**Doka has supplied the pre-assembled formwork and high load-bearing shoring towers to a complex ventilation shaft to ensure critical tunnelling activities are kept on schedule**

Mandeville Road shaft is one of five ventilation shafts along the Northolt tunnel route, which stretches 13.5km between Old Oak Common and West Ruislip.

Doka’s high-performance formwork was required for two elements of the Mandeville Road project being delivered by Skanska Costain STRABAG JV and sub-contractor Joseph Gallagher. Doka’s formwork and shoring platforms were essential to the construction of each structure’s secondary concrete linings.

A two-week cycle time was set for each concrete pour, which included the assembly, placement, concrete pour, curing, disassembly, next incline adjustment and re-setting over several levels. Using adaptable formwork and shoring towers from Doka, there was a lot for the Doka engineering teams to consider in conjunction with Joseph Gallagher both before and throughout the process. The planning aspect of the inclined and elliptical satellite ventilation shaft was significantly improved with the use of Revit-produced 3D design structural data. Doka used the BIM design method to create integrated formwork concepts of defined work stages. These were then exported to ensure the plans were executed more quickly and with greater clarity on the building site itself.

The tunnel leading to the Mandeville Road ventilation shaft is being constructed beneath an existing railway line using a huge tunnel boring machine. Hence, the inclined aspect of the satellite ventilation shaft, as it had to divert across and safely away from the existing train line. Contractors were working to a time-critical path to guarantee this outcome. Therefore, the rapid, effective completion of the ventilation shafts’ secondary concrete linings was of the utmost priority.

The challenge for contractors was to utilise formwork with suitable reconfigurability and manoeuvrability to meet the requirements of the Mandeville satellite shaft’s inclined aspect. Doka’s Top 50 formwork more than matched the brief. The made-to-measure wall formwork can adapt to any project design requirements.

For the project programme, Doka preassembled its Top 50 formwork at its facility in readiness for its rapid, simple on-site construction. Once in position, the Top 50 system enabled safe, quick and speedy reworking to accommodate the changing geometry of the shaft’s concrete-lined vertical walls.

The use of Doka's Staxo 100 high-speed shoring system was also critical to the safe and time-efficient construction of the shafts. Designed to provide a high load capacity of up to 100 kN per leg, the Staxo 100 was partly pre-assembled horizontally and crane lifted vertically into the shaft.

As well as its exceptional load-bearing capacity, the Staxo 100 strength is its high-speed assembly and ease of handling are key benefits of the solution. Its towers can be lifted when reconfiguration is required, as part of a less labour-intensive process that reduces the need to completely dismantle the system. This time-saving aspect was particularly important to the Mandeville Road project, with the system having to be adjusted in line with the elliptical satellite ventilation shaft’s inclined design.

Consideration needed to be paid to eliminate voids being left within the concrete underneath the ground raft beam to enable Joseph Gallagher to view and check the concrete levels and pressures. This was achieved with the installation of portholes in the Top 50 wall formwork on the final pour beneath the basement raft.

The inclined shaft, using SCS JV approved C40/50 concrete mix, took just six weeks to complete. The site’s 24-hour operation between six and seven days per week contributed significantly to the formwork’s timely completion, enabling Doka to adapt its preassembly and service levels accordingly. It resulted in a void-less pour and the inclined secondary shaft linings’ formation in line with the client’s ambitious two-week schedule.

The speed and ease of Doka’s formwork assembly have helped to keep the Mandeville Road Headhouse ventilation shaft on track, a process that is essential in allowing the tunnel boring machine to continue its vital work further along the HS2 route.