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Kings Mill Hospital, UK

Case Study 40

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

Kings Mill Hospital in Nottinghamshire, UK, is undergoing major redevelopment, which will improve clinical efficiency, the indoor environment and will utilise Hydrothermal (lake source) energy as part of a PFI (Private Finance Initiative).

Project Introduction

Kings Mill Hospital in Nottinghamshire, UK, which provides healthcare for 300,000 people, is undergoing major redevelopment. The 21-hectare site was originally an American Services hospital during the Second World War and has largely developed unplanned since the 1960s. Prior to the redevelopment the hospital was notoriously difficult to navigate and related services were scattered throughout the complex.

A Skanska consortium, including Innisfree investment group and the Sherwood Forest Hospitals NHS (National Health Service) Trust, is carrying out the redevelopment, which is part of a US$ 590 million PFI (Private Finance Initiative) contract to design, redevelop, finance, and operate three Nottinghamshire Hospitals until 2035. The Kings Mill redevelopment will create a modern hospital with state-of-the-art facilities, and includes three new T-shaped ward blocks and the retention and refurbishment of a third of the old buildings. The plans include a new entrance with a patient information centre, the creation of 28 new wards, new centres for Diagnostic and Treatment, Women and Children and emergency care, dedicated training facilities and increased inpatient capacity. The redeveloped hospital will have a total area of 140,000 m^2 and will add over 100 additional beds, increasing the total capacity to 920 beds. 60 percent of the new facilities will be available by 2009 and the redevelopment will be complete by the first quarter of 2011. The hospital will remain fully operational throughout the redevelopment.

The Kings Mill redevelopment project has been rated Excellent by the NHS Environmental Assessment Tool (NEAT), which assesses energy, transport, water, materials, indoor environment and waste criteria. The project also won a gold award from the Royal Society for the Prevention of Accidents in 2007.

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Contributing Toward Sustainable Development

The Kings Mill redevelopment project has created a state-of-the-art hospital, which is more functional and incorporates healthy indoor environments for patients and staff. The redeveloped hospital is also more energy efficient, has sections of green roofing and uses geothermal energy. A Sustainability Plan has been implemented to maximise local socio-economic benefit and minimise the environmental impacts during the redevelopment, operation and demolition of parts of the old hospital. A variety of stakeholders were consulted during the design and construction, and good communication was maintained to reduce potential disruption to hospital activities. An interactive occupational health and safety strategy was implemented along with a local school safety initiative. Local employees and businesses were prioritised and unemployed people were hired through training schemes. The Environmental Management Plan included comprehensive waste management, the use of environmentally responsible materials and the installation of a temporary water treatment plant to manage run-off.

Social Aspects

Interactive stakeholder consultation

A variety of Trust and community stakeholders were involved in the design process through organised meetings and informal information days. An aim of the redevelopment was to enhance the public perception of the hospital, and the design was adjusted to meet the requirements of user groups at an early stage. The orientation of the main entrance, for example, was altered following public consultation to make it more visible on arrival.

Occupational health and safety

The One Step Ahead plan was initiated to engage project partners and coordinate safety activities, and the Lost Time Accident Rate for the project was 6.6 per million hours worked between 2004 and 2007. The site safety office oversaw safety activities and ensured that all personnel completed health and safety training as part of their induction. Safety days, poster campaigns and team milestone rewards were used to raise safety awareness and incentives encouraged the reporting of safety near misses. Employee consultations, such as an anonymous questionnaire, were conducted to identify health and safety risks and to encourage suggestions for workplace improvements. Open door meetings, chaired by union safety representative, were held to give workers the opportunity to raise or discuss safety issues. Approximately 120 employees underwent Institution of Occupational Safety and Health manager training, and other training included first aid and working at height safety. Health initiatives included medical checks-ups, sight tests, a healthy eating club and a smoking clinic.

School safety awareness campaign

As of July 2008, around 80 children from three local schools had participated in a safety awareness project to discourage trespassing on the construction site. A safety film, an interactive safety identification exercise, poster competitions and quizzes were used along with site visits. The campaign also included environmental awareness and information about the construction industry.

Minimising hospital disruption during construction

The hospital was fully operational throughout the redevelopment and Skanska strived to minimise disruption to hospital operations and ensure there were no health and safety risks for patients, visitors and staff. Hospital stakeholders were continuously informed of the construction progress through clear information notices. Skanska relocated wards and departments directly to their permanent new locations where possible to avoid disruptive multiple moves. Traffic congestion was avoided by planning deliveries, encouraging construction workers to use public transport and by using a designated construction entrance at the rear of the site.

Creation of healthy indoor environments

The redevelopment intended to create comfortable and healthy environments to improve patient recovery times and staff satisfaction by maximising natural daylight, scenic views, fresh air ventilation, patient privacy and incorporating psychologically positive design features. The new sections of the hospital face south and have a window to external wall ratio of 50 percent to maximise the penetration of natural light into the building. High frequency flicker free lighting was used along with occupant operable sun blinds. Scenic views of the nearby reservoir and surrounding countryside were incorporated into the design and a wildlife garden has been created on the grounds. The fresh air ventilation system exceeds NHS ventilation standards and helps to control airborne infection.

The upper floors also have good access to natural ventilation through the large proportion of openable facades, which exceeds 5 percent of the total floor area. Approximately half the beds of the redeveloped hospital will be in private rooms and partition blinds allow seclusion and soundproofing. The interiors use the positive psychological properties of space, light, colour, texture and art.

More functional hospital

The redevelopment has incorporated a more functional hospital design, which has improved access to clinical services, hospital navigation, patient access to primary healthcare services and has amalgamated related specialised services. The new design ensures that 90 percent of clinical services are easily accessible from the wards. The redeveloped hospital was designed to promote intuitive navigation and uses common dual 24-bed module ward plans to enable staff familiarity with the generic model. Art was also incorporated into the building to create points of recognition. Primary healthcare services, such as the new Diagnostic and Treatment Centre, are easily accessible by the entrance of the hospital. Specialised services, such as a Women and Children's Centre, which were previously dispersed throughout the hospital, have been merged into dedicated departments.

Sustainable urban and transport planning

Hospital amenities include a pharmacy and cafe, and a supermarket and bank are adjacent to the site. Public transport information points have been established to advise on the 19 bus routes that pass the hospital and staff can apply for interest free bus season tickets. There are several cycle routes in the area and approximately 100 sheltered bicycle spaces are provided along with staff shower and changing facilities. A pedestrianised civic area has been created outside the hospital and there is good pedestrian access to the local amenities. A travel plan has been implemented to promote alternative modes of transport among staff, patients and visitors to improve congestion, air quality and health. The consortium is working with employment unions, bus companies, community health councils, and cycling and walking associations to target groups living within 3 km.

Redevelopment and cultural preservation

The creation of a modern hospital is intended to stimulate civic pride within a deprived ex-mining community.

Economic Aspects

Construction employment

Between 500 and 700 construction workers were involved in the project at any one time, approximately a third of whom were from the local area. In June 2008 it was brought to Skanska's attention that a subcontractor was underpaying 12 Lithuanian workers. In line with its code of conduct, Skanska worked with the union and the subcontractor to ensure that the workers were properly compensated and that such issues would not recur as part of its commitment to ethical business.

Regional economic development

The consortium aims to contract local businesses throughout the design, construction and operation of the hospital in order to stimulate economic development and employment. Regional businesses contracted during the redevelopment included construction subcontractors, decorating firms, a geothermal energy company and local artists. The redeveloped Kings Mill Hospital is expected to employ approximately 200 additional staff.

Vocational training

Training initiatives were used to improve worker competence and to employ local unemployed people through back-to-work schemes, in an area where unemployment is almost twice the national average. By July 2008, about 80 workers had undergone supervisor training. Skanska had employed 30 local unemployed through the Making the Connection training partnership as of January 2008. Two Skanska employees had also been employed through the Construction Gateway scheme, which retrains the long-term unemployed.

Life cycle cost modelling

Life cycle analyses based on long-term financial savings were carried out to make the case for more efficient and sustainable technologies. A new energy centre, which includes heating, refrigeration and steam plants, was constructed following a life cycle assessment of initial capital costs against improved operational efficiencies and lower maintenance overheads. The geothermal system was also based on a sound long-term investment, with capital repaid in less than ten years.

Energy efficiency savings

Electricity consumption will be measured in each department and gas and water in each building to encourage savings. The geothermal heat pump system annually saves approximately US$ 240,000 in costs.

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Environmental Aspects

Minimising environmental impacts during construction

Construction areas were hoarded off from the operational hospital to reduce noise and dust. Machinery was equipped with silencers and vibration dampeners where possible, and was well maintained to reduce defect noise. Noise and vibration monitoring was carried out during high impact activities, e.g. piling.

Minimising water pollution

The local clay soils produce a red run-off, which stains the nearby Kings Mill Reservoir. A settlement lagoon and water treatment plant was constructed to allow the continuation of construction work during wet weather without contaminating the reservoir. Run-off from the site was contained in the lagoon before being treated and discharged into the reservoir. The completed hospital car parks have water absorbent paving, interceptors and storm tanks and the temporay car parks have interceptors and swales (storage/settlement ponds) as part of a Sustainable Urban Drainage System (SUDS) to minimise pollution of the reservoir and to ensure that the run-off rate is comparable to that of a greenfield site.

Demolition and Construction Waste Management Plan

A comprehensive waste management plan was implemented and approximately 98 percent of the demolition and earthworks material and around 55 percent of other waste had been recycled as of July 2008. Permanent sorting stations were established and recycling was monitored and reported through an online database. Materials were accurately ordered and prefabricated to minimise on-site waste. Waste was reused on-site where possible, such as timber for shuttering and temporary carpentry, soil for landscaping and crushed concrete for the piling mat. All workers were involved in an ongoing education programme including waste minimisation and recycling.

Environmentally responsible construction materials

96 percent of the external walls, 90 percent of the plasterboard partitions and 55 percent of the roofing was A rated by the UK Green Guide to Specification, which measures the overall environmental impacts of construction materials from a life cycle perspective. Specific examples of environmentally responsible materials include bricks made from treated sewage sludge and all timber, which was procured through Skanska's Sustainable Timber Policy.

Energy efficiency

New sections of the redeveloped hospital are expected to annually consume less than 55 GJ/100m^3 and refurbished buildings less than 65 GJ/100m^3. Energy efficiency measures include the ventilation system, lighting and the geothermal system. The ventilation ducts were designed to minimise the fan power required and heat recovery units recycle energy from outgoing air. Efficient lighting measures include fluorescent lamps, timers, motion detectors and daylight sensors to control the light intensity. The geothermal heat exchange system produces between 4 and 7kW of energy for every 1kW it uses, which is more efficient than conventional heating and cooling

equipment and other renewable energy technology. The consortium also plans to provide staff with energy training to promote the efficient use of hospital facilities.

Water efficiency

Low-flow taps, and low-flush toilets have been used throughout the redevelopment. Rainwater is collected for vehicle wash down and landscape watering, and plants that require minimal or no watering have been used.

Geothermal heating and cooling

Skanska have installed a lake-source heat pump cooling and heating system that is capable of producing 5.4MW of cooling and 5MW of heating. A network of heat exchangers submerged in the adjacent Kings Mill Reservoir is connected to 42 heat pumps in the hospital, which regulate the temperature. The system is the largest geothermal lake loop in Europe and will fulfil the hospital's entire needs for cooling and support the gas heating system when the capacity is available, annually saving 9,600MWh of gas and electricity. Skanska consulted local preservation and wildlife groups and the heat exchangers were installed during the winter to minimise disturbance. A floating reed bed has been added to conceal and protect the exchangers and to create new habitats for wildlife.

Reduced greenhouse gas emissions

The geothermal system is estimated to annually save 1,700 tonnes of carbon dioxide emissions, which would otherwise be produced through the combustion of fossil fuels. The nitrous oxide emission rate from the new energy centre is below the NHS Environmental Assessment Tool (NEAT) standard of 150 mg/kWh, although the consortium plans to investigate possible further improvements.

Green roofing

Approximately 20 percent of the entire hospital roofing and around half the Diagnostic and Treatment Centre is covered with sedum vegetation, which reduces runoff during wet weather by absorbing water. The sedum roof provides additional insulation, new habitats for local flora and fauna and contributes toward a reduced urban heat island effect by decreasing the extent of dark and paved surfaces.

Recycling facilities

Facilities to recycle paper, glass and drinks cans have been included within the hospital, and recycling storage exists on the site.

Learning From Good Practice

The comprehensive and interactive approach to sustainability during the redevelopment was vital in fulfilling the requirements and expectations of the Trust, public user groups, neighbours and the wider society. A life cycle perspective also proved useful for making the long-term investments in resource efficient technologies financially viable.