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WEAVING AND BLENDING

Architectural precast materials, colours and finishes help form a luxurious aesthetic for developer

MANCHESTER AIRPORT MSCP

Space-saving design using Deltabeams, hollowcore and precast columns

LIGHT FOR THE PATH AHEAD

Luminescent concrete: a new decorative solution

How smart engineering and jumpform technology supported the delivery of the Kirtling Street shaft

Thames Tideway Tunnel is one of the UK's biggest infrastructure projects, involving over 20 construction sites. **PERI** supported the construction of multiple shafts on the project – Kirtling Street being the most challenging due to its size. On a project of this complexity, flexible products and innovative engineering were invaluable in shortening construction time, reducing costs and championing reusability. **Jinal Kansara** reports.

With a diameter of 30m, the Kirtling Street shaft is the largest across the entire Tideway project.

PERI's engineering team worked collaboratively with the Ferrovial Laing O'Rourke JV (FLOJV) site team to deliver a temporary works solution for two tunnel portals that were 7.3m wide and 6.5m deep, in addition to a 1m-thick secondary lining for the shaft walls.

The tunnel portals had to be cast in tandem with the tunnel drum – the 15m height of these portals making the formwork design more challenging. To ensure timely and simultaneous delivery of these structures, formwork engineers proposed a solution comprising standard rentable components from the Variokit range, minimising costs and maximising reusability.

SPLIT PROCESS IN TWO

The proposed formwork solution split the concreting process into two halves to accommodate the height of the portal. For the lower half, the tunnel drum was integrated with a moving frame used in conjunction with SB brace frames. The top half comprised SB brace frames, which were integrated with PERI UP heavy-duty shoring. To support and keep the SB brace frames securely in position, anchors were cast into the concrete structure on a 45° angle.

The drum formwork was integrated with heavy-duty trusses comprising RCS rail frames and heavy-duty

rollers to facilitate movement. The efficient solution was designed to serve multiple purposes, like enabling safe installation into the casting position, height adjustment and preventing uplift during concreting. It also facilitated the safe removal of the formwork unit out of the shaft.

CONSIDERATIONS

Minimising cost and wastage were important considerations of the design. The flexibility of Variokit components and cost-effective design ensured that the same solution could be reused for the second tunnel entrance.

For the secondary lining temporary works, the FLOJV site team required an efficient jumpform system that would reduce cycle times. Formwork engineers evolved the solution they had previously designed and delivered at the Blackfriars site to accommodate the larger diameter of this shaft. This comprised a hybrid RCS (rail-guided climbing) and SCS (single-sided climbing) system, which enabled faster cycles as all platforms climbed simultaneously with the support of RCS MAX hydraulics. Hydraulic operations accelerated the circumferential lift, as the system could be jumped in

just one to two hours, compared with crane operation that took 30 minutes per platform. It also enabled the crane to be used for removing locomotives from the shaft, making hook time more efficient.

SCS climbing was used to support the concrete load from the single-sided pours. RCS MAX lifted the entire ring consisting of 41 formwork platforms to the next level in 3.2m lifts with the push of two buttons.





In addition to faster cycling, RCS MAX provided built-in leading-edge protection, an important safety provision as formwork units climbed seamlessly without needing to be repositioned at each level. Formwork engineers also incorporated a bespoke shoe adapter to maximise the width of influence, for high usage of the SCS system components and to support the specified concrete pressure, which resulted in an anchor load of 200kN.

SAFE ACCESS

Safe access to the shaft walls was efficiently integrated into the climbing formwork design by extending the platform at level +1. Sufficient space was created on the platform to accommodate a four-person rider, which was used to transport operatives to and from various levels inside the 50m-deep shaft.



ABOVE:

The tunnel drum is made from PERI's Variokit formwork range, comprising individual standard components for ultimate flexibility.

LEFT:

Temporary works for the construction of the tunnel portal can be seen from the top of the shaft. The concreting process was split in two halves due to the height of the portal.

FAR LEFT INSET:

PERI's hybrid SCS-RCS jumpform system climbs its first level as a full ring.

The entire solution was fabricated off-site at PERI's Rugby depot, contributing to time savings, reductions in labour and minimising on-site safety risks. 