

Mr Rakan AliVia email only: rakan360@hotmail.com
26th April 2021
Our Ref.: 18209/CL/CG

Dear Rakan,

Re: 8 Inglewood Road, London NW6 1QZ

We are writing in regards to the proposed development at 8 Inglewood Road, London NW6 1QZ and the email received from Campbell Reith on Friday 23/04/2021, requesting the preparation of a qualitative method statement with regards to the adoption of chemical grouting methods in the eventual presence of thick deposits of soft soils overlying the London Clay Formation.

General

The Basement Impact Assessment Rev1.02 (report ref. 18209/BIA_R38/Rev1.02, dated March 2021) prepared for the proposed development at 8 Inglewood Road discussed the potential presence of soft superficial soils overlying the London Clay Formation at the site.

Similar soils, currently defined as Alluvium/Made Ground, could be present at the site or under parts of it and were classified as unsuitable for the construction of foundations, which should be instead set into or onto the underlying soils of the London Clay Formation.

Layers of limited thickness of unsuitable soils could be easily dug out from underpinning bays and replaced with a suitable engineering fill. Soils Limited, however, proposed a series of possible mitigation measures to put in place in the case unsuitable soils are encountered to greater depth, making the replacement with a suitable engineered fill and unsuitable procedure. The proposed mitigation measures comprised:

- Dig out unsuitable soils and replacement with lean mix or no fines concrete;
- Low pressure grouting;
- Chemical grouting;
- Micropiling.

The Structural Engineer then confirmed that the preferred mitigation solution in presence of thick layers of soft superficial soils would have been chemical grouting.

This commentary letter is therefore aimed to summarise the preliminary characteristics of the treatment, in order to represent a Qualitative Method Statement setting out the required interventions and the needed control measures. The definition of a proper, site-specific Method Statement is therefore left to the specialist contractor chosen for the development of the interventions, should this be confirmed at the time of the excavations.

Foundation Strategy

Soils of the Alluvium/suspect Made Ground were considered not suitable for the use as foundation layer and the Basement Impact Assessment recommended to set basement foundations within the underlying soils of the London Clay Formation.

A net allowable bearing pressure of 110kPa was calculated based on a 5m by 1.00m strip foundation set at a minimum depth of 3.20m below ground level (bgl) within the London Clay Formation. Taking into account the removed overburden pressure, the corresponding gross bearing value could be taken as 130kPa.

In the case soft soils of Alluvium/suspect Made Ground are encountered to great depth below the proposed basement formation level and cannot be removed and replaced with suitable engineered fill, then chemical grouting methods are to be put in place in order to improve the mechanical properties of unsuitable soils and allow foundation loads to be safely transmitted to the underlying soils of the London Clay Formation.

The target value for the net allowable bearing pressure is therefore established as a minimum of 110kPa. The minimum equivalent undrained strength (C_u) and elastic modulus (E) of the treated soils, which are made into a stable permanently cohesive/cemented material, are estimated respectively as 65kPa and 35MPa.

Ground Improvement

Chemical grouting methods for ground improvement represent a wide class of techniques for improving the mechanical behaviour of poor quality soils. For the purpose of the proposed development at 8 Inglewood Road, the soils of Alluvium/suspect Made Ground overlying the London Clay Formation are to be stabilised by means of resin injections, pumped into the ground using specific equipment.

The resins are injected in a low viscosity form using small diameter injection probes provided with lances 2m to 3m long, in order to achieve suitable depths. In the case the stabilisation should achieve greater depths, drilling rigs could be used. The injection of resin must be carried out at low pressure levels, to prevent the development of hydro-fracturing phenomena or heave.

The use of cement-based grout injections is not recommended due to the generally greater pressure to be applied, which could induce hydro-fracture phenomena within the ground and the neighbouring structures.

The suitable resin must be inert to groundwater to avoid any risk of contamination during the injection, the curing and the lifetime of the interventions. It must also be suitable for use in the eventual presence of organic materials, potentially present within alluvial soils.

The described interventions can be carried out by several firms (e.g. Geobear, OnSite Specialist Maintenance, Normet, Shire UK, etc.). This Qualitative Method Statement is not intended to recommend any particular contractor. The chosen contractor will have the responsibility of defining treatment parameters and methodology, design values and eventual additional testing needed for achieving the minimum desired net allowable bearing pressure of 110kPa.

Ground Movement Monitoring

The monitoring of ground and structural movements was already recommended in the BIA report. Monitoring activities were recommended to be carried out on the building for the proposed development and on the neighbouring ones before the commencement of site works, during construction and for a certain period thereafter and must comply with well established methods.

Following to the potential need for improving the mechanical properties of the soft superficial deposits that could be encountered at the site, recommendations are to be provided to avoid the development of movements due to the development of ground improvement activities.

A visual inspection of the buildings potentially affected by the proposed works is to be carried out before starting site operations at the presence of party wall engineers or other consultants authorised by the neighbours to establish and record the evidence of previously existing cracks, damages and other signs of disruption or deformation potentially linked to ongoing movements (e.g. leakages from pipes, malfunctioning of sewers, cracks on road paving, etc.). A condition survey is to be produced and shared with the relevant consultants. Visual inspections must then be repeated during the works and include the inspection of the existing foundations. A final visual inspection, and if required a measurement survey, is to be done at the end of works.

Movements monitoring is to be carried out with reference to ground and structures and must include vertical and lateral movements. Vertical movements can be monitored using standard optical equipment. Lateral movements between walls must use laser measurements.

The minimum monitoring frequency must consider one visit at pre-construction stage. During construction, monitoring is to be carried out whilst the operations of resin injection is being undertaken, then after every underpin is cast for the first 4No. pins to gauge the effects of the underpinning. Assuming the results of monitoring comply with the recommendations, then the frequency of measurements can be reduced and can be carried out after the completion of every other pin. Post construction monitoring is recommended to continue for a certain period after the completion of site works. Ideally, this should be done one day after the completion of underpinning, then after one week

and finally after one month. Monitoring could continue depending on the analysis of the time series of movements.

The monitoring equipment should include traditional (optical) levelling devices and targets and laser devices for lateral movements. Where cracks are noted, monitoring equipment must include tell tales and/or Demountable Mechanical Strain Gauges (DEMEC).

The monitoring targets locations on the building elevations and party walls, as long as the definition of instrumental tolerance and thresholds for the alert system are demanded to the chosen specialist surveyors. It must be reminded, however, that the definition of the thresholds must comply with the results of the ground movement assessment presented in BIA Rev1.02, with particular reference to the vertical ground movements plotted in Figure 24 and Figure 25 and the horizontal movements in Figure 26.

Alert systems generally include three levels:

- Green zone: movements are within acceptable limits and no further action is required;
- Amber zone: movements are still within acceptable limits, but approaching the maximum allowable limit for keeping the expected damage within the damage category presented in BIA Rev1.02 report. In that case, a local structural review is recommended. The frequency of monitoring should be increased and the contractor should prepare for the implementation of remedial measures;
- Red zone: Movements are above the limits presented in the BIA, therefore site works must be immediately stopped, with the exception of all the necessary works needed for ensuring the safety of the personnel and the stability of the structures. Ground movements and damage category must be reassessed in function of revised parameters derived from site evidence. The construction method statement must be revised accordingly and a revised method of work must be implemented to avoid the development of unacceptable damages.

If you have any questions regarding the above reports, please contact the undersigned.

Yours sincerely



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Principal Geotechnical Engineer