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Case Study 65

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



in the European Business Awards for the Environment

Management Category

Barts and The London Hospitals, UK

St Bartholomew's (Barts) and the Royal London Hospitals in London are being redeveloped into state-of-the-art facilities as part of a PFI (Private Finance Initiative) led by a consortium including Skanska, which has integrated sustainability into all stages of the project.



Project Introduction

Barts and the Royal London Hospitals are managed by the Barts and The London NHS (National Health Service) Trust, and annually care for over 700,000 people. Barts Hospital is situated in central London, and the Royal London Hospital in Whitechapel, East London. Prior to the redevelopment, the hospitals were in acute need of modernization and expansion following several decades of insufficient investment.

Capital Hospitals, a consortium that is jointly owned by Skanska (37.5 percent), Innisfree (50 percent) and the Dutch Infrastructure Fund (12.5 percent), is redeveloping the hospitals as part of a PFI project. The project is worth approximately US\$ 1.6 billion and is the largest hospital PFI in the UK to date. Capital Hospitals is responsible for designing, building, redeveloping and maintaining the hospital buildings until 2048. The NHS Trust will continue to be responsible for managing healthcare services and the hospital buildings will revert to NHS ownership following the contract. Skanska is undertaking the design and redevelopment of the two sites, which will construct or refurbish a total floor area of 277,650 m² and increase the number of patient beds from 1,062 up to 1,248. Redevelopment work began in May 2006 and both the Barts and The Royal London hospitals are scheduled for completion in 2016. The redeveloped Royal London hospital will include 144,000m² of new floor space in a cluster of inter-connected contemporary glass buildings and 17,000 m² of refurbished space. The hospital will house London's leading trauma and emergency care center and one of Europe's largest renal units, together with London's Air Ambulance, which is based at the hospital and will operate from one of the new 17-storey landmark towers. The redeveloped Barts hospital will include 60,000 m²

of new floor area and 6,650 m² of refurbished space. Two dilapidated wings were demolished and replaced with a single building that will house state-of-the-art cancer and cardiac facilities. Phase 1 of the Barts Hospital, the Cancer Centre, was completed with zero defects and became operational in March 2010.

The Barts and The London project is being constructed to meet the NHS Environmental Assessment Tool (NEAT) rating of Excellent, which requires the incorporation of sustainability into every stage of building design, construction, commissioning and management. The project has already won numerous sustainability-related awards, including a Corporate Social Responsibility Award from Construction News, a national Innovation Award from Constructing Excellence, a Waste Management Award from the Chartered Institute of Waste Management and a Sustainable Procurement Award at the national Sustainable City Awards.

Contributing Toward Sustainable Development

The Barts and The London project will deliver modern hospitals that are more functional, more energy efficient and which promote healthy indoor environments. The project is also bringing stateof-the-art healthcare to deprived communities and contributing toward urban regeneration, whilst preserving the cultural environment of the surrounding areas. From the beginning of the redevelopment, the consortium developed the project plans together with stakeholders and continues to keep them informed of progress. High standards of health and safety are being met and disturbance to hospital operations is being minimized. The project is also benefitting the regional economy by utilizing local construction employment and subcontractors. Environmental impacts are being minimized by implementing systematic waste management processes, incorporating responsibly sourced construction materials and by utilizing a Construction Consolidation Center to minimize the number of site deliveries.

Social Aspects

Interactive stakeholder consultation

The consortium spent 14 months developing and refining the project plans together with stakeholders, which enabled the team to comprehensively plan staff transfers and relocations, design layout and project phasing. Over 400 individuals, including clinicians, and patient and community groups, took part in a detailed evaluation of the redevelopment plans for both hospital sites. NHS personnel continue to undertake regular site inspections and remain involved in the clinical design.

Stakeholder communication and engagement

Stakeholders were kept informed during the design stage and public exhibitions of the project plans were held in 2004. During the redevelopment, Skanska developed a detailed communication matrix to ensure that all stakeholders are regularly





informed of any construction activities that may concern them. The matrix details how specific stakeholder groups should be communicated with, and ensures that clear, consistent and timely messages are conveyed to them. Skanska also organizes site visits for NHS staff to help them envisage and prepare for their new working environment. Individuals within Skanska and the Trust that have an interest in sustainability are involved as Sustainability Champions to promote the integration of sustainability into the project.

Occupational health and safety

The Lost Time Accident Rate was 5.34 per million hours worked as of December 2009 and 2 million hours without a reportable accident was reached in January 2010. The project has a full time Health and Safety Test Center, which is open to all operatives from Skanska's subcontractors, even those not directly involved in the project. Another initiative to promote site safety is the use of near miss cards to identify potential accidents before they occur.

Minimizing hospital disturbance during construction

Both hospitals remain operational throughout the redevelopment and Skanska is working closely with local Environmental Health Officers, Trust staff and local stakeholders to avoid disrupting patients and hospital activities. A noise, dust and vibration protocol was established prior to the project, which set thresholds for each of these nuisances and established a full-time monitoring regime. The

protocol also included a process to ensure that any serious concerns were escalated and resolved swiftly, although no serious complaints had been made as of April 2010. Skanska scheduled noisy activities, such as piling, around quiet hospital periods and low-vibration rigs were used in areas close to hospital buildings. An acoustic screen made from aluminum panels with sounddeadening foam is being used to reduce noise and vibration disturbance in the children's intensive care unit, which is 2.5 m from the building site at the Royal London. The 6-storey high screen covers the entire façade and reduces noise by around 25 decibels. Unlike most acoustic screens that are often single use structures, the screen has a design lifespan of 25 years and is supported by a scaffold, which avoided the need to excavate and create waste spoil.

Creation of healthy indoor environments

The redeveloped hospitals are designed to create indoor environments that promote patient healing and enhance the experience of both employees and visitors. The wards are light and airy and have large windows and glass atria to allow natural light into the buildings. The buildings are fully airconditioned and incoming air is filtered to ensure that pollutants from the surrounding city do not compromise the sterile hospital environments. Non-toxic and water-based substances, such as vinyl floor adhesives, were also used indoors to avoid air pollution.

More functional hospital

The redevelopment will create purpose built facilities capable of providing high quality healthcare. The hospitals will also be equipped with the latest diagnostic and treatment equipment throughout the contract, and a state-of-the-art IT and communications infrastructure, which will enable streamlined operations, mobile working and real-time diagnosis.

The consortium designed the hospitals around the innovative concept of arranging wards alongside relevant diagnostic and treatment facilities in discrete 'zones'. The design is intended to facilitate patient transfer and access to relevant facilities, whilst sufficiently separating patent areas and treatment facilities so as to minimize noise disturbance. Barts Hospital has been designed with features such as a pedestrian plaza to facilitate hospital navigation. Over 40 percent of hospital beds will be in single rooms, with the remainder in large four-bed bays. There will be separate facilities for men and women and relatives will be able to stay in overnight rooms close by.



Promoting public transport

Visitors to the hospitals are advised to use public transport during construction in order to avoid road congestion. Both hospitals are located in dense urban areas with good access to public transport.

Urban regeneration

All new buildings are being constructed on brownfield sites within the hospital grounds and no natural habitats are being disturbed. The project is regenerating the hospital sites by demolishing dilapidated buildings, restoring existing historic buildings, landscaping areas and enhancing pedestrian access.

Cultural preservation

Many stakeholders were consulted on the cultural and historical preservation of the sites, including local government, the NHS Trust and local stakeholders. The new buildings are designed to complement the historic nature of the sites. The new Barts building, for example, is clad in Portland stone to blend into the historic surroundings that include St Paul's Cathedral. Towards the end of the project, the 18th century square at the Barts hospital will be permanently closed to vehicles and restored to a pedestrian plaza to enhance the Smithfield Conservation Area. Work will include the repaving of the square and the restoration of a fountain, street lamps and façades of the surrounding buildings.

Providing healthcare to deprived communities

The Royal London is situated in London's East End, which is one of the poorest areas in the UK and has suffered chronic infrastructural underinvestment in recent decades. The redevelopment will ensure that some of London's most deprived communities have access to state-of-the-art healthcare facilities.

Philanthropic donations

Skanska donates US\$ 1,600 every month to a charity nominated by the highest achieving subcontractor as part of an Environment Health and Safety Award. US\$ 1.6 is also donated to a learning disability charity for every Near Miss card completed. Other charitable fund raising activities to date include participation in the London Marathon and a dragon boat race. US\$ 65,000 had been donated as of December 2009 (excluding Near Miss card donations). Children's play areas on both sites have also been redeveloped as a result of time and financial donations made by the construction team.

Economic Aspects

Local construction employment and subcontractors

At peak, the construction workforce consisted of around 1,800 workers. Skanska encourages local employment by sending out job applications to local organizations and 17 percent of the project workers are from areas adjacent to the projects.



34 percent of project subcontractors are from the Greater London area and Skanska is employing predominantly British companies on the project, which contributes toward regional economic development.

Vocational training

An employment program targeting the long-term unemployed is being implemented on both sites. Skanska also offers English classes for the construction workforce at the Royal London Hospital. The Skanska team of around 140 workers is a mix of young and older, more experienced, workers to promote knowledge transfer within the team. Local school students visit the projects as part of an initiative to give disadvantaged young people job market experience. 60 students visited the projects in 2009, and Skanska also ran mentoring groups at local schools.

Economic development during operation

The hospitals directly employ 7,400 people and by redeveloping the hospitals the consortium is contributing toward safeguarding these jobs for future generations. The hospitals plan to increase the proportion of local employment at the hospitals by allocating 80 percent of new entrylevel positions to local people, which could create around 900 new local jobs.

Environmental Aspects

Minimizing environmental impacts during construction

Dust and noise disturbance was minimized during demolition by demolishing buildings floor by floor. Demolition sites were sealed off and designated drop zones were established to reduce dust pollution. Monitoring stations, linked to the UK Air Quality Network, were established at both sites. The stations send text message and email alerts to the construction team when the level of small dust particles (PM10s) exceeds background levels. The sensors are so sensitive that they have recorded PM10 dust from forest fires in Eastern Europe and high pollen counts in the Netherlands.

Demolition waste management

Skanska demolished 12 six-storey buildings, a seven-storey building and several low-rise structures and recycled a total of 96 percent of the demolition waste. Pre-demolition audits were conducted to identify recyclable materials and plan their removal. The buildings to be demolished were first soft stripped by removing all fixtures, fittings and salvageable recyclable materials, along with hazardous and non-recyclable materials. The buildings were then systematically demolished, which generated approximately 37,000 tons of material.

Many salvaged materials were sorted on site and sold to private buyers, such as sinks, ceiling tiles, chimneystacks, railings, radiators and 250,000 bricks. 4,500 m³ of demolition material was crushed and reused at the Royal London for the piling mat and other inert materials were segregated and sent off site for crushing, screening and recycling. Sorted demolition waste was recycled off-site at a local Materials Recovery Facility, which ensured high recycling rates. Materials that were not recycled included asbestos, window glass and other materials that existed in a highly mixed state.

Construction waste management

The construction team had recycled 98 percent of the construction waste as of January 2010. Skanska strives to avoid the creation of site waste by using innovative off-site prefabrication techniques, reusable packaging and by working closely with suppliers. Prefabricated materials included 1,200 external cladding panels and 1,000 pipe modules that carry up to nine services, such as duct work, oxygen, nitrogen, water and cable trays. The prefabricated materials were manufactured in a purpose built Skanska factory with excellent recycling facilities to avoid waste. Skanska learnt from the automotive and retail sectors to pioneer the use of Returnable Transit Packaging (RTP) in the construction industry to transport mechanical and electrical products, such as 30,000 light fittings. RTP uses robust plastic crates that can be collapsed and returned to suppliers for reuse. The technique reduced cardboard packaging waste by approximately 8 tons. RTP further reduced waste by decreasing the incidence of damaged goods, which can be as high as 5 percent for light fittings when delivered on conventional pallets.

Skanska also worked with suppliers at the tender stage to agree waste targets and encourage innovative methods of reducing waste. A real-time waste management database tool was developed at The Royal London to monitor strict targets for each waste stream, which involves using bins with bar codes to compile contractor specific waste management data. Subcontractors are held responsible for any waste they create and receive financial rewards or penalties of US\$ 160 per ton if their estimated waste quotas are either met or exceeded. At the Barts, vinyl and plasterboard waste targets of less than 5 percent and 15 percent respectively were met. A special agreement was also made with vinyl flooring and ceiling tile suppliers to return off-cuts for recovery into the manufacturing process. An agreement with the Environment Agency allows the off-cuts to be treated as a 'product', which avoids some of the restrictions associated with transporting and managing waste. Skanska is also using an innovative 4D CAD (Computer Aided Design) modeling system to calculate the exact quantities of materials required to avoid over ordering and waste.

'Just In Time' delivery

Skanska utilized an off-site Construction Consolidation Center during phase 1 of the Barts project, which was used to store construction materials before they were transported to the site on a 'Just In Time' (JIT) basis. Consolidated loads from the center reduced transport emissions and vehicle journeys into central London by around 75 percent. The initiative restricted the volume of material on site, reduced waste and contributed to a safer working environment.

Environmentally responsible construction materials

Each supplier had to identify any high VOC (Volatile Organic Compound) or toxic materials at the project planning stage, which resulted in the early elimination of potentially harmful substances. Skanska also worked to improve the environmental performance of its contractors. For example, one contractor became the first blockwork company to achieve ISO 14001 certification in the UK following their involvement in the project. All timber used on the project is from sustainable sources certified by either the FSC (Forest Stewardship Council) or the PEFC (Program for the Endorsement of Forest Certification).





Energy efficiency

Energy efficient equipment includes heat recovery systems to reduce the amount of waste heat, efficient ventilation fans, low-energy lighting and variable speed drives to ensure that energy use better follows demand. Hospitals typically use large quantities of energy for clinical processes but efficient medical equipment has been installed throughout the hospitals. The new buildings have thicker insulation than the old hospital buildings and external shading and solar control glazing reduce the need for cooling in the summer. Only electricity from renewable sources is being utilized during the redevelopment and the consortium plans to explore other innovative and cost effective energy solutions during the remainder of the contract.



Learning From Good Practice

Skanska incorporated a 14-month planning stage, which enhanced project partner relations and cooperation and created the opportunity for innovation during the redevelopment. Other examples of good practice include the appointment of Skanska and NHS Sustainability champions to integrate sustainability into the project.