THE MAGAZINE OF THE CONCRETE SOCIETY

CONCRETE

Volume 58, Issue 2 March 2024

GAZEBO CONCRETO

Exploiting the sculptural potential of concrete

DECARBONISING CONSTRUCTION

The role of the main contractor in a lower-carbon industry

PHOENIX BRIDGE

3D-printed bridge built with recycled materials

GAZEBO CONCRETO

The brief for this project was simple: to provide shelter. The clients wanted a covered terrace in their garden to enable them to spend more time outdoors – day or night, rain or shine. But beyond its pragmatic function, the clients wanted something of higher architectural purpose too – to create something that exploited to the full the sculptural potential of a single material: concrete. **Adrian James** of **Adrian James Architects** explains the thinking behind the brief.

MAIN IMAGE: The Gazebo, end on view. *(Photos: David Fisher.)*

The client loved the resonant, ascetic quality of spaces and forms created only in concrete and defined by daylight: nothing more. With reference to Brutalist precedents and the particular example of John Lautner's Sheats Goldstein house in LA, the client asked us to design a structure that achieved the more poetic aims of architecture – manipulating space, light and form to create a dramatic, habitable sculpture.

Concrete has no airs; it has a raw purity. It is also supremely versatile and can perform extraordinary structural gymnastics. To exploit these characteristics to the full, the canopy was cantilevered out, which imbued it with an airy weightlessness, in contrast with its manifest mass. The canopy stood off the existing building on four slender columns away from the corners and a triangular geometry was applied to give it a sharp prow; it was given

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the requisite depth where necessary by coffering the soffit. The soffit was then punctured with an array of small circular pavement lights, peppering the polished concrete terrace with pint-size pools of sunlight.

But concrete, of course, also has a high carbon footprint. This is a very small construction, nonetheless it is not without environmental impact. It was clear from the very start that if concrete was to be used for the canopy's construction, we would need to reduce the embodied energy as far as possible and compensate for it by properly and fully off-setting its carbon footprint. This could not be done on-site and after much research, the most effective and assured way to off-set was for the client to finance the requisite amount of new woodland planting in Yorkshire.

SUSTAINABILITY

The first question was, inevitably, whether it had to be concrete. The author was once an ardent advocate of the material, whose practice 12 years ago designed a house with a structure and interior entirely in precast concrete. Slim concrete panels were assembled like a pack of cards in less than a week; the interior was self-finished, extremely durable and a thing of austere Ando-esque beauty. It felt like the off-site future but it also felt timeless; to go through the front door was to be immersed in a sea of tranquillity. Hill Top House was shortlisted for the Stephen Lawrence Prize and it won the 2013 Concrete Society Overall Winner award for excellence in the use of concrete.

But times have changed; there is an elephant in the concrete room and it has a very large carbon footprint. So, alternatives to concrete must be looked at wherever possible. Nonetheless, the material must still have a place in today's list of possible construction materials. It is the most versatile and useful building material on earth. It is the opposite of plasterboard, which makes every building a cheap stage set; it is hard reality.

OBJECTIVES

Two objectives were set for this project – make every effort to reduce the carbon footprint of concrete and make full use of the material's properties for the structure and the finish. A structure was designed that could only ever be concrete, with its combined strength, plasticity and water resistance. Four routes were looked at with regard to reducing the carbon footprint:

- Efficiency – from day one, the principle was that a waffle slab system would be used to minimise the slab depth where the stresses were less – albeit a rather different waffle than normal, being based on an equilateral triangle geometry rather than orthogonal. The project engineers worked hard to minimise the amount of concrete required. While the waffle slab system has a triangular geometry, the columns are arranged as two interlocking proscenia, which can be very slim because they are perpendicular to each other and cope with lateral loads between them. The columns, beams and slab are as slender as possible.
- Mix design – the small batches required meant it was not viable to specify a mix with greater proportions of GGBS or any other cement replacements; a designated RC32/40 mix had to be used because concrete plants make big batches and cannot cater for smaller loads of bespoke mixes.
- Formwork – specialist contractor Conform uses Wisa MDO or Pourform 107 phenolic

ABOVE: The coffered soffit.

The eastern elevation.

ABOVE:
Downpipe detail.

ply, which have excellent reusability: up to ten times more uses than the traditional formwork plywood. And the paper face gives an excellent matt finish.

- Waste – the reusable formwork meant there was very little waste, but all other timber was sourced from responsible suppliers.

Finally, the resultant carbon footprint was calculated and off-set.

Concrete need not be such a carbon bogeyman. It is top of the form for thermal mass. Concrete cuts the need for cladding or finishing materials and coats. Concrete is nine-tenths inert rock and sand – stuff that can be sourced locally and lasts forever with no carbon impact. Concrete is basically glued gravel and it is only the glue that is the problem: the cement. The industry is acutely aware of this issue and is urgently researching how to decarbonise cement and/or find alternative glues. It would be nice to think that in ten years' time, the cement conundrum will be solved and concrete can claim, with a clear conscience, to be the world's most useful building material.

It's not there yet, but nonetheless concrete has some intrinsic qualities, which means it should not be ruled out as an option. If it is selected with good reason, then every effort should be made to reduce its carbon footprint and to exploit its unique characteristics by designing a building that can only be constructed using this extraordinary material and which uses it for both structure and finish. C

TOP:
House meets Gazebo.

ABOVE LEFT:
The approach from the gate.