GROUND STABILISATION

VAN ELLE
TOTAL FOUNDATION SOLUTIONS

Grouting & Hoopsafe® Subsidence Repair
GROSVENOR ROAD

Client
Geoffrey Osbourne

Solution
Hoopsafe® Post-Tensioned Repair System
20 Tonnes of OPC/PFA

Year
2006

Grosvenor Road borders some of the most expensive real estate in the country. Running along the north bank of the Thames, the road stretches between Vauxhall Bridge in the east, Chelsea Bridge in the west and borders Belgravia and Pimlico to the north.

The extremely high price of real estate is one of the reasons Network Rail's property arm Spacia wanted to preserve a crumbling former ticketing hall that sits by the Grosvenor Bridge, which crosses the Thames.

Built in the 1860's to serve the London Chatham and Dover Railway, the building fell into disrepair after the station was closed in 1907.

Almost 150 years after it was built, the ticket office was showing its age. A high water table, trundling trains, and poor fill around the site were taking their toll.

Spacia drafted in the contractor Geoffrey Osbourne to carry out a total repair and refurbishment of the structure, this in turn called for us to stabilise the property.

The ground around the property was appalling. It was a mixture of material, including loose gravel and back fill from when the embankment against the Thames was built.

Not only was the ground below the building poor, the structure sat on rotting timber piles. There were voids forming below the timber. The ground was disappearing from underneath the wooden piles and the high water table in the fill didn't help.

These voids needed to be grouted before any structural work could be carried out. But the poor quality of the ground meant that there was a real danger of the grout bubbling back up to the surface, like boiling mud at a geothermal park. To combat this we capped the area with 125cu.m. of lean mix concrete. This acted as a surcharge on the fill and ensured that the grout did not find its way back to the surface. Effectively it put a lid on the area. We then drilled through the concrete and grouted the deep voids below it.

We used almost 20 tonnes of OPC/PFA grout, a mixture of pulverised fuel ash and ordinary Portland cement across a 450mm grouting grid throughout the site to stabilise it.

Confined working around sidings and carriage sheds that form a spur of track from nearby Victoria Station added to the scheme's complexity. As did the trackside certificates required for working so close to the rail spur, the constant access needed to the sidings and a sitting tenant. The main access for the shunting yard ran through the site and it was in constant use from maintenance teams. We had to maintain that access while continuing with our work.

To do this, along with Osbourne we set up a 'green' working area that allowed site staff to work on the scheme without Personal Track Safety certification passes, which are issued to contractors on rail schemes.

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Year
2016

Result
The original plan had been to use a piled foundation system to stabilise the structure, but there were concerns about the cost and implications of vibration when installing the piles. Instead we decided to use our Hoopsafe® post-tensioned subsidence repair system.

Benefits of this system include:

- Less disruption
- Quicker completion
- Cost effective
- No heavy machinery required
- Tenants can remain in occupation

Normally the system uses an external, reinforced ring beam to help stiffen structural walls, rather like a corset. But at this site we used a 'belt and braces' approach by placing a beam on each side of the external wall. It gave the building a new foundation as well as corseting around it. The frame for the inner-leaf refurbishment now sits on the beams.

The beams themselves measured 450mm square, with a 16mm diameter reinforcement steel cage and were formed flush against the original walls. Seven-strand Dyform tendons were fixed to the reinforcement cage before the concrete was poured. Six steel strands were woven around the central 'king' wire before they were tensioned by a hydraulic jack, bringing the beams into compression.

The ultimate tensile strength of the tendon was 300kN but we only allow tensions up to 225kN.

We tensioned up to 50% of the final load on all of the beams, positioned the locking wedge and then tensioned up to the full load. This allowed for any relaxation in the wedge. The tendons were checked to ensure they had reached their 'theoretical extension' by measuring the length before and after tensioning. The difference between the two measurements should be 7mm per metre of beam. Its like a cooper putting a metal ring on a beer barrel; the building behaves as a single unit again.