

Houses built with void formers



Effective insertion of Cobiax void former modules into light and resource-efficient prefabricated concrete slabs for house construction. (Images: Glatthaar Fertiggeller GmbH)

Commissioned by a prefabricated house manufacturer, the companies Glatthaar Fertiggeller GmbH & Co. KG and Heinze Cobiax Deutschland GmbH have successfully studied how to insert the Cobiax void former systems into prefabricated concrete slabs as a practical example for house construction.

This study aimed to gain practical experience of the void former system produced by the company Heinze Cobiax; from the planning and manufacturing process to the transport and assembly of the prefabricated concrete slabs - and to subsequently evaluate this system from a technical and economic point of view. In addition to technical and economic benefits, the prefabricated house manufacturer is focusing on future projects; particularly the sustainable and resource-efficient yet solid construction method using the Cobiax void formers made from 100% recycled plastic.

Once completed, the building will serve as a one-storey single family house, built using the solid construction method. The 80 m² ceiling

above the ground floor was designed using Cobiax void formers with 22cm thick prefabricated concrete slabs. The 120mm high void former module S100-120c from the Slim-Line product range was used for this purpose. The load reduction for this type is approx. 1.30 kN/m².

Strategy

Over the course of the overall structural analysis commissioned by the constructor, it was verified that the ceiling above the ground floor was made from a voided flat plate slab. Up-to-date statistics software was used, along with the help of the Cobiax Softwaretool quick & light. Due to a sufficient number of load-bearing walls on the ground floor, it was possible to calculate the biaxially stretched prefabricated slabs. Reducing the dead weight of the void formers by approx. 24% resulted in a tweak in the calculations and thus, a reduction of the necessary static reinforcement compared to a solid reinforced concrete ceiling. Based on the static and element planning carried out by the structural

engineer, Heinze Cobiax subsequently drew up the laying plan for the void formers and their construction in the prefabrication plant.

Delivery

The Cobiax void former modules required were pre-assembled and transported to the Glatthaar prefabrication plant ready for installation. They consist of 250cm long linear reinforcing elements made of reinforcing steel with integrated void formers made of recycled plastic.



For future projects and larger production volumes, the company will consider delivering the modules separately as individual components, i.e., plastic half shells on

pallets and reinforcing elements in bundles. Fitting the half shells to the void formers and assembling them into modules along with the fixation elements is carried out in an economic, space-efficient and project-based manner - directly on-site in the prefabrication plant.

Installation and production

After installing the necessary installation parts, the Cobiax void former module was assembled on the lower reinforcement layer, according to the installation plan.



The modules were flexibly shortened and partially connected using a binding wire and secured against dislocation with the reinforcement. The edge reinforcement and the upper reinforcement layer were subsequently installed. The Cobiax void former modules simultaneously serve as a supporting element in this case.

The void formers integrated into the reinforced concrete slabs must be secured against buoyancy during concreting. In the case of in-situ concrete slabs, this is usually done in practice by concreting two layers. After the first concrete later hardens, the void former module is fixed in place before the second layer of concrete is added. In addition to this, other useful options are available in the prefabrication plant. Using an additional weight or a separate structure to hold them down can prevent buoyancy. When the project was completed, buoyancy protection was achieved by ballasting with existing precast concrete parts.

For mass production, an alternative and effective method will be developed for this purpose: the use of a reusable auxiliary construction.



There was no significant difference between the concreting and compressing procedure and the procedure used for the conventional prefabricated slabs. It was performed swiftly. The concrete used was C35/45 of the F4 consistency class.



After removing the load, the non-concreted areas were filled in, re-compacted and the entire surface was smoothed out.



There were no defects on the undersides of the pallets.

Transport to the construction site and assembly

It was possible to reduce the dead weight of the 9.48m long and up to 2.49m wide concrete slabs by up to approx. 20% using Cobiax technology. Overall, the slab weight of the ceiling decreased by more than 7 tons from 43.7 to 36.6 tons. One main advantage of this weight reduction was that a single truck-load was used to transport the completed prefabricated components to the construction site. The impact of lighter finished parts on the assembly crane was not initially considered for this project. Mounting the lightweight, prefabricated concrete slabs with integrated Cobiax void former modules was a smooth operation, analogous to solid panels.

Summary

The construction project certainly confirmed the practical feasibility of inserting the Cobiax void modules into prefabricated slabs. With regards to saving resources, fully finished components with integrated void formers are certainly useful and sustainable. It was only possible to redeem the costs for the Cobiax components and additional costs for their installation through saving on the travel costs for the prefabricated components that failed to be delivered. Additional savings as a result of the elimination of the displaced concrete, the reduction of the reinforcement, the impact on the assembly crane and the possible optimisation of the entire support structure by the load reduction, also confirm the economic efficiency of Cobiax's void former technology in fully finished components.

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