going **underground**

basement project news from ISCHEBECK TITAN

Basements hit new heights

The ever-increasing cost of land, particularly in London, is forcing home owners and developers to look below their feet in the search for extra living space, with more and more seeking to build basements to provide everything from additional rooms to swimming pools, gymnasiums and home cinemas.

And, when we talk basements, we are not merely talking about a cellar within the confines of the property's footprint. Many of today's basements are large, elaborate affairs that can extend from the front garden, underneath the house itself and below the back garden, a massive and daunting undertaking if you are unsure of the techniques now available to ease the processes involved.

In addition to the amount of earth that needs to be excavated to create a basement, there are a number of technical and logistical obstacles that have to be overcome to create the ultimate structure. For example, access to and from a property, especially the rear garden, is often limited and will not allow for the movement of large machinery. In addition, there are neighbours to consider and a host of engineering challenges to take into account.

One company that is cornering the market in the provision of engineered solutions for this type of project is Ischebeck Titan, an international manufacturer of ground and structural engineering products. In conjunction with consulting engineers, the company has developed a number of innovative schemes for a variety of basement projects that have made the seemingly impossible possible as well as delivering time and cost efficiencies.

Ischebeck Titan's national sales manager, Sean Beirne-Lewis comments, "The versatility of our products enables us to devise engineered solutions that allow the design and construction team to make their plans a reality. More often than not, our solutions also result in savings in time and money as well as overcoming problems of restricted site access and disruption for neighbours.

"The secret is for the project team to contact us as early as possible in the planning process. We can then work with their engineers to create the best solution possible, taking all factors into consideration."

Piles take the weight

Home improvement took on a completely new meaning when the owners of a semi-detached family residence in an exclusive area of west London decided to make some changes to the property.

Resisting the usual temptations to add an extension or simply refit the existing structure, in consultation with architects, Powell Tuck Associates, the owners decided to build a new basement and totally rebuild the interior of the existing structure.
The new six metre deep basement would extend under the front and rear gardens as well as beneath the house itself, a total area of around 315m^2.
The rebuilding of the interior required the removal of all internal elements from ground floor to roof level, including floors, ceilings and stairs. Front, rear and side elevations were retained and temporarily supported during construction.

Supporting role

Access to the site was only possible from the front of the property and so large openings were formed through the front and rear walls, with sway frames being installed to facilitate plant access.
Before demolition and construction commenced in earnest, Ischebeck Titan micropiles with reinforced concrete pile caps were installed at the four corners and two sets in the centre of the property to support the sway frames. The piles were temporarily braced at intervals as the basement's excavation progressed to assure stability of the support.

Space maximised

Main contractor Westgreen Construction Ltd, in conjunction with engineer CDS Ltd, were succesful in changing the basement's support from a contiguous bored piled solution to silent sheet piling, installed by Giken Europe BV.
To maximise the space gained, Zero piles were installed adjacent to party and garden boundary walls. The sheet piles were internally braced with steel frames which were preloaded to limit ground movements.The sheet piles were also used to provide temporary support to the existing retained structure and to provide the lateral restraint for the Ischebeck Titan micropiles.

Ground forces

Ground conditions comprised approximately five metres of sandy silts overlying three metres of medium-dense sandy gravels which, in turn, overlaid the London Clay. Ground water level was at approximately 6 metres below existing ground level.
The existing and neighbouring structures were monitored twice weekly throughout the critical stages of the basement excavation and construction, and settlements were recorded in line with expectations (< 10mm).
Prior to excavation, and following a successful early testing programme to assure feasibility, Ischebeck Titan self-drilling micropiles, designed to work in tension and compression, were installed to enable the basement floor to withstand gravitational and uplift forces.
In what was the first use of a bayonet coupling in the UK, the micropiles were installed from the original ground level, some 6 metres above the intended finished depth of the basement.
Rather than leaving the entire pile in place, as would be required using temporary cased piles, the 6 metre drill string is uncoupled at the bayonet fixing by simply reversing the drilling direction, leaving the slab's reinforcing micropile in place at the 6 metre depth and below, but enabling the drill string to be removed, and re-used, from the slab to ground level.

Team benefits

This method of micropile installation delivered huge benefits to both the excavation and concrete substructure programme, and also for health and safety issues. Other benefits include no trimming down of the piles, no risk of pile damage from plant impact and no obstructions to excavation plant. Lorry movements are minimal, which offers enviromental benefits, as there is very limited spoil

created during installation and the cement grout is delivered dry and mixed on site.
The method of installation is very quick and was ideal for these ground conditions, as conventional piles would have required temporary casing.
All in all, the methods devised by CDS Ltd. in conjunction with Ischebeck Titan have provided a time and cost-efficient solution to what could have been a very tricky project. Early consultation and the ability to think 'outside the box' has allowed the entire project team to bring the architect's and owners' plans to reality.

Less pain with piles

The redevelopment of two properties near to the Old Brompton Road in South Kensington, London has benefited from the application of materials and methods more familiar to ground engineering projects than construction and temporary works.

The multi-million pound project involves the conversion of two adjoining properties into a prestigious single executive residence. In most circumstances this would have been a relatively straightforward task. However, in this case, in addition to the normal construction work that might be expected, the developers decided to create a 13m x 8m basement beneath the end property.
Obviously, the end property would, have to be demolished and rebuilt, but this left the problem of excavating the 4.5m deep basement on a site that was adjacent to the neighbouring property and bounded on the other side by a high brick garden wall, both of which were subject to local conservation/preservation orders.

More living room

Ground conditions on site were typical for the area, comprising 5-6m of dense terrace sand and gravels overlying London clay. The water table level fell below the level of the new basement formation.
Initial design considerations suggested an underpinning solution for both the adjoining property and boundary wall, with the latter also requiring a Party Wall Award.
This work would more than likely have required sacrificial earthworks support and temporary propping, possibly at several levels to resist horizontal earth pressures, as prevailing deposits would have been

unable to stand unsupported during excavation. For safety reasons, pins would have to be constructed in a minimum of two vertical lifts due to the overall depth of the excavation. In addition, the front, central and rear walls of the adjoining property would also have required underpinning, again using transition pins due to the depth.
All in all, the underpinning solution would have been a costly and potentially risky operation, a fact recognised by temporary works consultants, Contractors Design Services Ltd (CDS) of Stanstead Abbotts, Hertfordshire.

CDS managing director, Simon Smith, explains, “Underpinning is probably the first thought when faced with a situation such as this, but with the complexities of this project, we very soon realised that this was a non-starter. We also had to consider the client’s desire to maximise the size of the basement, which virtually ruled out the use of an inboard piling solution.
“So, working in conjunction with specialist drilling contractors, WT Group and injection anchor supplier, Ischebeck Titan, we devised a solution using Pali Radice piles, which was accepted by all parties.”
Piles were created using Ischebeck Titan’s 127/111 hollow self-injecting anchors. Each anchor has an external diameter of 127mm and an internal diameter of 111mm through which grout is injected under pressure as drilling proceeds. The grout exudes from apertures in the body of the drill bit at the end of the anchor, creating a continuous low pressure scouring action against the sides of the drill hole. This action exposes harder parts of the hole whilst flushing and removing the softer parts. A repeated withdrawal and redrilling procedure reams and improves the hole, which fills with grout to create a strong irregular grout body reinforced by the steel anchor that runs through its centre.
The piles were installed to a sequence at 450mm centres, using 225mm sacrificial drill bits, through the existing masonry party and garden walls via cored holes inclined at 15 degrees to the vertical around the entire perimeter of the intended basement area.
The piles provided both vertical support to the walls & horizontal support to the ground below, which allowed for excavation of the basement to proceed without hindrance and without the need for further temporary works. A single level of temporary bracing was located at the pile heads to maintain overall horizontal stability across the excavation. This was removed on completion of the new lower ground floor slab.

Time & cost savings

Simon Smith concludes, “The Pali Radice technique not only provided an excellent temporary works solution, it also obviated the need for the transition pins below the front, central & rear walls of the adjoining property. The solution delivered significantly greater savings in both time and costs than would have been achieved using underpinning and more common temporary works methods. It has allowed the development to proceed without undue delay and should enable the developers to secure an earlier return on their investment.”

Bungalow goes underground

Located in a prestigious residential area on the approaches to Harrow School, this bungalow development clearly demonstrates the efficiency, effectiveness and versatility of the Ischebeck Titan solution for basement projects.

The project entailed the demolition of an existing bungalow and the subsequent construction of a much larger bungalow on the same site.
The project also featured a 20m x 25m basement beneath the new dwelling to accommodate a gym and cinema.
In total, more than 130No. Ischebeck Titan micropiles were used throughout the project, ranging from 5 metres to 11 metres in length. Their application and ultimate function varied according to the topography of the site and ground conditions encountered, including tension/compression piles for the basement floor and the creation of a retaining wall to one side of the basement.
The 11 metre long retaining wall along the north-west side of the basement was created prior to excavation by 56No. 7.5 meter long 40/16 micropiles installed at 400mm centres to a triangular pattern in two rows. The injected grout for each pile interacted with the grout bodies of the adjoining piles to form a contiguous reinforced concrete wall below ground level.
The basement was then excavated, with the piled wall ultimately forming one of the walls of the basement itself.
A further 77No. micropiles were installed, working in tension and compression, to secure the reinforced concrete basement floor slab.
Being located on a road owned by Harrow School, the project had to meet a number of stipulations, both in terms of the design and finish of the final structure as well as the level of disruption.
Using the Ischebeck Titan solution, the contractors were able to satisfy the relevant authorities in all these areas of concern; vehicle movements to and from the site were minimised thanks to the use of Ischebeck Titan micropiles as they created less spoil for transportation away from site and necessitated less material deliveries to site. The ability to mix grout on site also reduced the number of deliveries required.
Finally, the speed with which Ischebeck Titan micropiles can be installed delivers significant benefits, not only in the obvious speeding of construction times, but also in the fact that disruption is kept to a minimum, a paramount consideration in such a prestigious and sensitive area.

Anchors take the strain

The total refurbishment of a large house in an exclusive residential area located just off Holland Park Avenue, London included the creation of a large basement to the rear of the property. The challenge - to maximise the size of the basement.

Occupying the entire footprint of the garden, the basement measured 38m by 19m and was just over 5m deep. It had been formed in the main by a 600mm diameter bored piled wall, but to maximise the footprint of the basement, and to eliminate internal propping, an anchored sheet piled wall was installed directly to the rear of property. In total, fifteen ground anchors were installed under the existing property. The anchors were 14m Ischebeck Titan 40/20 injection anchors, designed to a working load of 260kN.

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