



One of the buildings finished in SEWACO System

# SEWACO System house construction system

## SEWACO System in a Nutshell

SEWACO System is house construction system from prefabricated composite panels. The idea of the system consists in a set of **large-format panels** made of **concrete in a composition with EPS**, which allow for erecting buildings in the **frame structural system**, including **single-family** and **multi-family housing projects**. The basic element is an innovatively shaped, light composite box panel of 4 cm thick in wall and rib thickness, with in-built EPS panels 22-30 cm thick, for constructing external walls, internal walls, ceiling slabs, roofing, and other. In turn, the external panels are two-layered (26 cm thick EPS on the outside for low-energy buildings and 31 cm for passive buildings).

### Key benefits

- **Fast construction time:** up to one storey per day, as practically the entire building – roof-to-foundation – is prefabricated;
- **Huge reduction in investment cost:** efficient construction and lower amount of works at construction stage have beneficial effect on the building construction costs;
- **Mobile panel constructing factories:** mobile, easy-to-assemble and inexpensive tent halls which are not fixed to the ground and could be located near construction site;
- **Solid construction:** the load-bearing core of the building is created by reinforced concrete framing. All elements: walls, internal walls, ceilings, roofing, etc. are composites of concrete and EPS;
- **High quality:** all elements are manufactured in steel forms, so their precision and smoothness is significantly improved compared to traditional techniques;
- Significantly **reduced number of employees** on site.
- As an option, panels could be manufactured in Poland, and then transported to UK to lower production costs even more.

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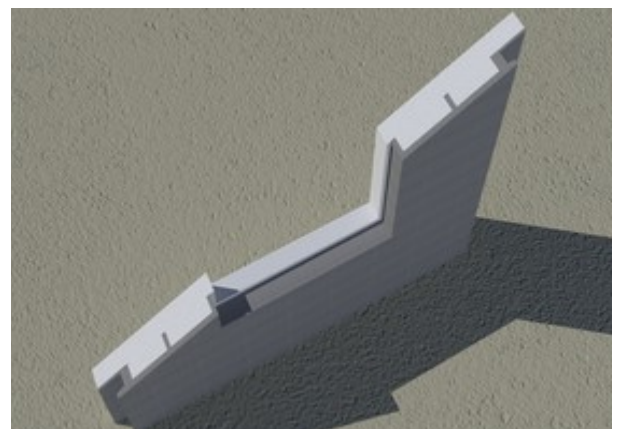
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### The System

The idea of the system consists in a set of large-format panels made of concrete in a composition with EPS, which allow for erecting buildings in the **frame structural system, including single-family and multi-family housing projects**. The basic element is an innovatively shaped, light composite box panel of 4 cm thick in wall and rib thickness, with in-built EPS panels 22-30 cm thick, for constructing external walls, internal walls, ceiling slabs, roofing, and other. In turn, the external panels are two-



layered (26 cm thick EPS on the outside for low-energy buildings and 31 cm for passive buildings).

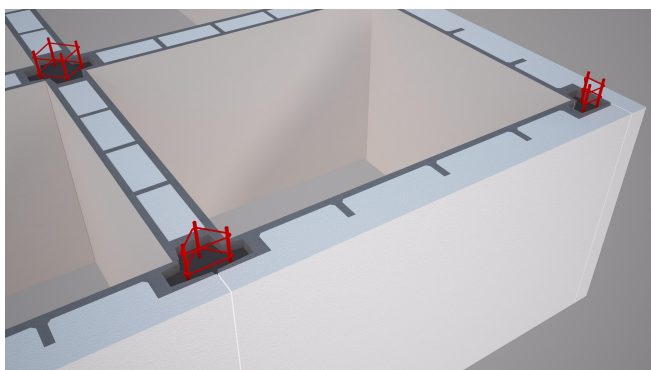
Laid on consecutive storeys, thanks to properly profiled concrete in the joint areas of two panels, external and internal wall panels form recesses allowing for performing load-bearing reinforced concrete structural columns at the construction site, **without using additional boarding formwork**. The walls of the building do not perform as structural elements, but merely act as external and internal partitions in the form of curtain walls.

In their upper parts, external and internal panels have an in-built reinforced concrete beam, also serving as a lintel, which, together with the concrete of the ring beam executed at construction stage, constitutes an element of the spandrel beams bearing the loads of the ceiling slabs as well as service loads and transmitting them to the structural columns.

In essence, a new system of erecting buildings was created, in which walls do not perform as structural elements, and the proper building structure consists in reinforced concrete columns performed at the construction site, transferring the loads of consecutive

storeys of the building onto foundation slabs and spandrel beams, identical on every storey. With such a concept adopted, each panel is non bearing panel and calculated only as per their specific weight, the weight of assembly and service loads from one storey, each storey is non bearing structure and does not bear the loads of the storeys above it.

This system allows for constructing layered wall panels with thin concrete layer box structure, identical for all storeys. Due to this fact, the system allows for designing and executing any window and door openings, including

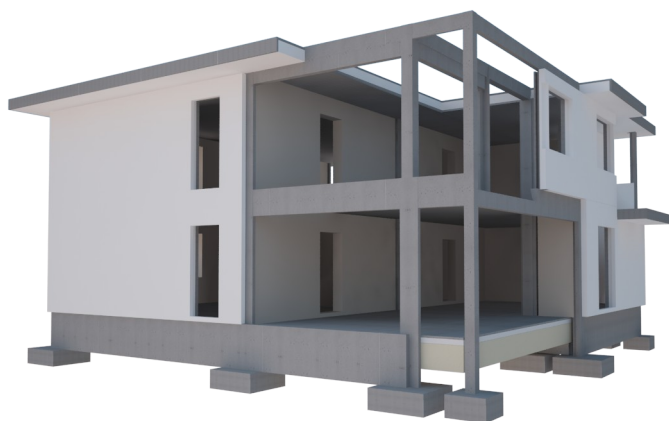


the performance of nearly entirely glass walls. Our current structural calculations provide for the construction of buildings up to 7 above-ground storeys, however, our company is still working on increasing this number to 10-11 storeys.

The concept specified above allowed us to create a type series of external and internal walls with one storey height and length up to 780 cm, as well as ceiling slabs with a span up to 780 cm, integrated with balconies, eaves, canopies, etc.

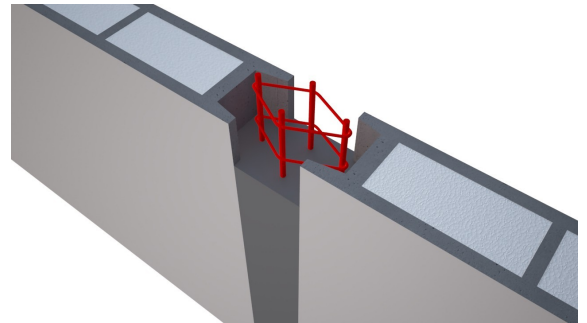
SEWACO created a consortium with the **Gdańsk University of Technology** for the purpose of implementing original heating systems in the area of renewable energy sources, as well as to develop the system and optimize technical solutions, structural calculations and performance tests in terms of structure physics and product quality. The company has been developing the offer of system panels manufactured with the aim of leading to the industrialization of the construction of buildings, both for housing and commercial purposes. **The National Center for Research and Development** participates in the financing of a part of these works and research.

Production of prefabricates was launched by the company in the Tri-city area in northern Poland. However, the company is planning to open several companies in the country.



SEWACO has developed and holds several original and innovative solutions. These are:

1. **INNOVATIVE STRUCTURE of prefabricated panels**, referred to as the „SEWACO System“, featuring concrete box structure in composition with EPS as a thermal insulation or filling layer, with a system for their assembly, dedicated to a wide range of buildings and other cubature structures. The structure of the panels and their method of assembly are protected by three **national patent applications** made in the Patent Office in 2011 and **one international application**. Moreover, several applications regarding the protection of utility and industrial models for particular system profiles were also submitted.
2. **INNOVATIVE PRODUCTION METHOD** of SEWACO System panels, consisting in a specific, company-developed, relatively light system of universal forms for manufacturing panels transferred from one station to another in a production line. **Production lines are fully mobile**, they can be set up in any way, adapting them to local conditions, as well as quickly assembled and disassembled. The production of forms and devices for own purposes as well as for licensing purposes has been launched.
3. **METHOD OF CONSTRUCTING FACTORIES** for producing SEWACO System panels. Apart from the realization of standard, permanent production halls with permanent production lines, or the realization of production in leased halls, the company has developed an original form of **mobile, easy-to-assemble and inexpensive tent halls** which are not fixed to the ground and which do not require long-term and costly legal procedures to enable assembly in a specific location. In the developed method of constructing factories, **everything is mobile and modular at the same time**, which allows for selecting the performance of production of the panels (50 to 500m<sup>2</sup> of floor space a day on one production line) and the place the production at any sites also within a larger construction site, as well as maintaining short deadlines and low production commencement costs.
4. **INNOVATIVE HEATING SYSTEMS** based on low-temperature heating systems in the form of surface heating panels in-built in the outer, concrete layer of the wall panels, which provide additional energy-saving heating and cooling effect.



## Competitive advantages of the system

- **Energy-saving properties** – external walls constructed in the SEWACO System offer the following heat transfer coefficient:  $U=0.11-0.15 \text{ kW/m}^2\text{K}$ . Such buildings consume less energy for heating, they are energy-saving or even passive. Moreover, it is also possible to install systems based on low-temperature heating and cooling of the walls during the prefabrication process.
- **Lower building construction and service costs**. Lower building shell stage costs, efficient construction and lower amount of works at construction stage have beneficial effect on the building construction costs.
- **Time** – reducing the time (2 to 3 times) of completing the investment is essential for investors, since the investment enters the stage of use faster and, at the same time, generates fewer costs in the crediting process. An assembly team trained by the manufacturer may assemble the walls, the ceiling, lay the reinforcement and concrete the columns and ring beams of c.a. 100 m<sup>2</sup> in total floor space, all in just one day.
- **Quality of finishing** – the panels are manufactured in steel forms, so their precision and smoothness is significantly improved compared to traditional techniques.



Moreover, the factors contributing to the future competitiveness of our solutions are:

- Practically the entire building – roof-to-foundation – is prefabricated;
- Prefabricates may be equipped with ventilation or sanitary installation ducts, electrical installation channels and other ducts assumed in the design;
- Consumption of materials is lower through, e.g. elimination of formwork in construction;
- Easy to assemble, the number of „wet“ works is reduced to pouring concrete for the columns and spandrels constituting the structure of the building in recesses in between prefabricates;
- Architectural freedom for the designers;
- As early as in the assembly stage, the building is already insulated – allowing for carrying out works in the winter;
- The scope of finishing works during construction is reduced to the minimum;
- Thermal bridges do not occur in the system;
- Building execution costs are very predictable, plus the use of proven materials neutral for the human health;
- The possibility of erecting mobile production lines in the vicinity of construction sites.

Construction of a building is similar to the assembly of applied load-bearing wall systems, however, the company developed detailed instructions for assembly, since several significant differences do occur. Traditional stretcher bars, suspensions, supports and ledgers for constructing ceilings are also applied in the assembly of the SEWACO system. Since there is no need to use formwork to column, ring beam, beam, binding joist the pace of construction is higher. After assembling a storey or its significant part, on the very same day, the construction team may proceed to concreting columns and spandrel beams. On the second day, the team may commence the construction of the next storey.



Our current calculations, analyses and tests in durability and structure physics have all confirmed the correctness of system assumptions, which allowed us to launch production and construction of buildings. At this point, the company has implemented further research for the purposes of national and European certification. The company has completed several single-family buildings with flat and sloping roofs, and is currently in the progress of commencing the construction of 5-storey buildings with underground parking lots and elevators.