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CONCRETE

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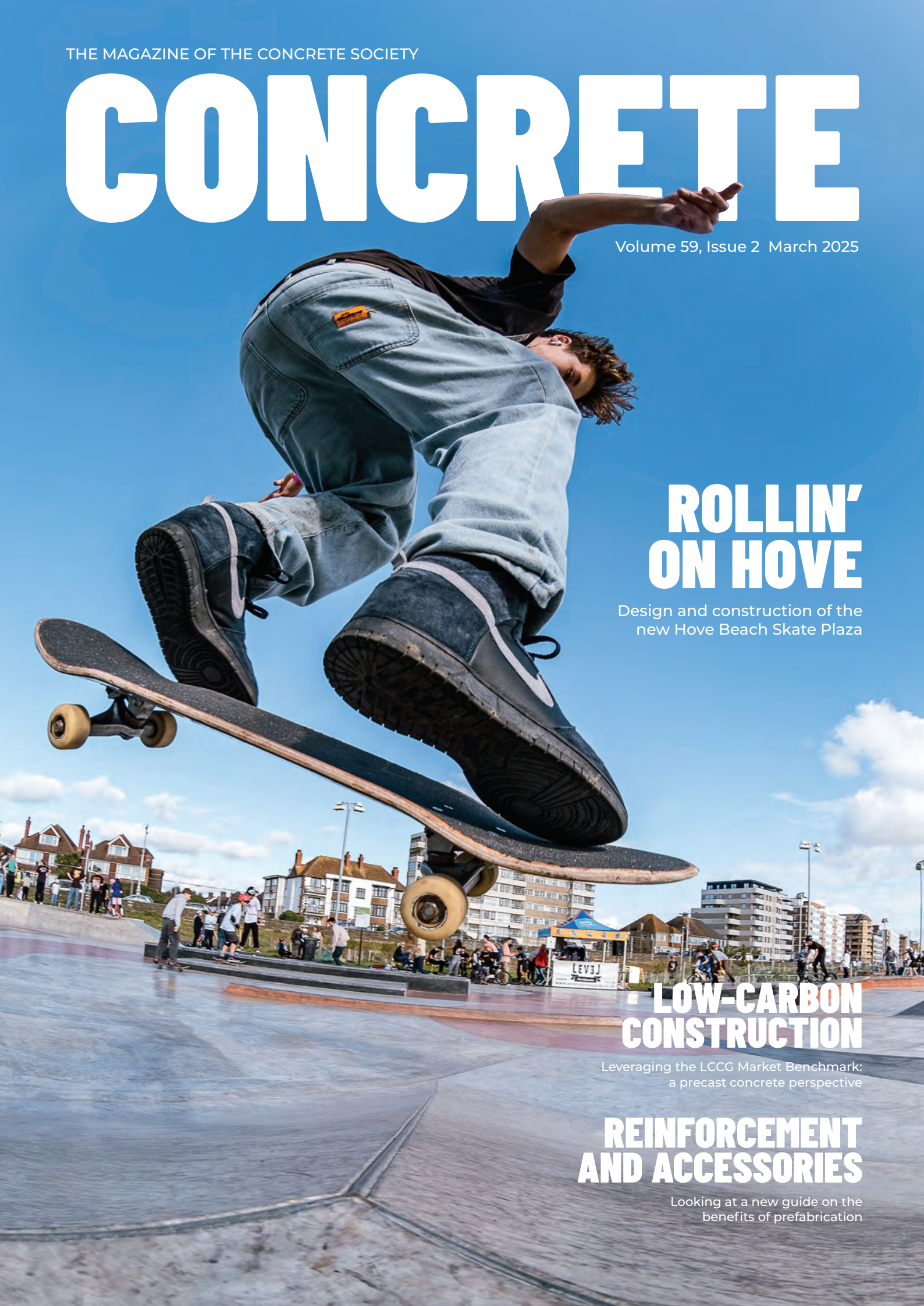


ROLLIN' ON HOVE

Design and construction of the new Hove Beach Skate Plaza

LOW-CARBON CONSTRUCTION

Leveraging the LCCG Market Benchmark: a precast concrete perspective

REINFORCEMENT AND ACCESSORIES

Looking at a new guide on the benefits of prefabrication

105 VICTORIA STREET, LONDON

A civil engineering contractor, and founder member of ConcreteZero, is rising to the challenges of achieving a step change in carbon reduction for the landmark 105 Victoria Street project in the heart of London. William Benson of Careys reports.

Taking on the challenges of helping achieve the ambitious carbon reduction targets for 105 Victoria Street has involved not only having to think 'outside of the box' but also quite literally rethinking the matrix that gives concrete its inherent strength. From the precontract planning period through to the routine wait for pours to gain sufficient strength before the formwork can be struck, every minute proved to be precious.

CLEAR VISION

The client, BGO, was clear on its vision for the project – to develop a world-class mixed-use building, which pushed the boundaries of low-carbon construction. The project slogan 'Find Alternative' is central to the mission of the project, reflecting a commitment to innovation and sustainable solutions. This ethos is evident in the building's design and operational strategies, which aim to challenge conventional approaches and promote environmental responsibilities.

> "With 17% of the embodied carbon in the Stage 3 concrete structure, Careys, working with Skanska and London Concrete, was able to reduce this by 41%."

In harmony with a number of other successfully delivered recent reconfigurations of outmoded properties across the capital, the project team for 105 Victoria Street took the pragmatic approach of repurposing what they could of the old building and are carrying the ethos through to setting new benchmarks for upcycling construction waste materials – making closed-loop circularity a reality rather than an aspiration. Hence, while the old raft slab had to be removed, approximately a third of the original basement retaining walls have been left in place.

MARGINAL GAINS

With 17% of the embodied carbon in the Stage 3 concrete structure, Careys, working with Skanska and London Concrete, was able to reduce this by 41%. The concept of 'marginal gains' was espoused by Sir Dave Brailsford and similarly successful sports coaches. Careys has achieved other small but significant wins through measures such as partnering with its reinforcement supplier to recycle temporary steel props to produce new reinforcement bars, saving 400tCO_2e. A pilot is in progress whereby a partnership has been established with Uploop to take any waste concrete from pours so it can be reprocessed to create recycled concrete aggregate (RCA) that goes back into the ready-mixed concrete sent to site. And, when available, those loads have been delivered to Victoria Street in London's first electric-powered concrete lorry.

It is though in the mix designs for the raft and the jumpforming of the building's twin cores that

the alchemy really captures the imagination.

The main site challenge faced by the team was scale and pace, so carbon was not the only parameter under consideration. There were 40 weeks to construct the 4000m^2 three-level basement and the twin cores, which were 16 and 13 storeys in height both with an exposed visual concrete finish. Emphasis was put on up-front planning and procurement, which allowed numerous carbon assessments to be run on the structure to ensure that 'spending' the carbon was done in the correct place. The cores were on the critical path, so carbon and time became the two opposing forces to focus on.

JUMPFORM RIG

Early on in the planning, the project required Careys' in-house jumpform rig. The rig is uniquely suited for projects requiring a quick cycle time, exposed concrete finish and low-carbon concrete, all while keeping tower crane dependency low. The rig is designed to jump at concrete strength as low as 12MPa, while also having the ability to store a week's worth of reinforcement on the top deck, significantly de-risking programme delays due to weather events.

The rig, which has built some of London's most iconic towers, including 22 Bishopsgate, Principal Place and 1 Leadenhall, was reconfigured for 105 Victoria Street. A team had been working off-site months before the project, refurbishing the Alkus Ply, which has built these previous projects, bringing it back up to as-new quality to deliver on the visual concrete requirements. No new ply was used on the core construction, which in itself is a great achievement.

It was the concrete mix design for the core walls that really took the upfront time to develop and test. Partnering with London Concrete helped develop a high GGBS and limestone filler, ultra-low-carbon mix (all the concretes used meet the LCCG-1 benchmark (2024)), which also had a high flow to aid placement around the steel embedment plates, while the design also allowed for a high early-age strength that was required to maintain the one-week cycle time.

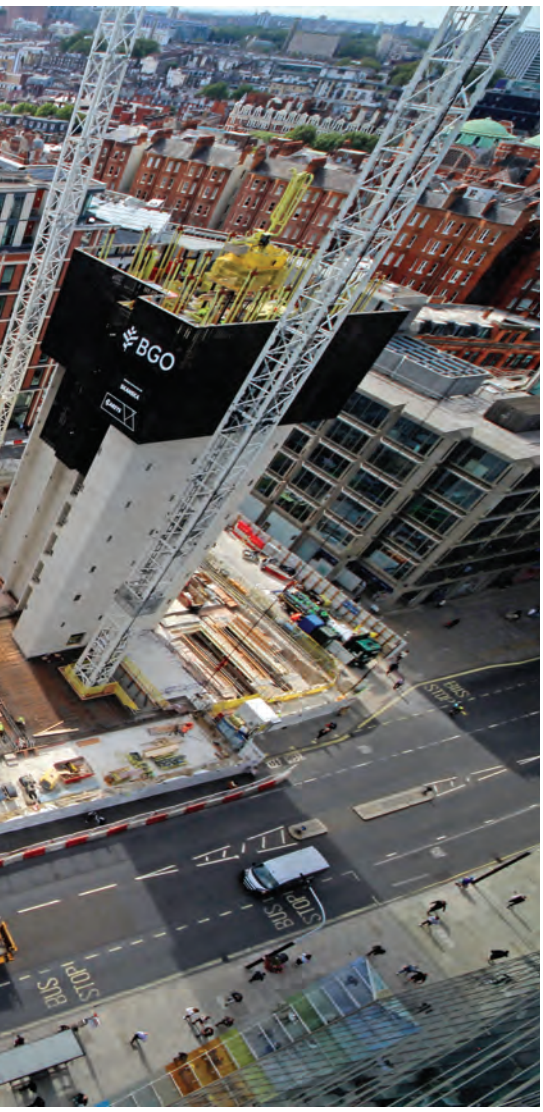
MAIN IMAGE:
Aerial view of concrete core construction.

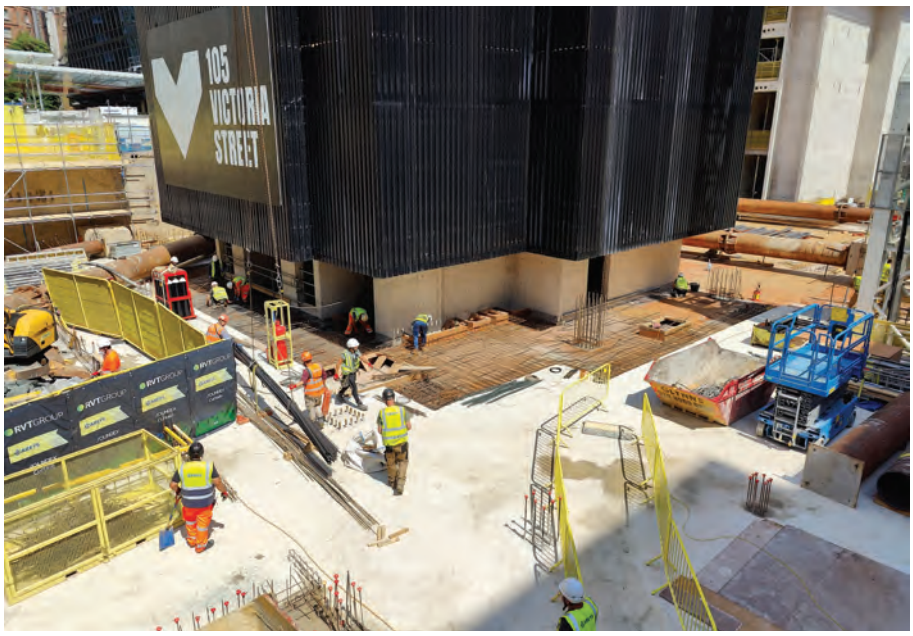
BELOW:
Basement works.

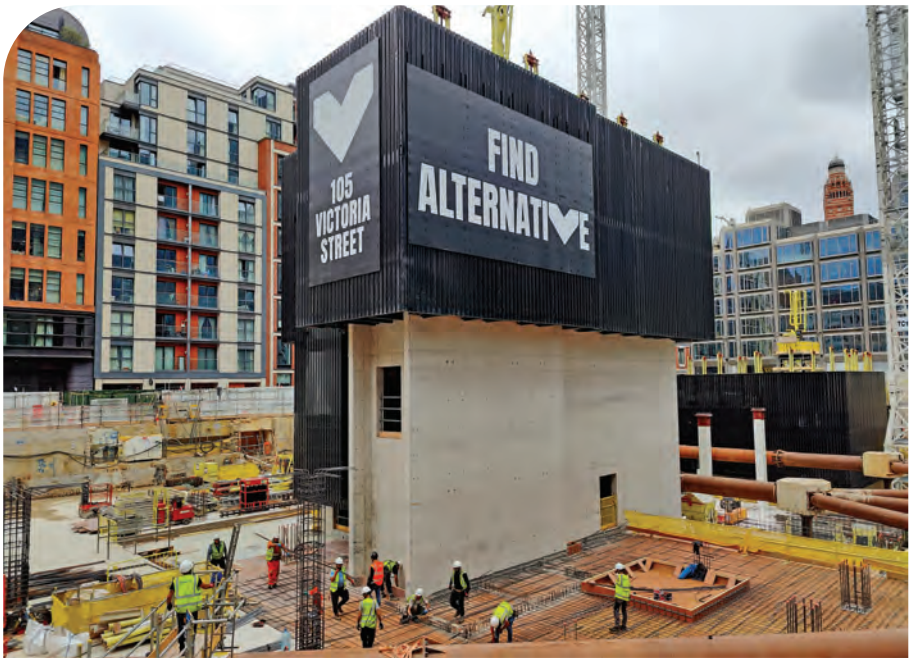
BOTTOM:
Construction of the second core.

LABORATORY TESTING

Careys' team spent many weeks with London Concrete in its concrete laboratory, testing the mix and conducting a number of temperature-matched curing trials to calibrate the mix so thermocouples could be used to remove the reliance on early strike cubes, which would not be representative of the in-situ strength. The use of the thermocouples helped achieve the one-week cycle time.







LEFT:
Jumpform construction of the core.

MIDDLE:
Start of jumpform works.

BOTTOM:
Steel props, which were later used as reinforcement in the project.

Achieving this one-week cycle required the mentality of a Formula 1 pit lane crew. The reinforcement had to arrive exactly on time, delivered from the Celsa plant in Wales. The jumping and levelling of the rig had to be completed in two hours so the reinforcement fixing team, Alkus Ply, remedial team and formwork team could get the pour complete in time for the concrete, which arrived exactly as the gates opened on Friday morning. The project is surrounded by local residencies, so working past 6pm was not an option.

Marco Catoni from London Concrete says, "We started working on ECOPact Prime AS in 2021. As well as achieving over 40% carbon reduction, the other key benefits of ECOPact Prime AS include its active strength development compared with the existing ECOPact product and the flexibility to provide bespoke products to fit site-specific requirements. It is also available in consistence classes S3 and above to meet the evolving needs of customers and clients, without compromising on quality or build time.

"Overall, Aggregate Industries and Holcim aim to reduce carbon emissions through the raw materials used and transport methods. Consequently, we are working towards prioritising local materials and, when it is not possible, optimising our importation."

CONCRETE RAFT COMPLETED

Construction of the 6350m^3 reinforced concrete raft was successfully finished in May 2024, with a total of 16 pours completed over a three-month period, while trials of Careys' equally innovative jumpform solution were underway to confirm the method statement and fine-tune the mix design for the next significant stage of this low-carbon exemplar project.

Construction at 105 Victoria Street is due to complete in summer 2026.