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Milíčovský Passive Residential

Case Study 93

Phase One of the Milíčovský Háj South residential development in the Czech Republic consists of several low-energy and passive house apartments, along with other homes built to Skanska's standards.

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

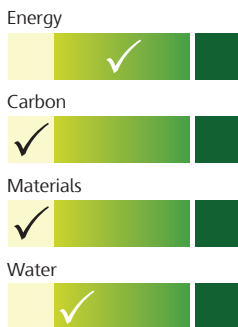
The Milíčovský Háj South residential development is situated in Prague, in the southeastern suburbs of the city. Phase one of the project includes five mid-rise residential buildings with a total of 66 apartments, which range from one-room studios to large four bedroom apartments. Four of the buildings contain 52 apartments in total that were designed using Skanska's own low-energy ECO-Comfort standards. One of the buildings was built to Czech passive house standards and contains 14 apartments. The project is part of the "Milíčovský Háj South and East" complex, which is one of the largest residential projects developed by Skanska Czech Republic and includes around 750 apartments in total.

Skanska Reality acted as the developer and the general contractor of the US\$ 7 million Milíčov project (low-energy and passive house apartments in phase one), which was completed at the end of 2011. The entire Milíčovský Háj development will cost around US\$ 120 million in total. The

apartment buildings have four above ground levels and one partially below ground, which contains garages and tenant storage spaces. The structures consist of slab foundations supported by large diameter piles, and include prefabricated elevator shafts, stairwells and balconies. Skanska largely relied upon its own capabilities and the expertise of other divisions within the company to carry out the project. For example, new structural components for the elevator shafts were developed together with Skanska Concrete Construction division that have the potential to be used on future projects.

The development includes apartments constructed to Skanska's low-energy EcoComfort and passive house standards. Passive houses are very low-energy buildings that do not require conventional electric or hot water-based space heating systems, and require very little energy for space heating. Under normal circumstances, the apartments are sufficiently warmed by the heat generated by human occupants, electric lighting and domestic appliances. The passive house apartments have

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a return on investment of approximately 13 years. The site is adjacent to the Milíčovský Les nature reserve, which is a Natura 2000 habitat that includes sensitive forests, meadows, lakes and wetland habitats. The project was therefore carefully adapted to minimize detrimental impacts on the adjacent sensitive natural environments.

Contributing Toward Sustainable Development

Phase One of the Milíčovský Háje South residential development has created 66 low-energy and passive house apartments that use between 40 and 60 percent less energy than the Czech building code. The apartments incorporate environmentally responsible materials and are equipped with water efficient fixtures. They provide healthy living environments and are designed to be functional and flexible in order to promote a long useful lifespan. The site also has a dual stormwater management system to deal with street and building runoff. As part of the project, Skanska remediated a large brownfield site, and preserved the adjacent Natura 2000 site by protecting and investing in the nature reserve. During construction, Skanska recycled demolition and excavation materials on site and ensured that the site was a net-importer of waste materials by incorporating excess backfill materials from other construction projects in Prague. The project had a good safety record and promoted the Czech economy by sourcing regionally manufactured products and materials.

Green Aspects

Energy

Energy efficiency

The Milíčov passive house apartments have an A-level energy rating and are designed to annually use 48.6 kWh/m² in total, which is almost 60 percent less than Czech energy standards that require an annual energy consumption of less than 120 kWh/m². The apartments are well insulated and the walls, roof and triple glazed windows have u-values of 0.15 W/m²K, 0.13 W/m²K and 0.75 W/m²K respectively. The apartments have heat recovery systems, which recover around 90 percent of the energy from outgoing air. The apartments are designed to annually use 10.6 kWh/m² for space heating, compared with the Czech passive house limit of 20 kWh/m². The building has an air tightness of 0.3 times the building volume per hour at 50 Pa, compared with the passive house air tightness requirement of 0.6 per hour. The passive house building was part of a research project involving Skanska and the Czech Technical University as part of the CIDEAS (Centre for Integrated Design of Advanced Structures) program to assess the feasibility of this particular passive house design. Skanska plans to learn from the passive house building and further develop passive house techniques on subsequent stages of the Milíčov site.

The Milíčov low-energy ECO-Comfort apartments are designed to annually use 56.9 kWh/m² in total, which is around 40 percent less than Czech energy standards and equates to a level B energy



rating. The ECO-Comfort apartments are also well insulated and utilize heat recovery systems. The ECO-Comfort apartments are designed to use 14.3 kWh/m² for space heating, which exceeds Czech passive house standards.

The windows of all the apartments are equipped with external remote-controlled blinds to avoid excessive passive solar heating during the summer months. Each building has a boiler room, which provides central heating and hot water for each apartment, and each has its own ventilation and heat recovery system to preheat incoming fresh air with the outgoing stale air. Heating is supplied by efficient district heating, which utilizes waste heat from a nearby power plant.

Renewable energy

The buildings have been prepared to be equipped with photovoltaic (PV) systems in the future. Installation has been delayed by changes in Czech legislation, but is expected to occur in 2012. The systems will annually supply the buildings with approximately 15 percent of the passive house building's total annual energy consumption.

Carbon

Operational carbon

The low-energy passive house and ECO-Comfort apartments are capable of reducing their operation carbon emissions by between 40 and 60 percent throughout their lifespan compared with apartments built to current Czech standards.

Materials

Environmentally responsible materials

The apartments conform to Skanska's standards for environmentally responsible materials, and the project incorporated PEFC (Programme for the Endorsement of Forest Certification) certified wooden windows, wooden flooring, low-emitting and water-based substances.

Waste management during construction

The site contained significant quantities of mixed debris, discarded waste and demolition materials, which could not be recycled and were sent to landfill. Such materials accounted for 52 percent of the total project waste. However, the project crushed and reused 67 tons of concrete waste from demolished buildings and 12 tons of asphalt from existing roads on site and incorporated them into the project as hard core materials to form foundations for roads and buildings on the site. Such materials accounted for 37 percent of the total project waste. Excavated soil from the site was also incorporated into the landscaping as backfill material and the project utilized excavated materials from other construction sites in the Prague area, which made the project a net-importer of waste material and helped reduce materials sent to landfill.

Apartment waste management

Individual apartments have designated waste sorting spaces, and each building has a roofed waste sorting station.

Water

Water efficiency

The bathrooms and kitchens are equipped with water efficient fixtures, such as low-flow taps and dual flush toilets. The apartments use around 10 percent less water in total than typical Czech homes.

Stormwater runoff

The Milíčov development is one of the first neighborhoods in Prague to have a dual stormwater management system for street and building runoff. Potentially contaminated runoff from asphalted streets on the site is diverted into the municipal storm sewer system, where it is properly treated. Non-contaminated runoff from the buildings is diverted into retention ponds in the landscaped gardens on the site before being slowly discharged into the Milíčovský stream. This system of retention and staggered discharge is designed to reduce the risk of stormwater runoff, which could potentially pollute the adjacent sensitive natural environments and cause localized flooding. The site is designed to cope with once a century severe rainfall events.

Other Green Aspects

Site remediation

The site contained various derelict structures and had been used as an informal dumping ground. Skanska removed a variety of debris from the site, such as scrap metal and used tires. Some of the existing buildings had asbestos roofing, which was safely removed and properly dealt with by Skanska's licensed asbestos removal services.

Wetland habitat preservation

Sensitive species in the reserve include the Great Capricorn Beetle (*Cerambyx cerdo*), which is the largest beetle in the Czech Republic and has a conservation status of "threatened". The reserve is also home to the attractive Metallic Beetle (*Anthaxia Candens*) and historic cherry orchards.



The project was carried out in consideration of such species and their natural habitats.

From 2008 and throughout the construction, Skanska had the groundwater and surface water chemically tested on a quarterly basis to verify that the construction process did not affect the site's water quality. The levels of the groundwater table and surface water around the Milíčovský nature reserve were also measured and recorded during construction to verify that the natural wetland habitats were not affected. As part of the project, the site's meandering watercourses were transformed into a network of pools and small lakes, which have been integrated into the natural environment of the adjacent wetlands.

Investment in the Natura 2000 reserve

The project restored and extended existing walking and cycling trails in the Milíčovský Les nature reserve, to create 4.8 km of forest trails, including a ford and a culvert that were created to allow access over watercourses. One of the existing ponds in the nature reserve was also restored. A new education trail through the reserve was created with ten themed study stations, including informative displays about the reserve's history, the impacts of human activities, the various wetland, forest and meadow habitats, and the reserve ecosystem as a whole. Skanska financed the work, which was carried out by the Czech Union for Nature Conservation.

Social Aspects

Reducing public disturbance

Noisy construction activities were planned to avoid excessive disturbance for local residents by only being conducted during the week. Activities, such as on-site concrete crushing, were carried out as far from existing dwellings as possible. Most on-site crushing was also conducted during school holidays due to the close proximity of an elementary school. Some noisy activities, such as the machine smoothing of concrete foundation slabs, were avoided altogether to reduce disturbance. Noise levels were continuously monitored around the site to ensure that legislative limits were not exceeded. A drive-through wheel washer was used to ensure that trucks leaving the site did not soil public roads.

Occupational health and safety

There were no accidents on site during Phase One of the Milíčovský Háj South, and the Lost Time Accident Rate was zero. Skanska and the project's subcontractors followed Skanska's standard health and safety procedures.

Healthy living environments

The apartments are equipped with fresh air ventilation systems that remove stale air from the kitchens and bathrooms, and supply fresh air to the living spaces to promote good indoor air quality. The ventilation systems are steered by carbon dioxide sensors that increase the volume of fresh air intake when predetermined carbon dioxide limits are exceeded. Non-toxic materials and substances have also been incorporated into the project to promote a healthy indoor air quality. The buildings are south facing and have large windows to maximize natural daylight, and external remote-controlled window shades prevent excessive solar heat gain. All the apartments have a balcony or terrace with views over the attractive landscaped gardens and adjacent nature reserve. The landscaped gardens surround and separate the apartment buildings and include trees, extensive lawns, ponds, outdoor seating areas and space for outdoor recreation and relaxation. The nature reserve offers residents easy access to forest and meadow landscapes, and opportunities for walking and cycling.

Functional and flexible apartments

The buildings provide modern apartments that are functional and flexible to meet the needs of various residents now and in the future, and to promote a long and useful building lifespan. The apartments are equipped with modern TV and Internet services, a security system and a video intercom system. All buildings are wheelchair accessible and have elevator access to floor level. Every apartment has a basement storage closet and residents can opt to rent a parking space in the basement garage, which is located directly under the apartment buildings. The apartments range in size to accommodate a variety of family units.

Contributing toward sustainable urban development

The project reused a brownfield site, which had been used during the 1980s as a support area for the construction of the adjacent Jižní Město residential development. The project consequently did not directly impact on natural environments or greenfield sites. Miličov is within a ten-minute walk of all necessary services and amenities, including supermarkets, a healthcare clinic and pharmacies, schools, restaurants, a gym, a cinema and ATMs (Automated Teller Machines).

Promoting more sustainable modes of transport

Several bus routes serve the Miličov neighborhood and the apartments are within a 7-minute walk of the Háje subway station (line C), which offers access to downtown Prague in 17 minutes. Every building has designated indoor bicycle storage available to residents.

Economic Aspects

Regional construction materials and workers

The project primarily used Czech made products and materials. Examples include bricks, steel, thermal insulation, windows and doors. Approximately 550 people worked on Phase One of the project.

Efficiency savings

The Miličov ECO-Comfort and passive house apartments cost around 10 percent and 16 percent respectively more to construct than apartments built to the Czech energy standards. However, the Miličov apartments typically reduce total energy costs for residents by 40 to 60 percent, compared



with apartments built to Czech standards. These passive house apartment energy savings amount to around US\$ 5,400 per year, compared with Skanska's Family standard apartment type, which is designed to use annually 95 kWh/m². The passive house apartments have a return on investment of approximately 13 years, based on current energy costs.

Learning From Good Practice

The experience of the Miličov passive house apartment building can guide the incorporation of passive house features into subsequent phases of the Miličovský Háj South and East project and other residential projects. The project also demonstrates that well designed and implemented projects can preserve and even enhance adjacent sensitive natural environments and habitats.

