European Commission

GPP In practice

Issue no. 96
May 2020

Highly energy efficient health centre with swimming and sport facilities

Municipality of Orkland (Norway)


Image: Stein Larsen / Orkland Kommune

Background

The Municipality of Orkland was established in 2020 after the merger of several municipalities located in mid-Norway. The new municipality has 18 200 inhabitants, with agriculture, metal, and engineering as its main industries.

In 2017, the Municipality of Orkdal (one of the municipalities that is now part of Orkland), kick-started the process of building an attractive new public health centre. The goal was to create a local gathering point and hub for the wider region. As well as housing a health clinic, physiotherapy, occupational therapy and social services, Orkdal wanted the new centre to also integrate existing recreational facilities – such as a gym and climbing hall – as well as a brand new swimming pool with play facilities.

The building of the health centre is the largest investment in public services in recent years in the region, and the municipality wanted to ensure that environmental aspects were considered through the whole procurement process. The municipality uses the United Nations' Sustainable Development Goals (SDGs) as a framework for all its projects. Thus, sustainability aspects in the building of the new health centre were important to both the project team and the politicians, and energy efficiency and reduction of GHG-emissions were particular areas of focus.

Procurement objectives

The procuring authority chose to use a competitive procedure with negotiation following prior notice for this procurement. In this type of procedure, anyone may ask to participate, but only those who are pre-selected will be invited to submit initial tenders and to negotiate. This procedure was chosen due to the project's complex nature. The swimming pool in particular was challenging to build due to the technical equipment required for operation and the maintenance of indoor air quality. In addition, the new pool had to be connected to existing buildings. Waste heat from the local smelting plant, Elkem Thamshavn, was available as an energy source, and by connecting to this, it was possible to meet the swimming pool's energy needs.

From the very beginning of the project, the municipality maintained extensive communication with all interested parties. Dialogue with potential suppliers was important for gaining knowledge on the sustainable potential of the project.

The procurement was performed as a design and build contract based on the standard NS 8407[2], for the contracting of a design and build contractor for design projects, construction and testing of technical building installations. A project description setting out the different needs, requirements and objectives that the suppliers should consider was included in the tender documents. This also identified the environmental aspects that proposed solutions should take into account. A contract notice with selection criteria and an invitation to suppliers to express interest was published in January 2017. Of the suppliers that qualified, four would be invited to submit bids.

1 Norwegian building and civilengineering contracts, NS 8407.E:2011 - General conditions of contract for design and build contracts.

Criteria used

Subject matter of the contract:

Design and build of public health centre including swimming pool with play facilities

Selection criteria:

The tenderer must have procedures for executing the project in a way that ensures environmental protection and safety.

Verification:
Description of existing routines or valid certificate from a third party verified system (e.g. ISO 14001, EMAS).

"The energy efficient solutions reduce the use-related yearly emissions by 891 tonnes CO_2-equivalent, which is an emission reduction of about 85 % compared to a reference building"

Technical specifications:

The project goal was the realisation of an energy efficient building with low carbon footprint that integrated existing facilities. As a competitive procedure with negotiation was used the technical specifications were functional in nature, to allow bidding consortiums flexibility to offer innovative solutions which would help meet the project's goals.

Energy:
The public health centre can extract energy from the district heating system with a water temperature of approx. 55 - 60°C, at a much lower price than normal.

Already, cooling water from the smelting plant is used for heating the two outdoor football pitches (to remove ice during winter). After this cycle the water has a temperature of 15 - 20 °C, and can be used further.

Another option is to extract wastewater (approx. 40 °C) directly from the smelting plant through an additional to-be-built pipe from the plant to the building.

Material/ resources:
- Reduce / phase out use of materials and products that contain priority health and environmentally hazardous substances
- To the greatest extent possible, choose materials that can be reused or recycled
- To the greatest extent possible, choose materials that have the lowest possible CO_2-emissions during their lifetime
- To the greatest extent possible, consider the possibilities of using wood
- Steel, reinforcing iron and metal products should contain a high degree of recycled material
- Material should be selected based on life-cycle costs

Waste:
- Facilitate resource efficient and environmentally friendly waste management in the operational phase
- Reduce the amount of waste produced during the construction period

Water:
- Reduce water consumption, as well as the energy use associated with it

Transport:
- Reduce impact on existing ecology
- Reduce resource use associated with open storm water management
- Adequate number of bicycle parking spaces

Areal efficiency:
- High degree of utilisation, which results in low resource and energy consumption
- Facilitate easy reconstruction and good flexibility.

Verification:
Bidders should describe their approach to implementing the above requirements and may refer to **BREEAM** or an equivalent methodology.

Award criteria:

The contract was awarded to the best price/quality ratio based on the following distribution:

Price - 50 %
Quality - 40 %:

Life cycle costs (LCC) was included as one of the quality elements, verified by the documentation of LCC calculations. Each tenderer could select their preferred LCC model, provided the results were unambiguous. The tender also highlighted the online LCC tool of the public construction and building organisation (no longer available). The contractor can specify which qualities of the swimming pool will ensure low life cycle costs.

Environmental criteria – 10 %:

Evaluation of the suitability of the proposed solution for achieving energy efficient lighting, heating, cooling and ventilation in the building.

Verification: The tenderer should deliver three pages of documentation on the specific solutions it wants to implement to achieve an energy efficient building. Attachments in the form of drawings, technical data sheets, specifications or similar supporting the description of the solutions should be submitted.

Results

Four suppliers were pre-selected for the competition, and all of them delivered bids that met the requirements set in the tender. During the negotiation stage, the suppliers suggested additional solutions, and innovative incentives for the project were discussed. The aim of the negotiations was for the client to get a picture of which solutions and results were possible to achieve, and which supplier could best deliver these.

After this phase, the suppliers had the opportunity to update their offers which were then evaluated.

The contract was awarded to a general contractor that cooperated with another company in the design phase and subcontracted technical advisors on passive houses and building engineering. After the contract was awarded, the requirements were further shaped in the design phase. Four key measures were identified in this early phase:

- reduction of GHG-emissions in the construction of the building
- energy efficiency in operation
- utilisation of heat from wastewater
- construction of micro-grid to utilise local renewable energy

The project received funding for the development of the energy solutions from Enova, owned by the Ministry of Climate and Environment, which invests in projects developing new energy and climate technology.

The contract was signed in March 2018 and the building was completed in March 2020. The final building is 11 500 m^2, with a capacity of 500 visitors. The total cost of the project is about €32 million.

Environmental impacts

The buildings and construction sector contributes about 40 % of global GHG-emissions. The main environmental impacts from buildings come from the construction and operation of the building. Nearly one fourth of the emissions are related to embodied emissions in materials. Energy use contributes the highest emissions in the operation phase of the building, making the energy source a key to reduce this.

Choosing materials with low carbon footprints, is estimated to have reduced construction emissions by 800 tonnes CO_2-equivalent compared to traditionally building methods and materials. The use of low carbon concrete contributes to a big part of the savings, but even larger emission reductions have been achieved in the daily operation. Traditionally, this type of building requires a huge amount of energy due to the heating of hot water for the swimming pool, showers and large open areas. A pipe was built between the smelting plant and the health centre to use heat from the plant`s wastewater. By utilising the heat from the smelting plant's wastewater together with thermal energy storage of water, no extra heat is needed to operate the swimming pools. The thermal storage consists of an underground concrete tank with space for 440 cubic meters of water, which is heated up to 68°C with the help of a heat pump and excess energy from photovoltaic panels. When needed, heat can be extracted from this tank and run the entire swimming pool facility for a whole week.

A 220kWp rooftop photovoltaic power station was installed, which in addition to the electricity supply for the building, also can charge electric cars and electric buses. When the power station produces more electricity than needed, the excess energy is stored in batteries, sold to the grid, or used to heat the water in the thermal energy storage. The energy efficient solutions reduce the use-related yearly emissions by 891 tonnes CO_2-equivalent, which is an emission reduction of about 85 % compared to a reference building. The building was finished in March 2020, exceeding the initial environmental criteria in the tender, by being built as a very high energy efficient building. In addition, the building is designed with the potential for adding more photovoltaic panels (PVs), which will increase the energy production even more and convert the building to an energy-positive building.

Lessons learned

The contracting authority considers contract management an important part of the project, which is essential for successfully achieving the project's ambitions. The project team in Orkland municipality were actively engaged in the design and building phases, and attended all design meetings, technical meetings, and contractor meetings. Parallel to this, the follow-up with Enova and smelting plant Elkem was maintained to ensure that everything was in order with the project funding and energy supply.

The project leader - John Anders Elvrum - believes that a key aspect for delivering a successful project is to contract a qualified construction contractor with experience. It is important that the tenderer can bring in expertise from similar previous projects, has competent personnel and is able to show innovative and forward-thinking sustainable focus. The project has been very enlightening for the municipality of Orkland, which has been highly satisfied with the contractor`s expertise on environment and energy, and the overall quality delivered. Due to competitive negotiation, the results of the project has been far better than was even expected. It is estimated that the municipality will save about €265 000 in yearly energy costs.

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For related information, please see European GPP criteria for Office Building Design, Construction and Management and the Technical Background Report.