

Energy-neutral primary school

Architect selection & energy performance contract



Purchasing body:	Municipality of Lansingerland
Contract:	Reward based on energy performances over 10 years (2017-2027). Total contract volume: 4 million Euros Awarded: 31 July 2017
Savings:	<ul style="list-style-type: none"> • 47.7 tons of CO2 emissions saved • Primary energy savings of 0.13 GWh

SUMMARY

- Ambition to build an energy-neutral school building.
- Design tender has been awarded to Frencken Scholl Architecten.
- Preparation and tendering of construction and maintenance contract will be completed in 2018.

Procurement Approach

The Municipality of Lansingerland and two school boards are planning to replace two primary school buildings with new ones, including the housing of after-school care. Concerning sustainability, the municipality aims for schools with both a low energy demand and healthy indoor environment. In doing so, the municipality leads the way in local energy transition, as described in Lansingerland's [Action programme Realistic Sustainability](#).

In construction projects, it is important to impose requirements on the design of the building and its installations at an early stage. This allows the integration of sustainability measures in the design, thus cutting costs.

With this tender, the municipality aimed to find a qualified architect and engineer to create the architectural, structural, and technical design of the new building, including installations and the terms of reference for construction. To guarantee the building's future performance in terms of comfort, indoor climate, and energy consumption, the bidders were challenged with developing a 10-year performance-oriented maintenance framework for technical installations. As energy performances are essential in the construction tender, combining a contractor and maintenance company integrated into one contracting party is likely to be preferred.

The selection of the main contractor is scheduled for spring 2018. The actual building process will start in 2019. In view of the nature and estimated size of the contract, the municipality followed a negotiated procedure¹ for the selection of architects.

Energy and maintenance performance contract

Part of the architect's assignment is to investigate the feasibility of an energy-neutral school, as described in the national guidelines (see [RVO: Energy-neutral school](#)). The tenderer had to draw up an action plan for this, which was included in the assessment. In addition, a translation will be made from the design brief to clear and measurable performance indicators concerning the maintenance of the installations. In this way the municipality guarantees the architectural and technical performance, thereby ensuring that the ambitions are fulfilled during the use phase.

PROCUREMENT INNOVATION

Performance indicators include both energy savings during the use phase and a healthy indoor climate. To guarantee energy performance, maintenance and management of the technical installations is contracted additionally during a period of 10 years.

¹ In a negotiated procedure the public authority invites at least 3 businesses with whom it will negotiate the terms of the contract (https://europa.eu/youreurope/business/public-tenders/rules-procedures/index_en.htm)

Tender specifications and Verification

TECHNICAL SPECIFICATIONS

- Total annual operating costs are at most €61,-/m² gross floor area (GFA)
- Mechanical ventilation systems are equipped with heat recovery systems with at least 75% efficiency
- Heat generation is at least 95% efficient
- Heat distribution has an efficiency of or above 95%
- Heat production of building-related equipment, excluding air treatment, amounts to 15 W/m² or less
- The installed lighting capacity is at most 9 W/m² in living spaces, and 4.5 W/m² in other rooms
- Lights are controlled with presence detection
- The lighting in rooms where daylight is present is automatically regulated based on the availability of daylight
- At least 10% of the building's total energy consumption originates from sustainable sources
- Energy consumption is measured per main user per quarter and stored so that it can be analysed. Moreover, it is possible to measure the electricity consumption of individual installations.

AWARD CRITERIA

- Action plan based on a feasibility study on energy-saving measures that lead to an energy-neutral school

VERIFICATION

Operating costs: submission of operating cost calculation and maintenance plan

Action plan: assessment on completeness, feasibility, and practical approach

A regional approach to SPP

The municipality of Lansingerland is part of the sustainable procurement network of the *Metropolitan region Rotterdam The Hague*. Initially, Lansingerland intended to publish a tender in which many technical choices were prescribed beforehand. This would eliminate the possibilities for innovative offers and ways of optimizing operation and maintenance. A technical expert supported by the SPP Regions project assisted the project team in setting up performance based criteria and will help to prepare the construction tender.

Results

Environmental impacts

The new school building is expected to save 47.7 tons of CO₂ emissions annually in comparison with a standard new school, as specified in the Dutch Building Decree (see Annex 1 for details). In comparison with an average existing school, up to 143.4 tons of CO₂ can be saved. All calculations are based on the desired Gross Floor Area (GFA) of 3346 m².

To determine the total energy consumption or savings, an economic lifespan of 40 years was assumed for the building.² The performance-oriented maintenance contract for technical installations will guarantee energy savings during the first period of time (10 years). The largest reduction of greenhouse gas emissions is expected to result from on-site electricity production using solar panels. Other assumptions are included in **Error! Reference source not found..**

Table 1: Environmental savings of new school compared to existing schools

Tender	Consumption Natural gas (m ³ /year)	Consumption Electricity (kWh/year)	CO ₂ emissions (tonnes/year)	Primary Energy consumption (GWh/year)
Average school	50,190	93,688	174.9	0.79
Benchmark Standard new school	0	150,570	79.2	0.38
Low carbon solution Energy-neutral school	0	56,882 (conventional) + 93,688 (green)	31.5	0.25
Savings (Benchmark – Low carbon solution)	50,190	-	47.7	0.13

CALCULATION BASIS

- Gross floor area: 3346 m²
- Lifespan of building: 40 year
- CO₂ emissions for conventional Dutch electricity set at 0.526 kg/kWh
- CO₂ emissions for green electricity (solar PV) set at 0.017 kg/kWh
- For primary energy consumption a PEF (Primary Energy Factor) of 2.5 was assumed for electricity produced from fossil fuels, and 1.1 for renewable sources³.
- Calculation made using the tool developed within the GPP 2020 project (www.gpp2020.eu), and refined within the SPP Regions project. Available on the SPP Regions website(www.sppregions.eu)

² Uitspraak Raad van State over voegwerk (Council of State decision on masonry). VNG, 2010.

<https://vng.nl/onderwerpenindex/onderwijs/onderwijshuisvesting/uitspraak-rvs-over-voegwerk>.

³ Development of the Primary Energy Factor of Electricity generation in the EU-28 from 2010-2013. Ecofys, 2015.

Financial impacts

The architect expects that a fully energy-neutral school can be constructed for €1200/m² gross floor area. The awarding authority has a budget of €963/m² available. With this construction, about 40% of the expected additional investments can be covered within the budget. It is envisaged that the energy cost savings from the new building can be used to recover some of the additional energy-saving investments. However, additional solutions are needed to financially facilitate the construction of the energy-neutral school. For example, it is expected that the Municipality of Lansingerland will make sufficient budget available to enable local energy generation. This would make the construction of an energy-neutral school feasible.

Social impacts

Energy use and a healthy indoor climate are sometimes conflicting. Sufficient ventilation is a prerequisite for healthy fresh air, but at the same time ventilation consumes energy. A healthy indoor climate is important, as it reduces health problems of pupils and teachers, resulting in lower absenteeism. In addition, learning and working performance and well-being are increased.

Several requirements from laws and regulations apply to schools, such as the Building Decree, Environmental Management Act, Health & Safety regulations, and requirements for air conditioning systems. Additional gains can be achieved by applying safe materials, e.g. through avoiding formaldehyde. To conclude, an energy-efficient, healthy, sustainable school contributes to a more sustainable world, thereby providing a statement to the school children.

Market response

During the private negotiation with the architect and interdisciplinary engineer, five organisations have been contacted (Architecten aan de Maas BV, No Label BV, Room for Architecture BV, Frencken Scholl Architecten BV en Kampman Architecten), four of which have tendered. The tender has been awarded to Frencken Scholl.

Contract management

Agreements will be made between the municipal sustainability advisor and the final contractor regarding maintenance and operations. The sustainability advisor will analyse whether the criteria from the design brief are met. The methods of compliance with the maintenance and energy performance contract during operations management are still to be determined. This will become clear at the preparation phase of the building tender. It is already apparent that these contracts require a different workflow for facility management, moving the priority from solving technical problems to monitoring performances instead.

Lessons learned and future challenges

Performance contracts are new to the municipality of Lansingerland, but it is a procurement approach that requires knowledge and experience. The fact that Lansingerland holds high sustainability ambitions provided a favourable starting point for this tender. Initially, the municipality intended to reach its goals by applying a restrictive design brief including many predefined measures. However, it soon turned out that decisions had to be made due to limited budgets available for building schools. A performance-oriented approach turns out to be beneficial, because it allows for innovative solutions that are more cost effective in the long run.

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Annex 1 - Calculation of environmental savings

The energy consumption has been compared with that of a regular new school. To quantify the latter, requirements specified in the Dutch Building Decree are used. The Decree prescribes an energy performance coefficient (EPC) of 1.2, translating to an energy use of 45 kWh/m² according to calculations. The preliminary calculations provided by the architect indicate that the energy use of the school in Lansingerland is close to this value.

The energy use in the new situation is based on a building-related energy-neutral building. An EPC of 0 and an electricity consumption of 17 kWh/m²/year are associated with such a building. It is assumed here that the reduced EPC will be achieved through the local generation of renewable electricity.

The lifespan of the school is supposed to be 40 years. The GFA amounts to 3356 m². The numbers for average schools are sourced from a report by former SenterNovem ⁴.

For reference, the table below lists the energy demand of different school types. The calculations have been made using the calculation tool developed within the *GPP 2020* project (www.gpp2020.eu), and refined within the *SPP Regions* project.

Location of energy contracting	Netherlands								
CO ₂ -emissions per kWh electricity (kg/kWh)	0,526	If you know your own rate, enter it on the sheet "General Assumptions".							
Lifetime of the measures implemented in the course of the contract	40	years							
INPUT DATA									
Energy source	Baseline		Conventional tender			Green tender			
	Current annual energy consumption		Expected annual energy consumption			Expected annual energy consumption			
Electricity, conventional	93 668	kWh	150 570	kWh	56 882	kWh			
Electricity, green		kWh		kWh	93 688	kWh			
Heating oil		l		l		l			
Natural Gas	50 190	m ³	0	m ³	0	m ³			
Wood pellets		kg		kg		kg			
Wood		kg		kg		kg			
District heating		kWh		kWh		kWh			
Coal Briquette		kg		kg		kg			
Lignite high quality		kg		kg		kg			
Lignite low quality		kg		kg		kg			
Coke/Anthracite		kg		kg		kg			
									TOTAL
SAVINGS									
Expected results	Savings (Baseline / Green tender)			Savings (Conventional / Green)					
	Per year	Per lifetime	Percentage	Per year	Per lifetime	Percentage			
Primary energy savings, (GWh)	0,55	21,9	69,11%	0,13	5,2	34,84%			
Reduction of CO ₂ emissions, (t CO ₂)	143,4	5 735,3	81,98%	47,7	1 907,5	60,21%			

⁴ Wat u wilt weten over Frisse Scholen. SenterNovem, 2006.
<http://www.co2indicator.nl/documentatie/frisseschoolen.pdf>.

About SPP Regions

SPP Regions is promoting the creation and expansion of 7 European regional networks of municipalities working together on sustainable public procurement (SPP) and public procurement of innovation (PPI).

The regional networks are collaborating directly on tendering for eco-innovative solutions, whilst building capacities and transferring skills and knowledge through their SPP and PPI activities. The 42 tenders within the project will achieve 54.3 GWh/year primary energy savings and trigger 45 GWh/year renewable energy.

SPP REGIONS PARTNERS



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