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Poland's first swimming pool meeting passive energy use standards

Municipality of Sulejów (Poland)


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Background

Sulejów is a small town of 6,700 inhabitants in central Poland. In 2018, Sulejów began a procedure to build a passive swimming pool and sports hall at the primary school. Passive buildings are characterised by ultra-low energy requirements for space heating and cooling.

The swimming pool will be the first built to passive standards in Poland, and the municipality benefited from a grant from the European Regional Development Fund (ERDF) of 8 million PLN (€1.7 million) under the Regional Operational Programme of the Lodz Province.

Procurement objectives

The ultimate objective of the procurement is to improve the health and living conditions for the inhabitants of Sulejów. By making sure that the swimming pool is built to highly-efficient standards, the town aims to improve air quality, reduce greenhouse gas emissions, and reduce operating costs.

The swimming pool was designed to meet the passive building standard. Through high thermal insulation and tightness, alongside the use of heat pump technology that recovers heat from used hot water from showers and wash water from the swimming pool, the finished building's energy consumption will be minimised, and operating costs kept low.

Building is complete, and the new facility will be officially opened in September 2021. The pool itself is 16.67x8.5m large and 1.10m to 1.60m deep, can fit four lanes and is designed to accommodate 30 children at a time.

An open tender procedure was used.

Criteria used

Subject matter of the contract:

Construction of a passive school swimming pool in Sulejów

Selection criteria:

Bidders must prove they have the necessary knowledge and experience to perform the works i.e. in the last 10 years they have performed the following:

a) The construction of at least one building which obtained a certificate of tightness test at a level not worse than 0.6 litres of air change per hour (l/h) performed in accordance with [PN-EN ISO 9972: 2015-10](#) (international standard intended to measure the air permeability of buildings) or equivalent, and;
b) Execution of at least one building in which a geothermal pump with vertical collectors is installed with a minimum heating capacity of 15 KW, and;
c) Execution of at least one swimming pool building with a reinforced concrete basin structure, with a water surface of at least $60m^2$.

The selection criteria also described the relevant professionals required as part of the team delivering the project, including an experienced site manager, sanitary works manager, electrical works manager, and road works manager.

Technical specifications:

The technical requirements of this project - including the use of highly efficient heat pumps in order to recover heat from water used in the showers and wash water from the swimming pool - were defined in the design documentation, along with examples of specific devices that could be used by contractors to achieve the necessary results.

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In order to achieve the required level of air tightness, all individual building partitions should be tightly connected using tapes and sealing components dedicated to maintaining high air insulation in construction. All penetrations of the outer seal required by installations – such as pipes – should be sealed with foil flanges glued to the object in question and the external partition. In the case of smaller cables, specialist sealants or fire-resistant assembly foam should be used. Wall intake and exhaust vents must be sealed at the point of contact with the wall using a 22mm thick waterproof Oriented Strand Board (OSB) substructure.

All external expansion joints must be continuously sealed with butyl tape (adhesive sealing tape) around each opening. When gluing the tape, an appropriate overlap should be taken into account in order to finish the joint with an expansion strip. When fixing equipment and acoustic panels on external walls, felt pads or alternative (at least 3mm thick) should be used to maintain the tightness of the internal plaster after drilling.

The sealing of windows and door openings should also be performed with particular care. Tapes around windows should be sealed from the inside with butyl mass, especially in the corners. The sealing of the outer shell must be performed in cooperation with the contractors of individual installations. All contractors must be familiar with the required air tightness of the building.

Indoor and outdoor lighting should use high-efficiency energy-saving Light Emitting Diode (LED) luminaires. Lighting intensity should be appropriate to the needs of the space:

- Swimming pool hall: 300 lux (lx)
- Corridors and lobbies: 100 lx
- Toilets: 200 lx
- Cloakrooms: 200 lx
- Technical rooms: 200 lx

The building must be equipped with two independent heat sources: a gas boiler with a capacity of 85 kW and a geothermal 44 kW heat pump with an active cooling function. Water from showers with an average temperature of around 37°C will be collected in an overflow tank, where a heat exchanger will allow for the recovery and transfer if approximately 14kW of continuous power. Similarly, swimming pool water (approximately 29°C) will collected as part of the filter rinsing process will be redirected to an overflow tank where approximately 13 kW of continuous power will be generated before the now cooled water is discharged to the sewage system.

Contractors who use equivalent solutions are obliged to demonstrate that these supplies, services or works meet the requirements specified, via declarations of conformity.

Award criteria:

The following award criteria were used:

- Offer price (60%)
- Extension of the warranty period (10%): an offer with a guarantee period of 36 months will receive 0 points; an offer with a guarantee period of 48 months will receive 5 points; an offer with a guarantee period of 60 months will receive 10 points. In the event that bidders do not specify a warranty period, or select more than one warranty period, the minimum period will be assumed (i.e. 0 points).
- Professional experience of site manager (30%): points will be awarded for additional professional experience on the minimum requirements i.e. experience in one additional project receives 10 points, two additional projects receives 20 points, and three additional projects receives 30 points.

Contract performance clauses:

The final acceptance of the building depends on the contractor obtaining the result of a n50 leak test[1], to be performed after the installation and sealing of window and door openings. The leak test result must demonstrate that the construction has achieved an air tightness of no higher than 0.2 l/h at 50 Pascal (Pa) pressure difference, in accordance with PN-EN ISO 9972: 2015-10 or equivalent.

During the construction phase, the contractor shall prepare (disassemble, segregate) and transport materials suitable for reuse. Other materials from demolition that cannot be reused should me managed in accordance with applicable legal requirements. It is also required that any trees that need to be removed for the construction of the pool need to be moved to a place indicated by the contracting authority (approximately 10km from the site) and re-planted.

After the completion of the construction works, the contractor will organise two one-day training sessions (8 hours each) at an interval of 5-7 days for building managers. The training should focus on operation of the new facilities, in particular on how to operate the pool technology, and achieve passive energy use, as well as the technical services and inspections needed for the devices and systems installed in the building.

Results

The contract was signed in May 2020 and construction began in July 2020. The project is valued at 14,625,355 PLN (€3.2 million). One bid was received for this under threshold call, but all criteria were met.

1 A test which measures the air tightness of a building. It measures the rate of airflow leakage through the building's envelope (i.e. the system of barriers which separate outside from inside, including the roof, walls, and windows).

The annual primary energy demand of the building upon completion is as follows:

	Heating and Ventilation	Hot Water	Lighting	Total
Value (Kwh/(m2year))	19.98	4.56	30.37	54.91
Share	36.4%	8.3%	55%	99.7%

For comparison, the average household heating consumption per m^2 across European Member States is approximately 115 kWh, and for Poland, this figure is closer to 175 kWh (source).

Altogether, the heat capture solutions and energy efficient lighting will result in a significant reduction of the swimming pool's operating costs. An energy metering and control system has also been installed to monitor energy consumption. This is the first example of such a system being implemented in a swimming pool building in Poland.

Environmental impacts

On the 1st of March 2021, the first leak test of the finished building was conducted. The obtained air-tightness of the building meets the design passive building requirement (n50 < 0.20 l/h), achieving an air-tightness of 0.16 l/h. This swimming pool is the first in Poland to have reached this standard.

The building is planned as a demonstration building, and it is hoped that other municipalities with similar sets of circumstances can learn from this procurement. The energy consumption for individual installation systems will be measured using energy meters. The resulting data will be made available to other contracting authorities, and will provide important evidence to inform the planning of similar investments in future. The data can also be used to inform the future improvement of the technologies being used in the building.

Lessons learned

Swimming pool facilities have different energy use needs compared to most other public buildings, and with this comes opportunities and obstacles, as well as specific technology needs. Designing a building and ensuring the right energy efficiency technology is in place, however, is only the first step. It is also essential to think about the building's use phase, and ensure that the staff operating the facility are trained in the proper operation of the building. Without this, the expected economic and environmental effects of the passive-standard building will not be realised.

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

The tender documents are available online here.