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# Report

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**A bold concrete structure built entirely with DUO formwork**  
Concrete House, Sussex, UK (as featured in Grand Designs)

“The project’s goal from the outset has been to simplify the construction process. By using DUO, we have been able to reduce our transport costs dramatically. Due to the size and weight of the panels and associated pieces of the system, standard delivery can be used. This has allowed transport vehicles to access the site easily and offload without causing traffic issues.”

Adrian Corrigan, Developer

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Over the past year, a concrete structure has slowly emerged amongst a more conventional residential setting in East Sussex. The single-storey structure is the first self-built project the owner, Adrian Corrigan, has ever built. At the same time, it's also PERI's first housing project with DUO in the UK.

The inspiration behind Concrete House stems from Adrian's experience with concrete throughout life, from riding bikes and skateboards in skate parks at a young age, to developing a keen interest in Brutalist architecture more recently.

In many ways, the project disrupts traditional methods of construction, making them more efficient or convenient for labourers. The choice of formwork is one of the methods that challenges the norm in building methodology. The entire

cast in-situ concrete structure has been formed using DUO, a technopolymer plastic formwork system, instead of traditional timber or heavy steel shuttering throughout.

### Digital technology

The DUO formwork system has been designed to give operatives the independence to erect panels without requiring detailed technical drawings. However, due to Concrete House's complex design, it was crucial for formwork designers to specify panel sizes and configurations in addition to concrete pressure tolerances, especially for irregular corners.

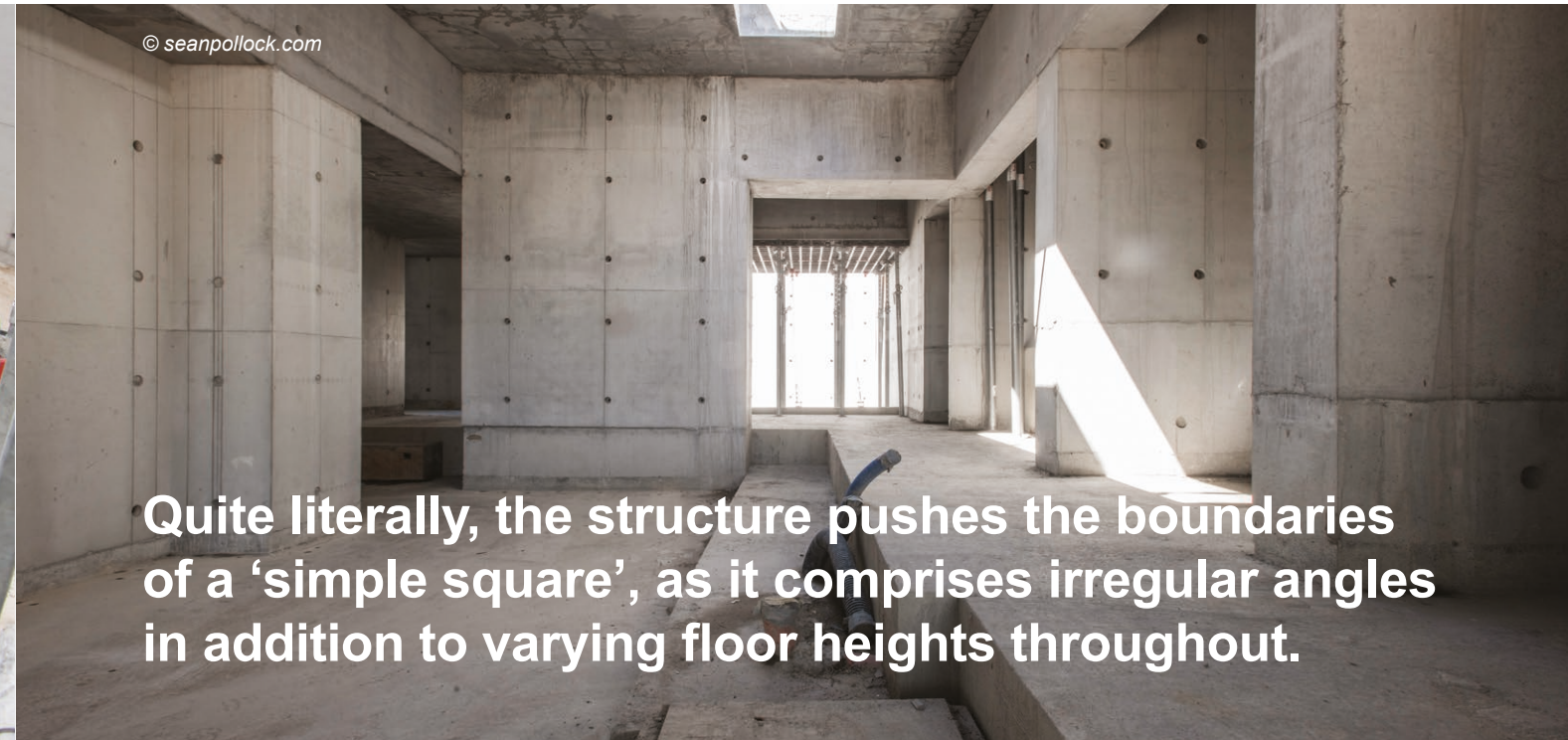
Additionally, planning had to capture design specifications, such as the alignment of visible panel joints and tie points. This involved using PERI's DK ties to create the required architectural detail in the concrete.

PERI worked with augmented reality software and produced drawings in 3D to facilitate the design stage.

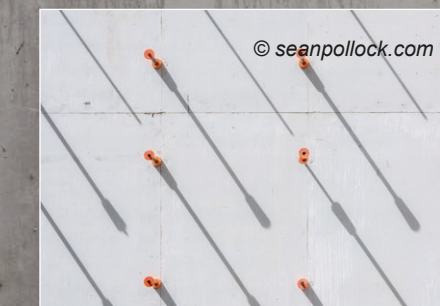
By doing this, the developer and sub-contractor were able to understand the relationship between formwork, concrete pressure and the site before construction started. A major benefit of visualising DUO in-situ ahead of the build was that issues could be identified and construction output optimised.



The complex design of Concrete House can be realised



Quite literally, the structure pushes the boundaries of a 'simple square', as it comprises irregular angles in addition to varying floor heights throughout.



DK ties form a regular pattern across the concrete surface



Roof slabs are formed via horizontal application of DUO

Developer: Adrian Corrigan  
Architect: RAW  
Concrete supplier: CEMEX  
Formwork supplier: PERI

### Why DUO?

Adrian first discovered DUO during its launch at the UK Concrete show in 2017. At this point, CEMEX (concrete supplier) had been appointed to trial its unique Resilia concrete mix, another experimental means of improving construction output.

Normally, DUO would be used to form small regular-shaped structures as an efficient alternative to heavier systems, whereby the need for tools and highly skilled labourers would be reduced. This project was a great way to test DUO and see if the system was capable of more.

From the onset, the idea was to use DUO panels for horizontal and vertical applications to form slabs, columns and walls. The lightweight panels, the largest

weighing no more than 25kg, were ideal for the project due to its location and confined site space. Labourers were able to lift and move the panels around the site by hand, eliminating the need for a crane to erect the system.

Furthermore, DUO aligned with Adrian's vision of reducing waste during construction. All of the raw material is 100% recyclable and can be reused in the production of new panels, making it a sustainable alternative to using conventional formwork on this project.

The system also offered logistical benefits. Due to the weight of the panels, only three lorries were required to deliver material from PERI's depot to the site.



### The Trial Wall

An L-shaped wall was poured on site to establish the finish produced by the concrete mix and formwork panels. The architect-defined feature, comprising a regular tie-hole pattern and panel joints can be seen across adjacent walls in the image above.



^ Field Services Team: The technical work was complemented by on-site support from PERI at all stages of the project, as supervisors briefed the site team on how to use the system effectively.

### Design work & Resilia concrete

When visualising the geometry of a house, the shape of Concrete House is not one that usually springs to mind. Quite literally, the structure pushes the boundaries of a 'simple square', as it comprises irregular angles in addition to varying floor heights throughout.

This was a new application for DUO, as the system is generally configured in perpendicular lines to construct regular shapes.

PERI's technical team had to control the balance between achieving the architect's design requirements and ensuring that the arrangement of DUO shutters was compatible with the system's limitations.

In addition to formwork design, seamless construction and a steady supply of concrete is crucial when achieving a consistent finish. Resilia is a fibre-reinforced self-compacting concrete mix. Due to its fluidity, the concrete exerts a higher pressure than conventional concrete. Panels were limited to a maximum pressure of 50 kN per sq m. In order to work within these limitations, concrete had to be poured in a controlled manner, especially as this was a unique mix that had never been used with the system and formlining before.

The consistency of the mix enabled concrete to flow naturally into the complex formwork shapes, without requiring vibration.

Although self-compacting concrete has a high flow rate, delays in the concreting process can affect the finish as the mix starts to solidify. Regular deliveries from a local production site reduced the chances of this occurring on the project. This was complemented by the fact that the number of DUO shutters erected on site justified the volume of concrete delivered for each pour.

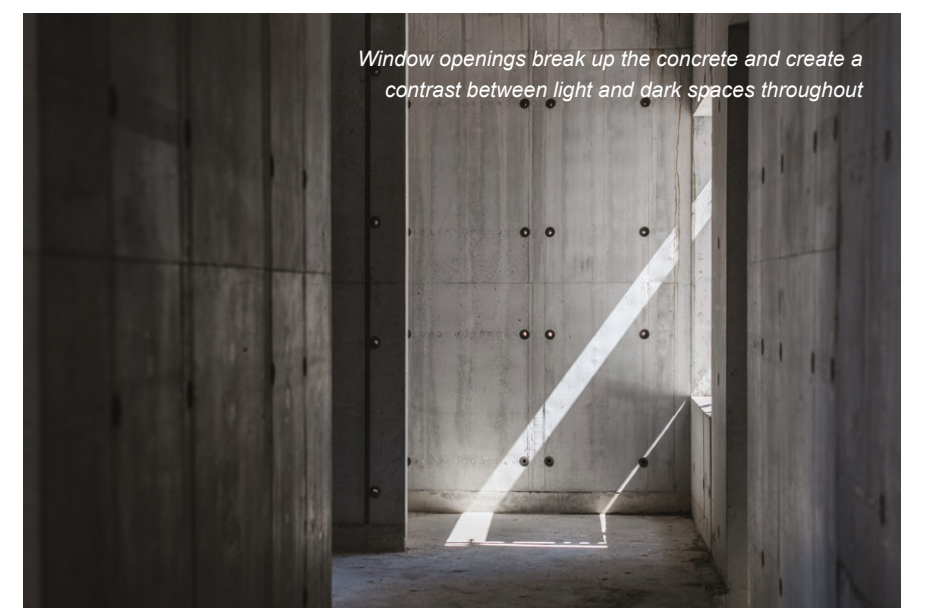
Overall, the concrete mix and formwork worked well together to create the bold and unique finish that was desired.

### The pours in detail

PERI pushed the boundaries of what could be achieved with standard DUO panels. 355 panels were erected to construct the entire build, with each panel offering 30 to 35 reuses for a combination of horizontal and vertical applications.

All walls were completed in 29 pours, with pour heights varying from 2.3 m to 3.8 m. ALPHA props provided direct support for 345 sq m of concrete slabs, which were concreted in five pours.

The customer also used DUO to pour 0.3 m and 1.4 m-high slab steps and upstand walls independent of technical drawings, demonstrating its ease of erection for simple structures.



Window openings break up the concrete and create a contrast between light and dark spaces throughout



The photographs in this brochure feature construction sites in progress. For this reason especially safety and anchor details cannot always be considered as conclusive or final. These are subject to the risk assessment carried out by the contractor.

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