Case Study

Griffith House BSP
Edgware Station, London

Customer
London Underground

Main Contractor
Bam Nuttall

Consultant
Buro Happold

Date
May 2011

The Problem
As part of the extensive, ongoing Power upgrade of the London Underground (Package 4), MGF had been selected by Bam Nuttall to assist in designing a support system for the construction of an reinforced concrete sub-structure on Chapel Road. MGF’s scope was to design and supply a structurally efficient TWs propping scheme whilst not comprising site buildability. Due to deep and high risk nature of the TWs (adjacent to a live LU track) MGF’s design was subject to a rigorous Cat III check prior to obtaining LUL / Network Rail approvals before works could progress on site.

A challenging as well as varying site topography combined with complex cofferdam geometry presented many design issues beyond that normally considered with a traditional sheet piled cofferdam. With existing ground level differences of up to 5.6m across the cofferdam combined with non-parallel cofferdam walls resulted in double-raked flying shores. Well beyond the scope of any modular format shoring systems; MGF’s propping scheme comprised a blend of off-the-shelf modular hydraulic propping systems and bespoke elements to provide our client with best value whilst maintaining the benefits and versatility of modular hydraulic systems.

The Solution
Structural detailing required consideration of horizontal as well as vertical shear restraint details to the walings and props to ensure a stable cofferdam and TWs support system was maintained. Horizontal shear restraints comprised steel shear keys welded to the backside of the walings which where then cast into concreted sections within designated sheet pile pans or where this was not practical steel plates welded between the walings and sheet piles where used. At raked flying shore positions vertical shear restraints where required to offer transitional and rotational restraint to steel walings. Prop-to-waling connections comprised MGF’s modular 2500kN Swivel Base assembly. Due to a very congested site with virtually no working space outside the cofferdam, MGF’s design was based on a staged propping installation approach mirroring the Client’s construction sequence. With the propping installation only nearer completion as excavation works had progressed across site, the temporary support frame could only be treated as an open / incomplete frame and therefore additional horizontal restraint steelwork to some of the walings was required to achieve a stable cofferdam and TWs support system. Once all of the walings and props had been installed a more traditional closed / complete cofferdam propping system was formed.
The use of MGF’s hydraulic propping systems mitigated construction / fitting tolerances during the installation stages. Although pre-loading of the propping system was not required by design, the inherent pre-loading capability of MGF’s hydraulic propping props provided our Client with piece-of-mind that the propping installation would be to a very high standard removing any ‘slack’ inherent within any TWs installation prior to excavating and actual earth pressures loading the system. This helped reduce ground movements and the obvious consequential risks of ground settlement given the locality of the site (built urban environment) and its close proximity to a live LU rail track / asset.