

THE MAGAZINE OF THE CONCRETE SOCIETY

CONCRETE

Volume 56, Issue 10 December 2022



RIDE THE CONCRETE WAVE

Get your skates on at F51 Sports
Park – our 2022 Outright Winner

HIGHLY COMMENDED

From 100 Liverpool Street to
the London College of Fashion

THE SHORTLIST

From 103 Colmore Row to
Warwick Uni Faculty of Arts

**THE
AWARDS
ISSUE**



MAIN IMAGE:
Concrete bowl at F51.

F51 SPORTS PARK, FOLKESTONE

F51, the world's first multi-storey skate park, features the only suspended concrete skate bowl in the world. The bowls, which also act as a structural transfer slab, appear to float in the air. Visitors walk under the undulating concrete surface, while skaters enjoy a perfectly smooth surface above.

(Photo: Matt Rowe)



F51, designed by architect Hollaway Studio, is an adrenaline building with a concrete centrepiece. The skate park embeds extreme sports, normally banished to the outskirts, and is named after its location right in the heart of town. Its beauty is urban and form follows function. This is the world's first purpose-built multi-storey skate park. It is also a central piece of the regeneration project in Folkestone's Creative Quarter, flooded with murals, showcasing the culture of the skate world as well as the town itself.

It is a central hub for youth culture, following the year that skateboarding was recognised at Tokyo as an Olympic sport and in advance of Paris 2024. Beyond skateboarding, F51 includes the tallest climbing wall in south-east England and facilities for bouldering and boxing. It was opened in April 2022 and was built by Jenner as the

main contractor at a cost of £17m. Concrete is irrevocably synonymous with skate culture; it is the professional skaters' material of choice. Bowl skating originated in California in the 1970s. During droughts, swimming pools were emptied to save water. Californian pools are often shaped as bowls and so the empty pools provided the perfect skating surface, and bowl skating was born.

Concrete bowls are centre stage at F51. The building structure uses concrete up to the first floor and then steelwork above. The first level features the unique 'Bowl Floors' – undulating and perfectly smooth concrete surfaces that are suspended in the air above the ground floor. These are the only suspended concrete skate bowls in the world.

The floor features two bowls: the classic concrete 'Pool Bowl' (up to 2.65m deep), and the 'Modern Bowl' (1.85m deep and considered slightly

F51 Sports Park, Folkestone

Client and owner

The Sports Trust

Structural engineer (superstructure)

Ramboll

Project manager

Spider Project Management

Architect

Hollaway Studio

Main contractor

Jenner

Structural concrete and groundworks

Darby Groundworks

Concrete skate surface

Maverick Industries

Concrete bowl modelling

Cordek

BELOW:

Café area showing exposed columns and 'floating' soffit.



(Photo: Hutton + Crow)



(Photo: Cordek)

ABOVE:

Formers used for construction of suspended skating bowls supported by proprietary formwork/falsework.

easier to ride). Both feature an ultra-smooth seamless concrete for the ultimate skate surface.

The suspended structural design of the concrete floors was carried out by Ramboll, working in close collaboration with Maverick, a skater-led firm that specialises in the design and installation of concrete skate parks. The concrete bowls cantilever out beyond the footprint, over a subterranean sewer, to support the steel building above. The bowls were designed to carry their own weight but also to act as a structural transfer slab, supporting the remaining floors (which are steelwork) above. This posed a significant structural challenge.

Ramboll worked with Maverick to refine the skate surface, to find a perfect balance between a structurally efficient structure and world-class skate experience. The result is a surprisingly efficient structure due to the natural catenary-like geometry of the concrete, which benefits from bending when compared with a flat slab. The final curved slab geometry was prepared by Maverick and then Ramboll created a mathematically defined geometry, extruded to the required depth, and placed it in the BIM model.

The structural design for the complex bowl structure was carried out by Ramboll using non-linear 3D finite-element analysis, which simulated the concrete cracking and/or crushing, as well as the



(Photo: Matt Rowe)

ABOVE:
Completed
exterior.

reinforcement yielding, to give a highly sophisticated check on the design. This design considered the crack widths, which is particularly important for the skate surface, as well as creep, diaphragm and thermal effects. The 'Bowl Floor' concrete structural surface typically varies between 350 and 500mm thick, with thickenings at the cantilevering parts of the floor. This structure is only possible

in concrete, due to its structural properties and unrestrained geometry.

Forming the organic undulating shape of the concrete bowls presented another unique challenge. To solve this issue, Ramboll provided a model of the bowl's underside surface to Cordek, who used this model to cut the shape of the bowls accurately into expanded polystyrene, using a

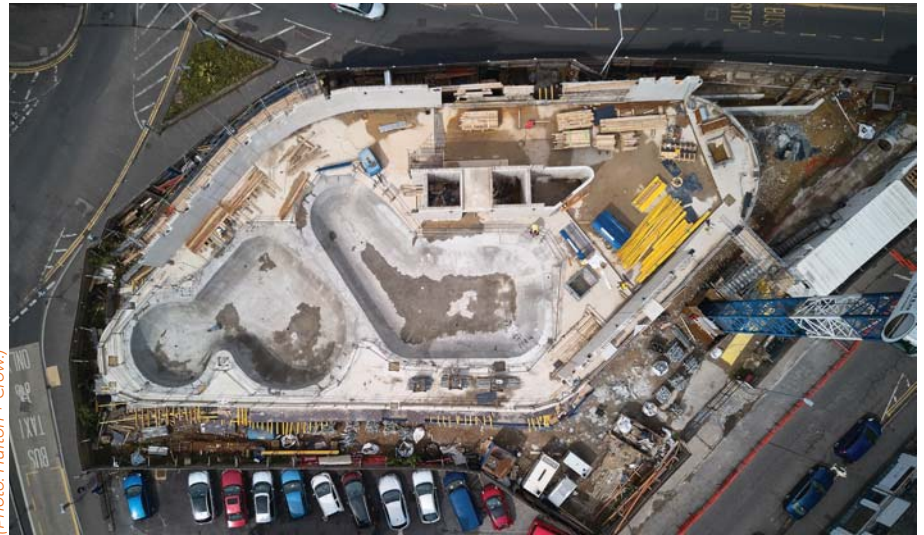
RIGHT:
Aerial view, showing the small
footprint and concrete bowl
construction.

five-axis CNC router. The 254 solid blocks were then delivered to site and placed on flat formwork tables 5m in the air. The blocks were then coated with an epoxy resin seal to provide a smooth finish and aid striking, and reinforcement laid on top.

The reinforcement detailing for the concrete bowl floor presented a significant challenge. Every bar is unique. A digital approach was adopted to solve this challenge. A bespoke parametric script was developed that created the reinforcement automatically, outputting each bar with a unique tag, along with necessary bar-bending information, which was scheduled as normal. The script also automatically provided curtailment to congested areas of the bowl geometry. The reinforcement took three weeks to fix and went without a hitch.

To avoid complex formwork to the top surface, the team elected to spray the structural concrete onto the formwork below. Ramboll worked closely with Jenner and its specialist concrete subcontractor, Darby Groundworks, to find a mix that balanced the need for a sprayable concrete against the need for a durable material that would withstand the seaside climate. Darby carried out the concrete spraying over two weeks.

Following this work, the polystyrene formwork was removed from below, revealing the stunning undulating concrete bowls above. The concrete soffit finish was excellent but the undersides of the bowls were manually polished for an additional refinement. The Pool Bowl is



(Photo: Hufton + Crowl)

expressed outside the building, with visitors to the skate park able to walk under the exposed raw concrete as they enter and sit under it in the café. The Modern Bowl is above internal space (the skate floors are unheated), so the underside was insulated and clad in GRC.

The top surface was laid to a tolerance of $\pm 25\text{mm}$, but the skate surface required a tolerance of $\pm 2\text{mm}$ and to be extremely smooth. Therefore, the team elected to overlay the structural concrete with a thinner skate finishing surface. This was installed by Maverick; it sprayed the skate concrete onto the structural concrete below, shaping and polishing it by hand to form a beautifully smooth and seamless surface for skating.

Concrete also adorns the columns and walls, allowing riders to skate all elements of the floor.

The other two skate levels in the skate park, the 'Street Park' and 'Flow Park', use timber as a skate surface, installed by Cambian Action Sports, supported on composite steel beams and concrete floors. Stability to the building is provided

by concrete stability walls.

The client, Dan Hulme, CEO of The Sports Trust, says, "We are delighted that Folkestone 51 has met our ambitious expectations. Funded by The Roger De Haan Charitable Trust and run by The Sports Trust, the innovative concept of creating the world's first multi-storey skate park in the heart of Folkestone has come to fruition thanks to the dedicated project team."

By prompting us to push physical and mental boundaries, within the context of beauty and surprise, F51 not only facilitates thrills but also adds to them. **C**

Judges' Comments

The suspended bowls are sprayed concrete onto curved EPS forms. The bowls' final surface is a perfectly smooth fine cementitious coating. Skateboarders are particular about smoothness and the slightest imperfection, crack or variation in surface irregularity that affects the flow while riding the board.

The surface of the supporting internal circular columns as-struct were shiny but sanded back to a matt finish. The external circular columns have been left as-cast but where the bowl soffit extends externally, it has been painted matt black to match the external ground-floor walls and metal rainscreen. The stair and lift core were an as-struct finish, typically rubbed down and/or a wash applied to give an urban appearance, with the addition of street art.

With the Paris Olympics including skateboarding, this bowl is likely to be a training location for UK skaters. It is an engineering feat and deserves an award for ingenuity and foresight alone.

(Photo: Hufton + Crowl)

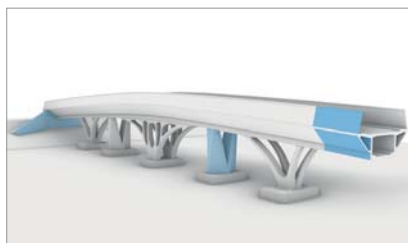


RIGHT:
Skaters enjoying
action in the bowl.



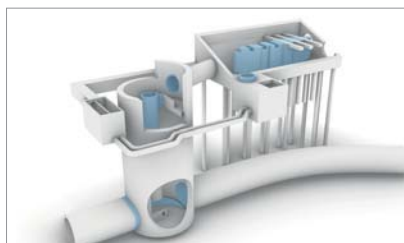
COMPLEX FORMWORK

In addition to complex formwork for creating architectural features, finishes and shapes, we also have a range of complex solutions related to infrastructure construction.



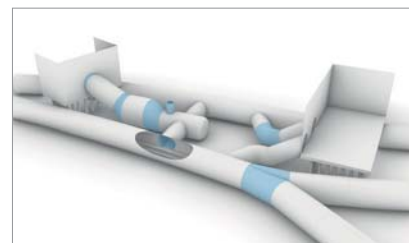
Bridge Formwork

- » Abutments & Wingwalls
- » Parapet Walls
- » Piers & Support Columns
- » Soffits



Drainage & Sewer Formwork

- » Benching
- » Connection Culverts
- » Intakes & Outfalls
- » Vortex Structures



Tunnel Formwork

- » Intersections
- » Soft Eyes
- » Transitions
- » Ventilation Shafts

For more information on our complex formwork solutions, please visit cordek.com or scan the QR code.

