BRYNSENG SCHOOL

FutureBuilt pilot project, Oslo 2017

Photo page 1 and 2: Undervisningsbygg Oslo KF. All other photos: Tove Lauluten

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BRIEF PRESENTATION OF BRYNSENG SCHOOL

Brynseng School is a new primary school in the borough of Østensjø in Oslo. The school has four parallel classes per grade level for pupils from grades 1 to 7, with space for 840 pupils and around 110 staff. With experience from over 20 passive house projects in Oslo, the municipal enterprise Undervisningsbygg has increased its ambitions for Brynseng School in order to comply with future energy requirements concerning near-zero energy buildings.

The use of building-integrated solar panels in the school's façade – along with the well-insulated, transparent façade of the sports hall, which shows the activities going on inside – also presents the environmental efforts to the outside world. The school lies right next to the Brynseng metro station. A new cycle path and pedestrian route have also been built, and many cycle parking spots have been included. Outdoor spaces have been created on the south side of the building facing the green corridor down towards the Alnaelva river. Trees and shrubs bearing edible berries and fruits have been planted in the schoolyard.

Read more about Brynseng School at www.futurebuilt.no

KEY FIGURES

Greenhouse gas emissions from Brynseng School have been cut by 51 per cent compared with a reference adjusted for the actual geometry of Brynseng School and by just over 43 per cent compared with a standard reference building.

Total CO_2 emissions, prototype reference:
22.3 kg CO_2/m² per year
Total CO_2 emissions, adapted reference building:
25.6 kg CO_2/m² per year
Total CO_2 emissions, planned project:
13.1 kg CO_2/m² per year
Total CO_2 emissions, "as built" project:
12.7 kg CO_2/m² per year

According to the 'as built' plans, the emissions are distributed as follows (reduction compared with the adapted reference building):

Material use:
5.6 kg CO_2/m² per year (34% reduction)
Stationary energy:
3.1 kg CO_2/m² per year (71% reduction)
Transport:
4.0 kg CO_2/m² per year (38% reduction)
Energy consumption, school building (NS 3031/NS3701):
- Net energy need: 56.3 kWh/m² per year
- Supplied energy: 40.5 kWh/m² per year

Energy consumption, sports hall (NS 3031/NS3701):
- Net energy need: 105.3 kWh/m² per year
- Supplied energy: 60.8 kWh/m² per year

Energy production, solar panels:
- Energy production: 105,410 kWh/ per year
  9.82 kWh/m²

Energy sources:
- Solar energy, geothermal heat pump and electricity

Areal usage (usable floor space, heated):
- School building: 7,972 m²
- Sports hall: 2,765 m²

Project support from ENOVA: NOK 4.5 million.

URBAN ENVIRONMENT AND ARCHITECTURE

An extensive transformation is expected in the Brynseng district, as small-scale industry is being converted into residential areas. The new school will feature heavily in this redefinition of the cityscape. The school's placement on the site emphasises a screening of the outdoor area, even as it establishes a transition to the vital green corridor down towards the Alnaelva river.

The architectural elements highlight the project's deliberate ambition of an eco-friendly, energy-efficient design. The solar panels herald the architecture of the future, while the use of bricks signals the school's solidity and permanence. The sports hall's transparent façade materialises the aspect of energy efficiency, even as it showcases the activities taking place within the hall, whether during the day, when the hall serves as the school's gymnasium, or during the evening, when it is rented out to local sports clubs.

GREENHOUSE GAS EMISSIONS

The greenhouse gas emissions stemming from the 'as built' project are somewhat over 50 per cent lower than those from an adapted reference building, as calculated according to standard material use, means of transport and the TEK10 building regulations.

The adapted reference building has factored in the building's geometry as a quadratic building of 5–6 floors. The reference building uses standard concrete and recycled reinforcement steel and complies otherwise with the TEK10 regulations.

The project's primary measures for mitigating greenhouse gas emissions were as follows:

- Passive house standard for the building envelope
- Energy wells with heat pumps
- Solar-panelled façade
- Transparent and well-insulated façade for the multi-purpose sports hall
- Stringent demands on the material use – low carbon concrete and recycled structural steel
- Immediate proximity to the local metro station, and no car park on the school's premises
- Routes and parking spots for bicycles

Complete greenhouse gas report is available at www.futurebuilt.no/English under pilot projects.

AREA AND TRANSPORT

The school has not facilitated car parking and includes only two electric car and two handicap parking spots on its premises. The school is right by the Brynseng metro station and in close proximity to the Bryn train station. There are also bus stops in the vicinity. This infrastructure encourages the use of public transport by staff, pupils and parents/guardians, many of whom also live within walking and biking distance.

The school's premises includes space for up to 230 bicycles to park, of which 180 are protected by a roof. This shall encourage both children and adults to bike to school and to the sports hall. New walkways and bicycle paths past the school have been built, as has a repair station for making simple repairs and inflating bicycle tyres.

The project is based on staff and pupils mainly travelling to school on foot or by biking (95–96 %) and far less so by car (2–3%) and public transport (2–3%). The corresponding distribution for travelling to the sports hall is 50 per cent walking/biking, 20 per cent by car and 30 per cent by public transport.

ENERGY

The project's energy target has been near-zero energy (as defined by Rambøll in 2013), which entails that the school complex will use 70 per cent less energy than specified in the TEK10 regulations, as calculated by net delivered energy. A passive house standard was required, and a geothermal heat pump and energy wells have been installed in order to cover 90 per cent of the heating and hot water needs. The building-integrated solar panels, covering 1,100 m² of the façade, will potentially produce around 105,000 kWh per year. Such measures shall ensure that the project reaches its targets.

STRUCTURES AND MATERIAL USE

The experiences from the Bjørnsletta School pilot project were continued when Undervisningsbygg was to build Brynseng School. BubbleDeck slabs were not required, but emissions requirements were set for the hollow core slabs and the cast-in-situ concrete, and the reinforcement steel was required to be 100 per cent recycled. All the materials in the building were restricted by the A20 list of banned pollutants and by the requirements to use low-emitting materials indoors (class M1).

The main groups of materials have been assessed in regard to reducing the greenhouse gas emissions (the respective Environmental Product Declarations were accessed early on in the project). The indoor construction largely used natural materials such as linoleum, parquet and polished concrete. The Environmental Product Declarations were accessed, and low emissions materials were selected in order to achieve the overall target of a 50 per cent reduction in greenhouse gas emissions.

The choice of materials for the sports hall's façade was also stimulating. The hall was to be well-insulated and ensure compliance with the passive house requirements, even as its façade was to be transparent and allow in natural daylight. This will reduce the need for artificial lighting in the hall.

PROJECT INFORMATION

Address:	Brynsengfaret 8–10
Municipality:	Oslo
Project period:	2013–2017
Status:	Completed by the start of school, 2017
Project type:	New building
Building type:	School and sports hall
Environmental standard:	Passive house standard; near-zero energy building
Model programme:	FutureBuilt
Contract form:	Design and build contract
Client:	Undervisningsbygg Oslo KF
Architect:	HRTB Arkitekter AS MNAL
Landscape architect:	Bjørkbekk & Lindheim AS
Artistic consultants:	Børre Sæthre, Vigdis Fjellheim and Torunn Skjelland
Consultants:	Multiconsult (solar energy)
Main contractor:	NCC Construction AS

DEVELOPER'S EXPERIENCE

With an eye towards the ongoing green transformation, the City of Oslo aims to be a climate-neutral city already by 2030. Undervisningsbygg has always striven to be at the forefront of developments in the environmental area and implement specific measures to reach the ambitious targets that have been set for Oslo. As a major public sector real-estate developer, we also want to steer the construction sector in an ever-more sustainable direction.

Undervisningsbygg had ambitious energy goals for Brynseng School, and this is the first school building in Oslo to become a near-zero energy building. The school's solar façade has provided us with a great deal of knowledge and attention, and we have shared our experiences with many visitors from Norway and abroad. Additional school buildings will be outfitted with solar panels, and when we now are to build a new school building at Voldsløkka, our ambition is for it to be an energy-plus house.

Undervisningsbygg shall continue its environmental efforts and follow the specifications laid down in our environment and energy strategy. The 2018 Sustainable Procurement Prize from the Agency for Public Management and eGovernment (Difi) provides renewed inspiration. With our innovative agenda we shall be a driving force in a field that is more vital than ever.

Rigmor Hansen
Chief executive,
Undervisningsbygg Oslo KF

ARCHITECT'S EXPERIENCE

In spring 2015 the project was selected to be a pilot project in the FutureBuilt programme. By then the contractor had already been contracted, and construction was fast approaching. The preliminary project, developed by HRTB Arkitekter in collaboration with Undervisningsbygg Oslo KF, included highly ambitious environmental goals. The new building was planned as a passive house and aimed to meet the nZEB (near-zero energy building) standard. Norway's largest building-integrated solar panel facility – over 1,000 m² – was planned on the southern façade, which faces the schoolyard. Twenty energy wells were facilitated, and the multi-purpose sports hall on the top of the school was planned to have transparent glass walls that complied with the passive house standard. It was possible to refine and develop the project in line with FutureBulilt's specifications, and the project was expanded to include a 'bike repair station' and an extensive inclusion of useful plants, including ones bearing fruits and berries, in the outdoor areas. This has enhanced the complex with amenities for both the school children and the local residents.

Our experience has been that ambitious environmental goals, combined with a willingness to innovate and to search for a unique architectural expression, lead to exciting projects. This has provided those of us who planned the project with more knowledge, which we will be able to use in our future endeavours.

Ida Hexeberg
Architect,
HRTB Arkitekter

ENVIRONMENTAL ADVISOR'S EXPERIENCE

The integrated solar panels on Brynseng School's southern façade have provided us with a good deal of useful knowledge of and experience with the procurement process and the requirements we should set to solar panel systems. During the project we hired a dedicated solar panel consultant to facilitate the procurement, assess the various offers and ensure that we acquired a solar panel system that would meet our expectations for energy production, security, style and durability. We have availed ourselves of this competence in new school projects where solar panels are to be procured. We have also used our experiences from Brynseng concerning energy production from solar panels to search for new, innovative solutions to storing and efficiently using the energy that is produced by solar panel systems.

Although the school's outdoor facilities are heavy on asphalt and rubber, we have this time been able to incorporate trees and shrubs bearing edible berries and fruits, such as redcurrants along the façade and apple and pear trees on the margins of the area. Ecology and surface runoff are much more in focus in our new environment and energy strategy, and we are interested in exploring the use of elements in the schoolyard that are more natural, but that also are highly durable.

Brynseng School includes a simple bike repair station that is also available to cyclists passing by or visiting the school. This is an amenity we're also considering for other schools.

Bodil Motzke
Environmental advisor,
Undervisningsbygg Oslo KF

THE CONTRACTOR'S EXPERIENCES

NCC's experience after having carried out the project is that it is important to define early on what is needed to be considered a FutureBuilt project. In order to gain an understanding of what this entails, we carried out a review with representatives from FutureBuilt, something that was fundamentally important in order to guide the work in the right direction. The environmental aspects that were to be factored in concerned energy, physical design, product specifications, zero-energy houses, low-emitting materials, etc.

The school is situated on a former industrial site. It was therefore necessary to transport large amounts of pollutant materials. In cooperation with the Agency for Urban Environment, we also removed black-listed species from the site and planted new trees and bushes that are bee-friendly.

It is a distinctive feature of the Brynseng School project that the entire southern façade has been clad in solar panels, and that the passive house/near-zero energy requirements were met by including the sports hall and its large glass panes. It was necessary to resolve these matters in close collaboration between the developer, NCC and the subcontractors hired to develop the solutions. In line with the construction site's eco friendly ambitions, electricity from the solar panel system and the energy wells was used during the building phase. It was made a priority to have these systems up and running early on.

In order to see to the above-mentioned aspects, the managers at NCC acquired the necessary competence to follow up the technical implementation and construction work. The elements that were needed to satisfy the defined requirements had to be anchored in the planning group, which incorporated the requirements into descriptions, drawings and contracts. This helped ensure that the specifications would be complied with. A system was created for documenting that the specifications were implemented and adhered to, and this helped us oversee the project.

Gisle Ranheimsæter
Project manager, NCC Building Norge

WHAT IS FUTUREBUILT

Human-caused climate change is one of the gravest challenges we are facing, and our greenhouse gas emissions must be drastically reduced. This will have a major impact on urban development and architecture.

VISION

FutureBuilt's vision is to demonstrate the feasibility of developing high-quality, climate-neutral urban areas and architecture.

GOAL

Our goal is to realise pilot projects that cut greenhouse gas emissions from transport, energy consumption and material use by at least 50 per cent. The pilot projects, which may involve either entire areas or individual buildings, shall be of high architectural quality and enhance the urban landscape.

FutureBuilt operates in the Oslo–Drammen region, and its pilot projects shall be located in close proximity to public transport hubs. FutureBuilt is a national and international showcase and aims to promote change within the construction sector.

PROGRAMME – PARTNERS – PERIOD

FutureBuilt is a decade-long programme that will run until 2020. The programme is overseen by a wide-ranging consortium consisting of the municipalities of Oslo, Bærum, Asker and Drammen, Husbanken (the Norwegian State Housing Bank), Enova, the Ministry of Local Government, the Directorate of Building Quality, the Norwegian Green Building Council and the National Association of Norwegian Architects (NAL).

Partnere i FutureBuilt:

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