SKANSKA

Reimantorni, Finland

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Case Study 37

Reimantorni is an 18-storey energy efficient apartment building project in Espoo, Finland, that developed new efficient construction techniques and sought to minimise impacts of the building throughout its entire life.

Aspects of Sustainability

This project highlights the following:

Social Aspects

Human Resources

Corporate Community Involvement

Business Ethics

Health and Safety

Environmental Aspects

Energy and Climate

Materials

Ecosystems

Local Impacts

Economic Aspects

Project Selection

Supply Chain

Value Added

Project Introduction

The Reimantorni is an 18-storey apartment building in the Kivenlahti district of Espoo, Finland. Espoo is the second largest city in Finland, 16km west of Helsinki and within the Helsinki Metropolitan Area. The building was completed in August 2007 and includes 79 apartments, most of which have been sold to private residents.

Skanska Finland constructed the US$ 29 million project between 2006 and 2007 for clients Skanska Residential Development and Asuntosäätiö (The Finnish Housing Association), who initially owned 59 and 20 apartments respectively. The Reimantorni has a residential floor area of 5,639 m^2 and basement parking for 159 cars. Communal facilities include a drying room, sauna, social room and a roof terrace.

The Reimantorni building won the Skanska Project of the Year award in 2007 for meeting all project targets and for developing innovative construction techniques, such as a 4D Building Information Modelling (BIM) tool, which incorporated scheduling with 3D animations. The Reimantorni also became the first residential building to win the Construction Site of the Year 2006 award from the largest construction magazine in Finland, and was declared the Safest Housing Construction Site in a 2006 industrial safety competition in the southern Finnish region of Uusimaa.

Contributing Toward Sustainable Development

The Reimantorni apartments are energy efficient and constitute healthy indoor environments for the building's residents. The building has also contributed toward sustainable urban planning by being located in an urban district of Espoo. During construction, prospective residents were

communicated with via an online information portal and project partners were involved in the development of the project. High standards of site health and safety were reached and a school safety initiative was implemented. Innovative construction techniques were developed during the project, which have been shared within Skanska Finland and among other Nordic business units. The project primarily employed construction workers from the Helsinki Metropolitan Area and regional materials and subcontractors were utilised where possible. Vocational training was provided on site for Skanska trainees and students from universities and local vocational schools. The environmental impacts of the building were assessed and considered over its entire service life and Skanska strived to minimise waste and use environmentally responsible construction materials.

Social Aspects

Stakeholder communication

An Internet portal was developed to provide information about the Reimantorni project for residents and project partners. Prospective residents could use the portal to find information on how the construction was progressing, the building in general and individual apartments. Residents could also submit questions to the Skanska project managers, select materials and appliances for their apartment and order alterations on-line during the construction phase. Once the Reimantorni building was completed the portal was handed over to the Finnish Housing Association to facilitate access to information. All project documents related to the construction materials used and the maintenance of the building are available on the portal.

Zero building defects

The project team developed a new inspection method during construction to ensure that all apartments were defect-free before handing over to residents. Each apartment was regularly inspected for defects throughout the construction process and the entire building scored maximum points in a final 12-item evaluation. The inspection method has since been applied to all Skanska Finland residential projects.

Project partner collaboration

The Skanska team had previously collaborated on several other projects and the project managers had worked together for around 20 years. Construction workers were actively involved in the project planning stages and in the development of the BIM tool, which provided the entire team with a common reference point from which to work. The same project team will build on the experience gained from the Reimantorni project to collaborate on a new 21-storey residential building in Espoo. Construction of the new building is scheduled to commence in autumn 2008. External project partners included experts from the Finnish Technical Research Centre, who tested the efficiency of the windows and indoor emission levels.

Occupational health and safety

The Lost Time Incidence Rate for the Reimantorni project was zero and there was only one minor accident, which did not result in lost time. The project set a new Finnish safety record by achieving a score of 99.4 percent in the Finnish TR safety assessment, which is a comprehensive construction safety assessment involving over 100 criteria. A worker safety awareness initiative was developed and implemented that encouraged the entire team to record their site safety observations and identify potentially hazardous situations. The initiative has since been implemented on other Skanska Finland projects. Innovative techniques were used to improve ergonomic work practices, such as a new concrete spreading tool that enables levelling work to be done standing rather than kneeling. The tool has improved working postures for concrete workers and is thought to have reduced absence due to illness. A fall protection plan was implemented, which included the extensive use of easy-mount railings with mesh barriers to prevent materials accidentally falling to lower levels. Weekly safety meetings were organised, including sessions in Russian and Estonian for foreign workers, and regular meetings were held with the Uusimaa industrial safety district office.

School safety awareness project

Skanska developed a safety awareness project with a local school to educate children about the dangers of trespassing on the construction site. Teachers from the school were briefed on the site's safety and security arrangements and two classes of 14-year-olds visited the site to learn about safety procedures and the project in general. A security fence surrounded the site to prevent trespassing and surveillance cameras were in operation.

Development of innovative construction techniques

Several innovative construction techniques that improved project efficiency and quality were

developed during the Reimantorni project, which will be used on future Skanska projects. The project pioneered the use of a 4D BIM tool to plan each stage of the construction, which allowed the early detection of design and logistical problems. The tool also improved time and resource efficiency and reduced the construction period by six weeks. A self-levelling floor concrete was developed and the team worked with suppliers and subcontractors to improve the construction techniques and quality of cast-in-situ floor slabs. A metal box called a 'Timotec box' was designed by one of the project managers to prevent concrete and rainwater entering the pipes and ducts during construction. Good practice techniques were also borrowed from other Skanska projects, such as a tool to facilitate concrete spreading called a 'sluda' developed by Skanska Sweden.

Raising awareness of more efficient construction techniques

The decision was made during the design phase to record and communicate the innovative production and construction techniques developed during the Reimantorni project. Several visitors from Skanska Finland toured the site along with personnel from Skanska Sweden, Norway and Denmark. Innovative techniques to construct foundations, concrete floor slabs and cast-in-situ walls were filmed and have been submitted on Skanska's intranet.

Healthy indoor environments

The Reimantorni apartments are healthy indoor environments that do not contain toxic substances and are well ventilated. Non-toxic and low emitting materials were prioritised and the concentration of Volatile Organic Compounds (VOCs) and formaldehyde were measured at three intervals during construction. The building is equipped with a high performance ventilation system and there is a ventilation regulator in every apartment, which enables residents to control their indoor environment. The cleanliness of the ventilation ducts was monitored during construction and there was a two-week period prior to handing over where no building work was done in order to improve the indoor air quality. When handed over to residents, the indoor concentration of VOCs was measured to be approximately half the level found in the average newly constructed residential building in Finland.

Sustainable urban planning

The Reimantorni is located in an urban district of Espoo and is close to grocery stores, shops, restaurants and amenities, including a health

centre and a day care centre. The building is situated 17 km west of Helsinki and several smaller urban districts are within 10km. There is a bus stop 200m from the building and buses make the 30-minute journey to Helsinki every 10 minutes. Bicycle storage is provided on the ground floor of the building.

Economic Aspects

Local construction employment

An average of 20 Skanska site personnel worked on the Reimantorni project. Approximately 70 percent of the workforce was from the Helsinki Metropolitan Area, which includes Espoo. A small number of workers from Russia and Estonia were also involved in the project.

Vocational training

The Reimantorni project involved two participants from Skanska's site management trainee program, four university trainees and four summer trainees, including two from the Helsinki University of Technology and two from vocational schools. 20 first-year vocational school students were also involved in the project as part of their basic education. The students worked with the project team under the guidance of their teacher to support with the parking facilities and outer walls of the building during two three-week periods.

Regional materials and subcontractors

The majority of the construction materials were sourced from within Finland, including all wood and stone. An exception was the patented iron bar rolls used on the project, which could only be sourced from a licensed supplier in Germany. Most of the mechanical and electrical equipment was also sourced from Finnish suppliers, including fixtures and fittings. The structure of the building was completely built by Skanska's own workers, and subcontractors were only used for mechanical and electrical system installations.

Resident financial savings due to energy efficiency

The Reimantorni building uses approximately 15% less energy than Skanska Finland's average multi-storey building. The energy savings constitute financial savings for the residents of the Reimantorni building.

Local economic development

The Reimantorni development has brought more urban residents into the Espoo area, which may benefit local businesses and services. The site was previously used as a car park and the building is thought to have improved the perception of the neighbourhood.

Environmental Aspects

Environmental impact assessment

Skanska Finland's Ecometer environmental assessment tool was used to assess and minimise the environmental impacts of the building throughout its entire life cycle. The Ecometer is a web-based tool, which uses a construction material database based on the results from buildings designed by Skanska to assess the overall environmental impacts of a building. Skanska made material and structural choices based on the Ecometer tool to minimise the environmental impacts of the building, including operational energy consumption.

Minimising environmental impacts during construction

The project team strived to minimise public disturbance, dust and energy consumption during construction. Site activities did not exceed 6:00 in the evening in consideration of the surrounding residential areas. An air filtration system was used during the construction phase to collect and control dust. The local district heating system was used to dry the structure during construction, rather than using electric or gas heating.

Waste management

2.3 kg of waste was generated per m^3, which is almost a third of the amount generated on the average Skanska Finland residential construction project. Waste was minimised by the effective planning and sorting of materials for recycling. Waste sorting facilities for plastic, plasterboard, timber, brick, paper and cardboard were located on every floor of the building.

Environmentally responsible construction materials

All materials used within the Reimantorni building exceeded the voluntary Finnish M1 standards for low emissions, which demand less than a total VOC value of 200 micro g/m^2/hour. Durable materials were also selected and the building's structure has been designed for a 100-year service life.

Energy efficiency

The Reimantorni is more energy efficient than a conventional Finnish building and consumes 127 kWh/m^2 compared to Skanska Finland's average of 149 kWh/m^2 in 2007 for multi-storey buildings. Each apartment air conditioning system is equipped with a heat recovery unit to recycle energy. Walls and windows have been well insulated and energy efficient lighting and appliances have been used within the building.

Water efficiency

The apartments are equipped with water efficient fixtures and toilets. Water usage is measured individually to encourage residents to monitor their consumption and conserve water.

Learning From Good Practice

Innovative construction techniques were developed during the Reimantorni project, which have been shared with other Skanska Nordic business units. The Reimantorni project also combined Skanska Finland's experienced project managers with company trainees to ensure that Skanska learns from good practice and has a highly skilled workforce in the future.