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St Lars Bridge, Sweden

Case Study 66

Skanska Sweden designed and constructed the St Lars Bridge in Linköping, Sweden, in a manner that reduced environmental impacts and made financial savings for the client.

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

St Lars Bridge is a road bridge that crosses the Tinnerbäcken River close to central Linköping. The bridge carries up to 10,000 vehicles every day and was the first multi span bridge with integrated abutments to be constructed in Sweden. The bridge replaced a 60-year-old bridge that was in a poor state of repair, was too narrow for future traffic projections and posed safety risks for motorists and cyclists.

Skanska designed and constructed the bridge for Linköping Council as part of a project worth approximately US\$ 4 million. The project included the demolition of the old bridge and the construction of a new two-lane bridge in the same location. The council drew up original plans for the bridge but Skanska developed an alternative more functional and efficient design. Skanska's design featured a triple span bridge with two abutments and two intermediate supports.

The new bridge is broader than the old structure with wider vehicle lanes and segregated cycle lanes. The project also included the creation of a riverside park and the redevelopment of connecting street infrastructure, which involved resurfacing 10,000 m² of highway, installing new traffic light systems on three junctions, erecting new street lighting and improving pedestrian infrastructure.

Skanska's alternative bridge design reduced environmental impacts and made financial savings for the client. In-house design specialists from Skanska Teknik replaced the council's flat slab design with a beam-based design, which was more resource efficient and Skanska recycled demolition and fill materials to further reduce the environmental impacts and overall costs of the project. Skanska's design also preserved the stretch of river under the bridge by not rerouting it through a concrete channel as the client had originally envisaged.



Contributing Toward Sustainable Development

The St Lars Bridge project has promoted public safety, the aesthetics of the area and the use of sustainable transport in central Linköping. Skanska developed the project together with the client, Linköping Council, and informed relevant stakeholders about the construction activities. The period of time the route was closed to the public was minimized and Skanska opened the bridge early to vehicles as the cycle lanes were being completed. The project had an impeccable safety record and benefitted the regional economy by only hiring workers from Linköping and the surrounding area. Environmental impacts during construction were minimized and Skanska designed a more resource efficient bridge with higher foundations than the original council design, which reduce environmental impacts and overall project costs. Skanska also incorporated demolition materials into the project to further reduce the environmental impacts and project costs.

Social Aspects

Project partner collaboration

Skanska worked closely with Linköping Council, who were receptive to an alternative bridge design that improved aesthetics, and reduced environmental impacts and project costs. The council approved the bridge design and all construction activities, and were represented at the monthly construction meetings.

Stakeholder communication

Prior to construction activities, Skanska informed local property owners of the project plans via mail. A public communication campaign for the project was also implemented with Linköping Council, which included local newspaper coverage and radio updates regarding traffic diversions.

Reducing public disturbance

Traffic was diverted onto other routes in an around the city during construction. However, the St Lars Bridge is a vital route in central Linköping and Skanska worked to minimize the length of time the route was closed so as to minimise public disturbance. The bridge was closed for six and a half months in total and Skanska opened the bridge early for buses and cars while asphalt and curbs were still being laid for the cycle lanes. Skanska also reduced public disturbance and congestion in central Linköping by significantly decreasing the number of truck journeys to and from the site by reusing demolition materials on site.

Occupational health and safety

There were no accidents during construction and the Lost Time Accident Rate was zero. The team followed Skanska Sweden's standard safety procedures, which includes risk assessments and compulsory worker safety training.

Enhanced public safety

The St Lars Bridge is safer than the old bridge with less risk of traffic accidents involving motorists, cyclists and pedestrians. The traffic lanes on the

new bridge are over 1 m wider in each direction and are separated by a central reservation, which did not exist on the old bridge. The cycle lanes on the new bridge are segregated from traffic, which has significantly improved safety for cyclists compared with the cycle lanes on the old bridge that ran alongside the narrow traffic lanes. The bridge is better lit, particularly for pedestrians, and additional traffic lights have been installed for both vehicles and bicycles. The park area that was created adjacent to the bridge is also well lit to promote pedestrian safety at night.

Promoting sustainable transport

The bridge has promoted sustainable modes of transport, such as walking and cycling, by providing good quality pedestrian and cycle lanes that are segregated from traffic. The pedestrian walkway through the park is also connected to the other riverbank by a small footbridge, which provides pedestrians with an alternative route across the Tinnerbäcken River.

Economic Impacts

Regional construction employment

Approximately 25 people worked on the construction of the bridge. Around 30 percent of the workers were from Linköping and the remainder were from within 50 km of the city.



Local construction materials

Skanska replaced granite sourced from China with local rock paving, which benefitted the local economy and reduced the environmental impacts associated with the long-haul transportation of heavy materials. Similarly, all gravel and fill material was sourced from the Linköping area.

Reduced project costs

Skanska's bridge design cost around US\$ 300,000 more than the original design. However, the design saved over US\$ 400,000 by requiring less construction materials and reusing waste. The project consequently produced a more aesthetically pleasing and functional bridge with overall savings of over US\$ 100,000. Skanska repaid over US\$ 60,000 to Linköping Council following the project due to the reduced project costs.

Environmental Impacts

Reducing environmental impacts during construction

A low-noise pile driving machine was used to minimize noise disturbance to property owners in central Linköping and vibrations were monitored during pile driving to ensure they did not cause excessive disturbance. A geotextile was used in the river to prevent sediment pollution when installing granite blocks as additional erosion protection.

Environmental bridge design

Skanska's bridge design reduced environmental impacts compared with the council's original design by incorporating a different abutment construction with higher foundations and by avoiding rerouting the river. The foundations of the new bridge were 5 m higher than the original plans, which reduced the amount of materials that had to be excavated by 4,000 m³ and avoided an estimated 750 truck-hours to remove the material from the site. The higher foundations also avoided the need to source and transport 7,200 tons of new fill material to the site, which avoided around 600 truck-hours. Skanska preserved the route of the Tinnerbäcken River by altering the original council plans to reroute it through a concrete channel. The project consequently avoided the potential for negative environmental impacts during construction and preserved the aquatic systems along the stretch of river. By not redirecting the river into a concrete channel, Skanska avoided the need to manufacture and transport 16 tons of rebar from Poland and 273 m³ of concrete. Skanska's more efficient bridge surface design also



reduced the quantity of asphalt that was required by 100 tons. By avoiding the local transportation of materials, Skanska's bridge design reduced carbon dioxide emissions by over 50 tons compared with the council's bridge design.

Recycling demolition and construction waste

The old bridge was demolished and broken up into aggregate by demolition machinery on site, which avoided the need for special crushing machinery or the processing of materials off site. Approximately 7,200 tons of crushed concrete from the old bridge was reused in the road sub-base and 800 tons of crushed material was reused on site as a reinforcement layer for the new bridge. The reuse of demolition materials from the old bridge avoided the transportation and disposal of waste, and the need to source and transport virgin fill material for the construction of the new bridge. Recycled granite blocks were used to reinforce the existing erosion protection measures under the bridge. Skanska sourced the granite from an old barn that was demolished on a local farm. Skanska also carefully extracted and reused granite paving stones of various sizes in the redevelopment of connecting street infrastructure.

Improved aesthetics

The new bridge is more aesthetically pleasing than the old structure and the project has enhanced the local environment. The natural look of the river was maintained by not redirecting the river through a concrete channel, and granite blocks at either side of the bank replaced a large unsightly

metal pipe under the old bridge through which the river flowed. Skanska also landscaped the temporary construction road to create a park area on the banks of the Tinnerbäcken River. The park, which was created in central Linköping during the project, covers an approximate area of 5,000 m² and includes a meandering walking trail, trees and seating areas overlooking the Tinnerbäcken River. Skanska also designed an attractive concrete wall, which encloses the park.

Learning From Good Practice

The Skanska team developed an innovative streamlined bridge design and incorporated demolition materials into the construction of the new bridge to reduce project costs and environmental impacts. The project consequently demonstrated Skanska's green credentials and the ability of environmentally beneficial projects to simultaneously reduce project costs.