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Clarion Hotel & Congress Trondheim, Norway

Case Study 102

The Clarion Hotel & Congress Trondheim was developed according to a green proposal by Skanska, which upgraded the energy performance of the building from Energy Class C to Energy Class A and realized significant lifecycle environmental and financial savings.

Aspects of Sustainability

This project highlights the following:

Green Aspects

Energy

Carbon

Materials

Water

Local Impacts

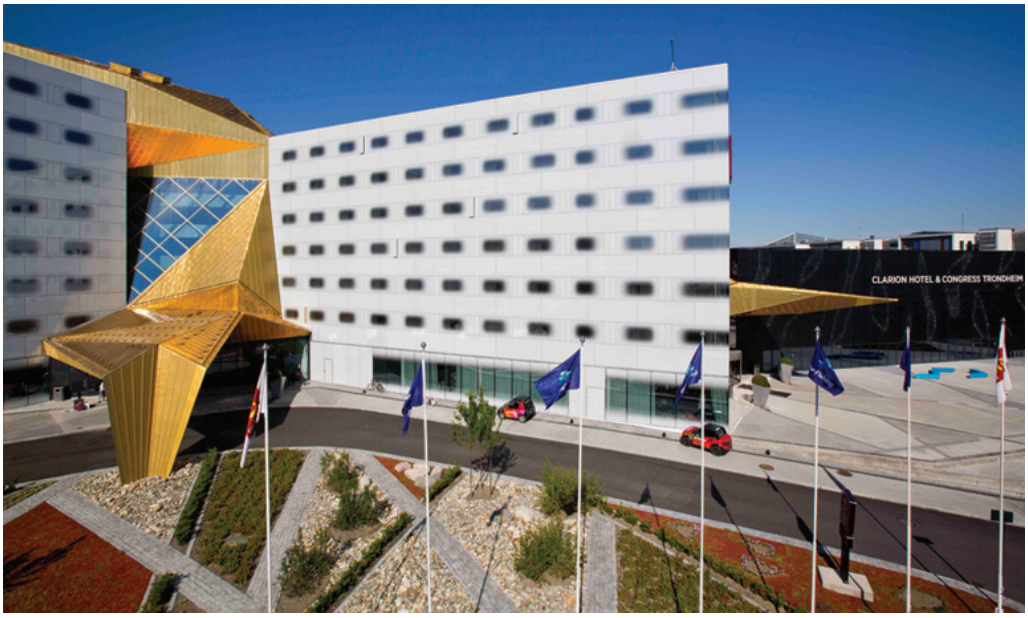
Social Aspects

Human Resources

Corporate Community Involvement

Business Ethics

Health and Safety



Project Introduction

The Clarion Hotel & Congress Trondheim is Norway's largest convention hotel and one of Scandinavia's largest convention venues. The hotel is situated close to the harbor in central Trondheim, near the city center. The 31,500 m^2 hotel was Norway's largest hotel investment for 25 years, with 400 rooms and 3,000 m^2 of conference space. The hotel is a landmark building in Trondheim with its distinctive architecture, unique white glass glazed facades, innovative interior design and large copper star-shaped roof. 150,000 hotel guests and 80,000 conference guests are expected each year. The hotel and conference center are operated by Nordic Choice Hotels.

Skanska constructed the US$ 97 million hotel for Star Property, and the project was handed over to the client in April 2012. The project team used Building Information Modeling (BIM) throughout the design and construction phases, which promoted project partner cooperation and construction accuracy. The hotel has a large lobby, two restaurants and a Sky Bar with 190 m^2 outdoor terrace. Conference facilities include 22 meeting rooms, including an auditorium in the center of the complex that can accommodate up to 1,800 conference guests or a concert audience of around 2,500 spectators. The hotel also has basement parking for around 300 vehicles.

The hotel was originally designed in 2007 to Class C energy standards, but Skanska developed a green proposal to upgrade the energy performance of the building to make it one of the first Class A buildings in Norway. As part of its proposal, Skanska guaranteed the hotel's energy performance through a two year Energy Performance Guarantee. Skanska's proposal also won a grant that partially covered the upgrade costs from Enova, which is a Norwegian government enterprise responsible for promoting energy efficiency.

Skanska Color Palette™

Energy

Carbon

Materials

Water

Click here for more information

November 2012 102CS : V2

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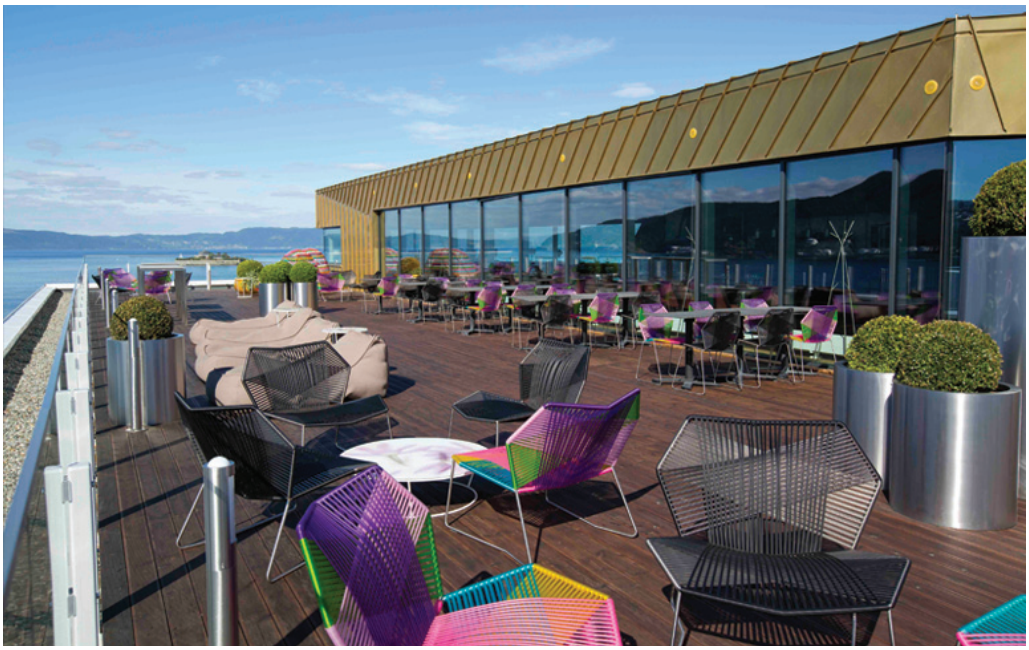


Contributing Toward Sustainable Development

The Clarion Hotel & Congress Trondheim was upgraded from Energy Class C to Energy Class A by Skanska to halve the building's original design energy consumption. A water-to-air heat pump sources the hotel's heating and cooling from seawater in the adjacent fjord, and an advanced central building management system allows the efficient control and monitoring of the hotel's energy use. Skanska established an Energy Performance Guarantee (EPG) with the client to ensure the hotel meets its energy design targets. The hotel is also water efficient, promotes healthy indoor environments for guests and staff, and contributes toward sustainable urban development by redeveloping an underused site in central Trondheim. During construction, the project team established comprehensive waste management facilities and processes on site.

Green Aspects

Energy

Energy efficiency

Skanska successfully upgraded the original hotel design from Energy Class C to Energy Class A, which halved the building's theoretical energy demand (calculated according to NS3031) and, corresponds to an annual reduction of about 3,000,000 kWh. An energy simulation calculated the hotel's total energy consumption to be 188 kWh/m^2.

The team achieved an airtightness of 0.5 Air Changes per Hour at 50 Pa, which meets Norwegian passive house standards, compared with the original target of 3.0 ACH (current Norwegian building code). The improved airtightness alone is expected to annually reduce the energy consumption by about 350,000 kWh, which is equivalent to the annual energy consumption of 25 average Norwegian houses. The average efficiency of ventilation heat recovery units was increased from 70 percent to 76 percent, and the average Specific Fan Power was decreased from 2.45 to 1.8 kWh/m^3/s. Heat recovery systems also recover waste heat from cooking and refrigeration units at night and store it in large water tanks to provide guests with hot water in the morning.

A water-to-air heat pump sources the hotel's heating and cooling from seawater in the adjacent fjord. The heat pump can meet the hotel's entire space and ventilation heating demand, and over 70 percent of the hot water demand. The well-insulated and airtight hotel was designed to utilize low-temperature heating in order to achieve the greatest efficiency from the heat pump.

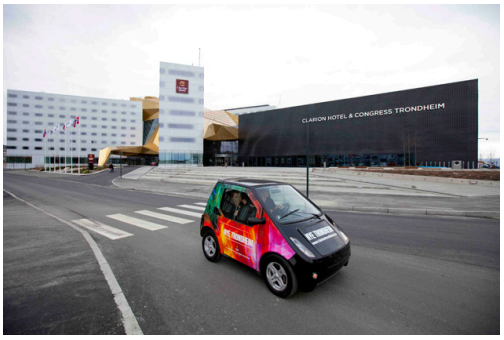
The glazed facades are made from silkscreen glass, which partially reflects energy from the sun, and exterior shading has been fitted where necessary to reduce the need for cooling in the summer. Lighting is controlled by occupancy sensors and energy efficient lighting, such as LED (Light-Emitting Diode) fixtures, have been used throughout the hotel. The elevators are equipped with regenerative drives that recover energy from downward movements.

Intelligent energy management

The hotel is equipped with an advanced central Building Management System (BMS), which promotes the efficient control and monitoring of the hotel's energy use. The system allows energy zoning and is linked to the hotel's room booking system to optimize energy use in individual rooms according to actual use.

Energy Performance Guarantee (EPG)

Skanska agreed an EPG with the client during 2013 and 2014, which has a target value of 4,200,000 kWh/year (188 kWh/m^2.year) for all indoor energy use, based on a 75 percent occupancy. Skanska will monitor and optimize the hotel's energy performance during the EPG to guarantee that the objectives are met. If energy consumption is less than 3,917,000 kWh/year (176 kWh/m^2.year), the client and Skanska will share the gains equally. In the event of the EPG not being met, Skanska will implement necessary measures or compensate the client financially.



Carbon

Reduced carbon emissions

The annual efficiency savings of approximately 3,000,000 kWh, compared with the original Energy Class C design, equate to savings of approximately 1,095 ton CO_2 per year (calculation based on 0.365 kg CO_2/kWh, which is the OECD/EU figure).

Materials

Environmentally responsible materials

The rooms have minimalistic exposed concrete ceilings, which avoided the need for ceiling materials. Low VOC (Volatile Organic Compound) materials and substances were used, such as the stretch ceilings in the lobby. All timber used on the project was certified according to the Forestry Stewardship Council.

Waste management during construction

The project team established comprehensive waste sorting facilities and processes to ensure that 91 percent of construction waste avoided landfill. All demolition materials from the existing two-story concrete car park were reused on site as backfill.

Water

Water efficiency

The hotel uses around 200 liters of water per guest night, which is 20 percent less than the "good" international hotel benchmark for temperate climates. The rooms have been fitted with water efficient showers and dual flush toilets, which reduce water consumption by 20-25 percent compared with conventional fixtures.

Other Green Aspects

Raising awareness of more sustainable buildings

The Clarion Hotel & Congress Trondheim has featured in several Norwegian and international media news articles since it was handed over to the client. The articles have focused on the hotel's energy performance and have raised awareness of greener hotels.

Social Aspects

Project partner cooperation

Skanska worked closely with the client and entire project team throughout the project. Close cooperation was vital due to the project's size, complexity and tight construction schedule. BIM facilitated project team cooperation during the project as it allowed the architect and consultants to develop the design simultaneously. BIM also enabled the project to be constructed to a very high degree of accuracy. Skanska's development of a proposal to upgrade the energy performance of the building also required close cooperation with the project team and the local energy company.

Occupational health and safety

The project team worked over a million hours in total without serious injury. There was only one lost time accident on the project. The team focused on safety by closely following Skanska's standard safety practices and embodying them into the project as a whole.

Healthy indoor environments

The hotel is designed to promote a high quality indoor environment for guests and staff. The glazed façade allows plenty of natural light into the building, including the restaurant, lobby and Sky Bar. The silkscreen glass used in the façade avoids glare and provides sun shading without compromising natural daylight or external views.

The rooms are sizable and have high ceilings to also maximize natural light. No toxic substances were used in the construction of the hotel.

Functional and flexible hotel

The hotel caters for a range of different guests and has four room types: Basic, Standards, Superior and Deluxe, as well as three suites. Conference facilities include 18 meeting rooms of various sizes to hold any event from small meetings to large conferences, courses and congresses. The central auditorium is a flexible open-planned multi-purpose arena that can also be used as a concert venue. The energy efficient nature of the hotel promotes a long useful lifespan.

Contributing toward sustainable urban development

The site was previously a two-story car park. The project has consequently redeveloped a prime site on Trondheim's waterfront, and did not impact upon greenfield sites or natural environments. The hotel is situated 500 m from the city center and has good access to services and amenities.

Promoting more sustainable modes of transport

The hotel is located 400 m from Trondheim Central Station. There are bus stops on the road adjacent to the hotel, which include airport buses that run up to eight times an hour. The hotel has bicycle parking and offers rental bicycles.

Economic Aspects

Regional construction workforce and materials

Around 260 people worked on site at the peak of construction. Around 75 percent of the construction workers were from the Trondheim area. Regionally sourced materials included all steel work, concrete, prefabricated slabs, insulation, asphalt and crushed stone.

Efficiency financial savings

The additional costs related to the green upgrade amounted to approximately US$ 3.6 million. The project received US$ 600,000 from Enova's energy good practice program, which will ensure that the total green investment will be repaid within 5 to 6 years through energy savings.

Local economic impact

The hotel directly employs 120 people and is estimated to attract around 150,000 hotel guests and 80,000 conference and restaurant guests to Trondheim each year. The Clarion Hotel & Congress Trondheim is world-class and has secured the city as an international conference destination.

Learning From Good Practice

The Clarion Hotel & Congress Trondheim demonstrates Skanska's ability to develop green project proposals that significantly reduce environmental impacts and make significant lifecycle financial savings.