benefitted the university, the local society and the energy supplier.

► Some of the atria combine daylight, internal connections and informal meeting space [Åke E. Lindman].



SHOPPING MALL WITH A PARK ON THE ROOF

Covered by one of the world's largest and most diverse roof parks, the new shopping centre, Emporia, outside Malmö emphasises both social and ecological sustainability in its construction.

With more than 30,000 plants bedded in 27,000 m², the roof park on top of the new shopping centre Emporia in Sweden, is considered one of the world's largest. By integrating a variety of innovative sustainability measures in its construction, Emporia aims at meeting ecological and climate related challenges. The purpose of the roof garden is to ensure climate adaption and biodiversity in a cultural landscape.

Accessible from both the inside and the outside of the building, the roof garden also provides an outdoor space for activity and relaxation available to visitors and the local community.

Besides being one of the most sustainable shopping centres, Emporia was appointed the World's Best Shopping Centre in 2013 at the World Architecture Festival in Shanghai and was a finalist in the 2014 European Shopping Center Award.

EXEMPLARY PROJECT PERFORMANCE IN CHARTER PRINCIPLES

- | | |
|--|--|
| <p>O1 MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE</p> <ul style="list-style-type: none"> ✓ Pleasant and comfortable ✓ Health and safety ✓ Accessibility | <p>O7 UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS</p> <ul style="list-style-type: none"> ✓ Adapted to local conditions |
| <p>O2 PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE</p> <ul style="list-style-type: none"> ✓ Extraordinary sustainable performance ✓ Involvement of high level experience ✓ Interdisciplinary teams | <p>O8 IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES</p> <ul style="list-style-type: none"> ✓ Involvement of users and stakeholders |
| <p>O3 MERGES URBAN LIVING WITH THE QUALITIES OF NATURE</p> <ul style="list-style-type: none"> ✓ Access to urban natural elements ✓ Greening of building and surroundings | <p>O9 EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY</p> <ul style="list-style-type: none"> ✓ Reproducible and adaptable |
| <p>O5 IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION</p> <ul style="list-style-type: none"> ✓ Reflects Nordic/local building and design traditions ✓ Industrialised production | <p>10 PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT</p> |



01: IS MADE FOR PEOPLE AND PROMOTES QUALITY OF LIFE

Attractive facilities for all

The shopping centre has more than 180 shops and restaurants. To create a pleasant and inviting indoor environment a number of varied measures were introduced. Different colour themes help the users find their way through the centre. Resting-niches are placed along the walkways, and there are large and comfortable family lounges that contain stroller parking, family bathrooms, spacious changing tables, microwave ovens, play areas for older children and comfortable seating arrangements for breastfeeding mothers. Lounges where visitors can charge their mobile phones or tablets free of charge are available, and there are drinking fountains on every floor.

Culture and commerce

Emporia is located in Hyllie district just south of Malmö city, a development area focused on being the most 'climate-smart' urban district in the Öresund Region and a role model for sustainable urban development. With new housing estates rising all around, Hyllie needed commercial elements. Emporia offers local

The Amber Entrance is inspired by Roman Pantheon and Nordic amber [Tord-Rikard Söderström].

BASIC PROJECT INFORMATION

Project

> Emporia

Client

> Steen & Ström Sverige AB

Principal design contact

> Wingårdh Arkitektkontor AB
www.wingardhs.se

Location

> Malmö, Sweden

Building type

> Shopping, new construction

Project stage

> Completed in 2012

Gross area

> 93,000 m² divided on 3 floors

Local neighbourhood

> Suburban area

Certification

> BREEAM 2009 Europe Commercial
-Excellent

<< amenities such as grocery shops, postal facilities, a pharmacy and cash machines.

Safe working conditions

During the construction of Emporia, the developer's security requirements were high: Risk assessments were made of each construction phase and smoking bans and bans on music systems were introduced. The project achieved the highest score on health and safety issues in the BREEAM certification system.

Free of charge wheelchairs

The Emporia building promotes accessibility for all. The shopping centre is easy to reach transportation-wise. It is located right by the train station in Hyllie. Bus stops for buses coming from all over the region are located at a short distance from the building, and there are pedestrian paths and bicycle lanes from Malmö city centre all the way to the entrance.

Inside the building, customers can free of charge use the strollers and wheelchairs available at the service centre. In the parking garage there are 30 charging stations reserved for electric cars, also free of charge.

02: PUSHES THE LIMITS OF SUSTAINABLE PERFORMANCE, AS A RESULT OF OUR INNOVATIVE MIND-SET AND HIGH LEVEL OF KNOWLEDGE

Pleasure and sustainability combined

Besides being a recreational and social arena the plant-covered roof park provides visible and effective answers to reducing a number of environmental impacts: The plants take care of a very large amount of rain-water and create a delay of storm-water, while rainwater is discharged to surface water ponds. This way, Emporia's load on the local drainage system is minimised. Vegetation attenuates the noise, and filters reduce air pollution. The waterproof layer of the roof is of a type that cannot be damaged by roots. Instead, it is protected from UV light which otherwise degrades the membrane over time.

International showcase

Emporia with its internationally acknowledged roof park stands out as a showcase for sustainability and BREEAM certification in Sweden.

► Greening softens the traditional shopping centre atmosphere [Tord-Rikard Söderström].





As a member of GRESB - a global industry-driven organisation committed to assessing the sustainable performance of real estate portfolios - the developer Steen & Strøm has widely promoted not only Emporia's sustainable qualities but also Sweden as a role model for sustainable buildings in general.

▲ The gently sloped landscape is resembled in the richly coloured and softly shaped glass façade [Tord-Rikard Söderström].

In addition, learning points from project design, methodology and data have been made available to education systems to promote sustainable ideas.

Teamwork

The Emporia project was carried out as a shared contract with a collaborative team and close and early collaboration among key suppliers, planners and constructors as the point of departure – so-called lean construction.

About 40 different contractors were

involved in the project. The project organisation handpicked all individuals for the design and construction team, and then hired experienced suppliers to ensure that the project was able to meet the quality and flexibility required. The sub-contractors were able to influence the timetable by planning and managing their own

<< work in collaboration with other contractors on site.

03: MERGES URBAN LIVING WITH THE QUALITIES OF NATURE

Seven hills offer protected spaces

The building's most innovative and impressive feature is the 27,000 m² roof park accessible from the outside and inside of the building. The park serves three major purposes: Climate adaption, biodiversity in a cultural landscape and outdoor space for relaxation and activity.

Seven hills offer protected spaces for play, events, organised training sessions and relaxation. In a more practical sense, the hills and vegetation hide fan rooms. The roof park consists of several sections: A Garden of Senses promoting experiences of the vegetation with all human senses; the Wild Corner, a biodiversity area where plants are allowed to seed as they like; an ice rink open during winter and, vista points. The roof park is also a habitat for small animals and birds.

Nature brought inside

Indoors Emporia provides integrated spaces for plant and water elements which are used actively in the architectural concept. At the lift tower on the Ocean Square water flows down and is collected in a water mirror on

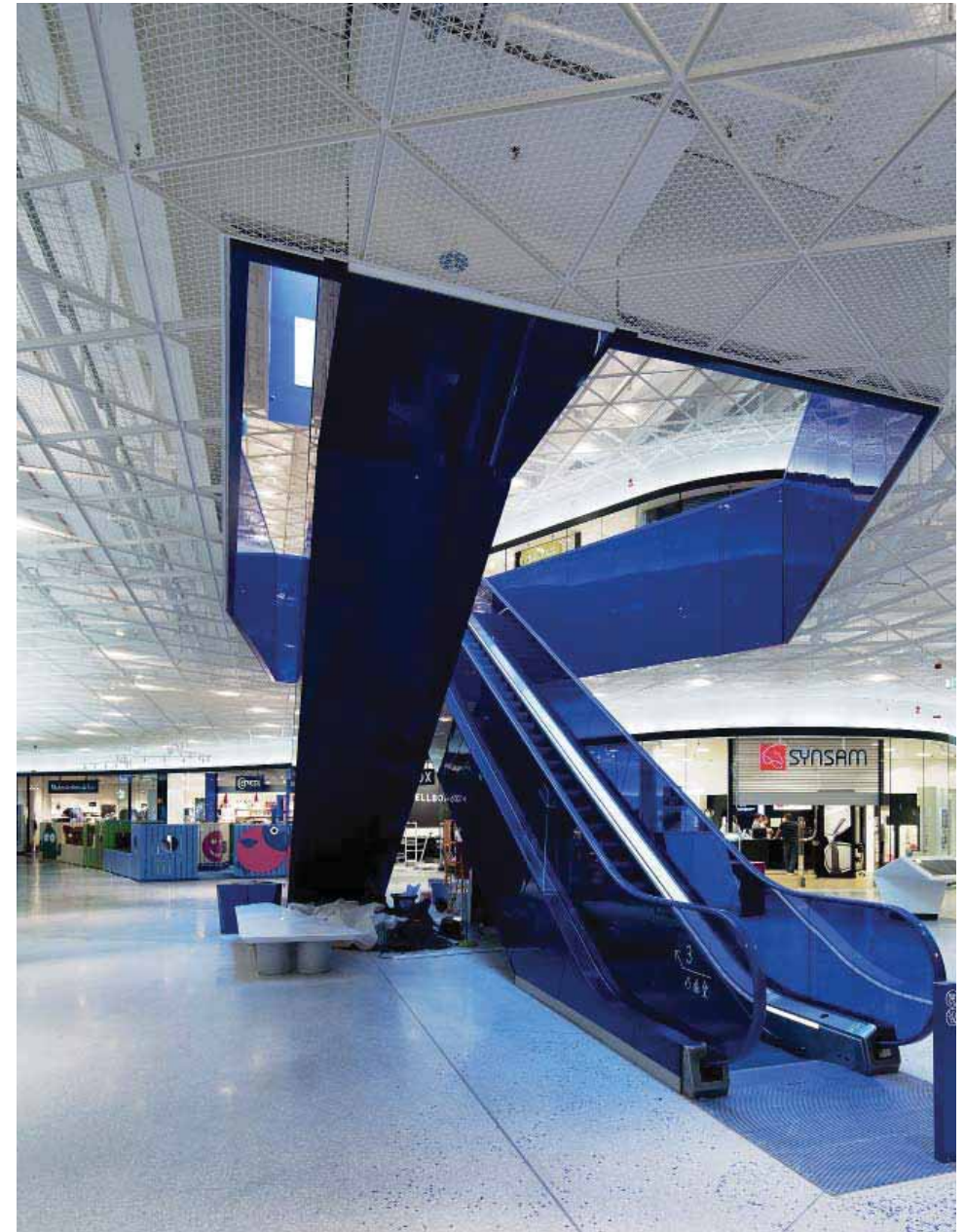
the 1st floor. The building's most leafy space is the Flower Square located in the intersection of three walkways. There are over 30,000 plants in the square. Some are used to clad the lift tower in greenery while others hang in the seven plant-ropes measuring 18 meters from floor to ceiling.

05: IS FUNCTIONAL, SMART AND AESTHETICALLY APPEALING, BUILDING ON THE BEST OF THE NORDIC DESIGN TRADITION

Intuitive wayfinding

The Emporia building design, layout and installations are functional, smart and intuitively user-friendly. Together with the characteristic entrances and strategically placed squares, the softly shaped walkways act as guidance to visitors through the shopping centre. The number of signs inside the centre are kept to a minimum since the building largely speaks for itself. Signage is concentrated to service sites and natural hubs and intersections.

► The varied colour scheme helps way-finding [Tord-Rikard Söderström].



07: UTILISES LOCAL RESOURCES AND IS ADAPTED TO LOCAL CONDITIONS

Giving back to nature

Built on a green field Emporia aims at giving back more to nature than what it has taken. Large amounts of rainwater are handled thus minimising Emporia's load on the local drainage system. Extensive use of plants lower temperatures in the outdoor environment and inside Emporia through evaporation from plants. A human aspect is the fact that a green environment has a positive effect on people's mentality, even measureable effects on people with stress-related diseases.



◀ A public park is rising on the roof top of Emporia [Tord-Rikard Söderström].



08: IS PRODUCED AND MAINTAINED THROUGH PARTNERSHIPS FOUNDED ON TRANSPARENT COLLABORATION ACROSS BORDERS AND DISCIPLINES

Local involvement

Stakeholder involvement was crucial to the process. It included local groups in Malmö, which helped ensure that Emporia is an accessible building for everyone regardless of disabilities.

09: EMPLOYS CONCEPTS THAT ARE SCALABLE AND USED GLOBALLY

Certified quality

Emporia is certified by the internationally recognised certification system BREEAM Europe Commercial, achieving 'Very Good'. In line with this, Emporia and owner Steen & Strøm were granted Sweden Green Building Award 2014 and Scandinavian Green Roof Award 2013.

10: PROFITS PEOPLE, BUSINESS AND THE ENVIRONMENT

Both social and ecological sustainability was emphasised in the construction of Emporia. Numerous measures were taken to create an accessible, pleasant and inviting environment, and Emporia is a strong contribution to the local environment. Emporia has integrated innovative sustainability measures, directed at relevant ecological and climate related issues, and in addition created an outdoor space for activity and relaxation available to visitors and the local community.

NEXT STEP: NORDIC BUILT CITIES

An increasing population and historically unprecedented urbanisation characterise the 21st century. When resource-scarcity, climate change and growing demands for liveability are added into this mix, thinking of innovation and sustainability in the built environment becomes critical. The Nordic countries are in a strong position to address many of these challenges.

Therefore, following the successful Nordic Built programme, the Nordic Ministers for Trade and Industry decided to launch the Nordic Built Cities programme in cooperation with the Nordic Council of Ministers and Nordic Innovation. The Nordic Built and the Nordic Built Cities programmes are closely linked together, and share the Charter as a joint platform. But while the Nordic Built programme focused on the development of innovative solutions for sustainable buildings, the Nordic Built Cities programme focuses on the development, visualisation and export of Nordic innovative solutions for liveable, smart and sustainable cities.

APPENDIX 1: THE CHARTER PRINCIPLES EXPLAINED

O1. Made for people and promotes quality of life

We will put the human perspective at the centre of everything we do. This results in a healthy, safe, accessible and pleasant built environment that enhances quality of life.

Our indoor and outdoor climate promotes human health through fresh clean air and unharmed materials, and surroundings that inspire a healthy lifestyle.

Our built environment shall provide safety for all inhabitants during construction, use and demolition.

O2. Pushes the limits of sustainable performance, as a result of our innovative mind-set and high level of knowledge

Our approach is progressive and solution-oriented, and it is our responsibility to create the changes needed. We will use our high level of knowledge and broad expertise to create innovations and implement new solutions.

Our education system will be the key lever in the transformation to a sustainable built environment. Professional values and skills in interdisciplinary cooperation are learnt in school and are vital to the sustainable building industry.

O3. Merges urban living with the qualities of nature

Our built environment actively includes nature's properties by bringing the outdoors indoors and connecting urban living to nature.

We will use daylight as a vital element in designing our built environment, creating a natural, pleasant and stimulating living and working environment.

Our urban built environment will include qualities of nature to promote biodiversity and improve living conditions and quality of life for urban dwellers.

O4. Achieves zero emissions over its lifecycle

We will strive to create a built environment with zero carbon emissions related to production, operation and demolition.

We will combine energy efficiency and renewable energy by integrating smart technologies for resource optimisation and clean energy production in our buildings. Through this, we will contribute to the transformation to zero carbon emission.

Through cooperation between companies, organisations and governments, we will aim at the following goals:

- Always offering solutions aiming at zero carbon emissions as the first alternative to the customers.
- Avoiding harmful pollutants to the health and the environment.
- Eliminating carbon emissions from buildings.

- All retrofitting projects result in reduction of net energy consumption by at least 50 %.
- All our new projects will be zero carbon emission from 2018 – making European frontrunners.
- Raise the yearly renovation rate for existing buildings to 3% by 2020
- No use of direct fossil-fuel energy in any new buildings.

O5. Is functional, smart and aesthetically appealing, building on the best of the Nordic design tradition

Based on the idea that beautiful and functional everyday objects should be affordable to everyone, Nordic design is characterised by simple designs, minimalism, functionality, daylight, quality and efficient, industrialised production. Our built environment will reflect this Nordic design tradition.

Our built environment is intuitively user-friendly, with functional and effective solutions that are reliable in the long term.



Underlying systems may be complex, but their operation and successful implementation is always simple and user friendly.

O6. Is robust, durable, flexible and timeless - built to last

Our built environment will consist of high quality solutions that are robust and durable.

We will reduce the environmental impact of our building materials through a total life cycle approach.

We will create a timeless built environment that will stay attractive, functional and stimulating in the future.

Our built environment will have a high degree of flexibility to accommodate users' habits and changing needs over time, without requiring significant rebuilding.

O7. Utilises local resources and is adapted to local conditions.

There are no 'one size fits all' solutions. We will adapt to each location and utilise its specific natural resources and surroundings, as well as local knowledge and traditions.

We will adapt the built environment to local conditions, making it able to handle existing and future climate conditions.

We will strive to use locally available materials and base our choice of materials on life cycle assessment (lca). We will reuse materials when retrofitting and demolishing, and strive to achieve a zero waste attitude for our activities.

We will adapt the built environment to local ecosystems.

O8. Is produced and maintained through partnerships founded on transparent collaboration across borders and disciplines.

We will change the way we work together, to secure effective collabora-

tion and knowledge sharing through the entire value chain utilising the strengths and complimentary competences within the different sub-sectors of the building sector. In this manner, we will ensure that the principles of the Charter are included in all stages of the building process.

We will create a less fragmented and more collaborative building sector through cross border knowledge sharing and business alliances within the Nordic region and beyond. By joining forces, we strengthen our chances to win global markets.

We will be open-minded and democratic in our stakeholder involvement to ensure that product supply matches user demands.

O9. Employs in concepts that are scalable and used globally.

We will realise the vast business potential in sustainability for the Nordic building sector through scalable concepts that can be implemented and exported.

1O. Profits people, business and the environment.

Long-term environmental and social performance is currently undervalued in the business models of the building sector. We will develop business models that capture and boost the value for people and the environment.

We will achieve sustainable development in all three pillars of sustainability; people, business and the environment.

Our sustainable concepts and solutions will be profitable to a degree that will drive change, improving quality of life and environmental performance.

Our solutions will be attractive to average citizens: Affordable, realistic and scalable everywhere.

APPENDIX 2: TERMS AND ABBREVIATIONS

Active House

A target framework for how to design/renovate buildings that contribute positively to human health and well-being by focusing on the indoor and outdoor environment and the use of renewable energy. All needed energy is supplied by local renewable energy sources.

BREEAM

British design and assessment method for sustainable buildings, levels of certification: Pass, Good, Very Good, Excellent and Outstanding. National adaptations available.

BREEAM-NOR

BREEAM adapted to Norwegian standards and building regulations.

Cradle-to-cradle/C2C

A design approach with focus on the lifecycle of applied materials aiming at leaving a positive impact on the environment and maintaining our welfare.

DGNB

German certification system for sustainable buildings and urban districts,

levels of certification: Bronze, Silver and Gold. National adaptations available.

EPD

Environmental Product Declaration - an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products.

EU Green Building

EU programme aimed at improving energy efficiency in buildings, annual awarding of projects.

FinZEB /nZEB

FinZEB defines the term 'nearly zero-energy buildings' (nZEB) meeting EU and Finnish energy efficiency requirements.

IED

Integrated Energy Design aims at a high degree of energy efficiency, and comfort at the lowest possible cost. Tools often involve passive solutions verified by dynamic simulations in the design stages.

LCA

Life Cycle Analysis, assessing environmental sustainability of products.

LCC

Life Cycle Cost, assessing economic sustainability.

LEED

US rating systems for the design, construction, operation, and maintenance of green buildings, levels of certification: Certified, Silver, Gold and Platinum.

Miljöbyggnad

Swedish system for certifying buildings in relation to energy, indoor climate and materials, levels of certification: Bronze, Silver, Gold.

Passive House

The Passive House standard focuses primarily on reducing energy consumption for heating and cooling in buildings. Passive solutions and the use of free heat from the sun and inhabitants are crucial to the design of a Passive House. National adaptations available.

PEFC/FSC

Certification systems for wood products from certified sustainable forestry. Subject to controlled production.

PV panels

Photo-voltaic panels producing electricity from sun radiation.

Solar panels

Panels producing heat/hot water from sun radiation.

ZEB

A Zero Emission Building produces enough renewable energy to compensate for the building's greenhouse gas emissions over its lifespan. Levels of zero emission buildings depend on the number of phases in which a building's lifespan is counted.

ZEB – OM

The building's renewable energy production compensates for greenhouse gas emissions from the operation and production of its building materials.



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