

London School of Hygiene & Tropical Medicine

Movement monitoring during basement construction

The below outlines the proposed strategy for the monitoring of any movement during the basement construction at the development known as 15 – 17 Tavistock Place, London. WC1H 9SH. The basement is single storey (Circa 6m deep) and is to be constructed using 600mm diameter Secant piled wall construction with capping beam to the perimeter at ground level. The Secant piled wall is to be designed to only require temporary works propping at capping beam level such that the deflection levels of 9mm to the North-East wall and 11mm to the Southern wall are not exceeded as per the Basement Impact Assessment (BIA) prepared by GEA. The temporary works will be installed by the specialist groundwork contractor and inspected and signed off by the temporary works designer with a permit to load issued prior to excavation of the ground within the piled wall construction. Temporary works shall remain in place until the new basement construction is permanently braced by the construction of the new basement slab, basement to ground floor concrete walls and ground floor capping slab that props the basement in its permanent condition, with load transfer from temporary works to permanent works signed off by the basement designer with permit to load issued prior to temporary works removal. During this period, movement monitoring will be carried out as follows.

Movement monitoring of surrounding structures

The Client has appointed Cavetto Building Consultancy to act on behalf of The London School of Hygiene & Tropical Medicine as Party Wall Surveyor. Draft awards are in place and condition surveys carried out to adjoining properties. To date there has not been a call from the adjoining Party Wall Surveyors to appoint a Party Wall Engineer. As such, subject to the appointment of a Party Wall Engineer any movement monitoring of surrounding Party Wall structures will be subject to discussions and agreements with the owners and their representatives of the adjacent properties and structures. It is thought that should there become a need for movement monitoring of adjacent structures and properties that this will be as outlined below:

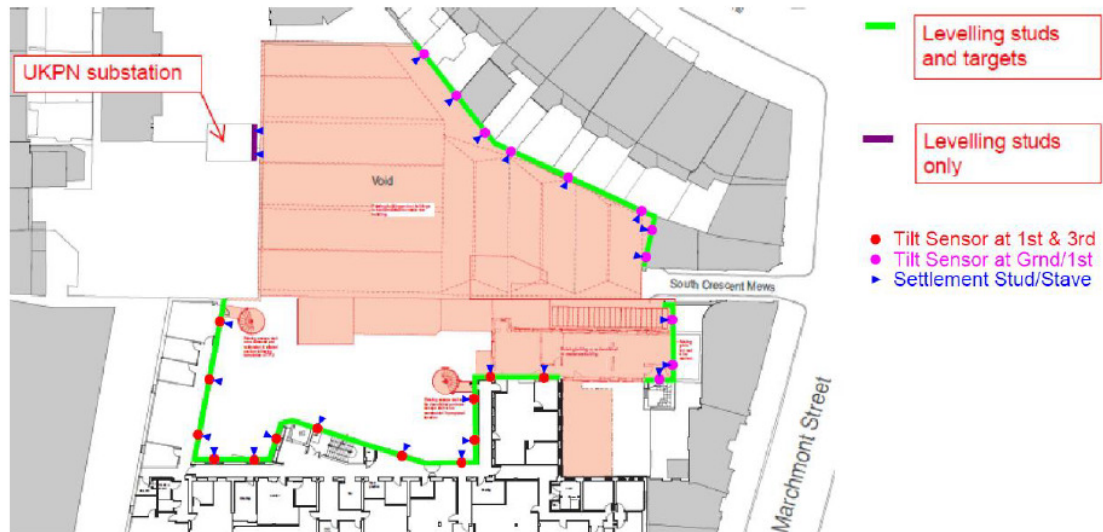


Figure 1 - Location of monitoring stations to surrounding structures being retained.

Structural deformation monitoring to determine the rate and direction of any movement of building facades, boundary and party walls to be retained during basement construction will be carried out subject to Party Wall Engineer requirements. The structures will be monitored using either reflective targets or uniaxial tilt sensors subject to sight lines with monitoring reports being prepared at specified intervals.

Reflective targets or uniaxial tilt sensors will be installed onto the structures where highlighted red and magenta on figure 1. Using the reflective targets, weekly measurement using Electronic Distance Measuring equipment (EDM) will ascertain if there is any movement against a set base line and a report prepared.

Where uniaxial tilt sensors are used, a data gateway positioned on site will transmit live real-time measurement data. The approximate locations of these sensors will be recorded on site to aid analysis of the monitoring data. Monitoring reports will be provided throughout the basement construction with the monitoring system continuously recording any movement at intervals of 30 minutes. This will be streamed live to the host server with a live traffic light system set up to predefined movement threshold values for notification of any erroneous movements. These notifications will be set-up to contact relevant personnel via email.

To accompany the reflective target measurement / uniaxial tilt readings, manual settlement monitoring of the structures will be carried out. Monitoring studs and / or bar code staves will be installed on the structures where marked blue on figure 1 at ground level. These studs / staves will be observed manually using a precise levelling instrument with results referenced to datum's established away from the zone of

influence, being recorded to submillimetre accuracies and presented in a spreadsheet format against baseline readings.

Movement monitoring of basement piled wall construction

Our calculated horizontal movement of the piled wall during excavation of the basement is 6mm. It is noted that this figure is the calculated movement of the wall and not the movement of adjacent structures /services which would be something similar or lower during the staged excavation.

In the BIA report the estimated maximum lateral movement of the soil behind the wall resulting from the installation of the bored pile walls and basement excavation is between 10mm and 15mm.

The horizontal movement estimated by GEA can be considered in line with our calculated wall horizontal movement during excavation if the effect of the pile installation is also considered.

Our wall deflection during excavation has been calculated using the software Wallap Version 6.05 by Geosolve.

The following assumptions have been made in our analysis;

- The wall is installed from +22.5mOD. This level also represents the level of the external ground during and after the piling works.
- A nominal variable surcharge of 10 kPa has been applied.
- The wall is temporary propped with only one row at capping beam level \approx +21.5mOD. The assumed stiffness of the temporary prop per linear m of the wall is 53846 kN/m².
- Hard piles are 600mm diameter spaced at 850mm to 900mm.
- General excavation level of +16mOD (6.5m excavation).
- The wall is permanently propped by the RC basement and ground levels slabs.
- The temporary propping is removed only after the ground slab is cast and the concrete is cured.

To monitor the movement during the period of excavation, inclinometers will be installed to the secant piled wall in the locations as shown in figure 2 below. These will provide real time monitoring of the piled wall during the excavation of the ground within. Trigger levels will be set at 8mm, this being greater than the designed anticipated movement of 6mm to avoid false alarms, but less than the movement of 10 – 15mm stated within GEA's BIA in order to provide opportunity to implement an action plan as follows:

1. In the event that the 8mm trigger level is activated, the Structural Engineer would be informed, along with the specialist pile and temporary works designer.
2. Close monitoring of any continued movement beyond the 8mm trigger level would be carried out daily.
3. If there is continued movement beyond the 8mm trigger level, then in conjunction with the Structural Engineer and specialist pile and temporary works designers, an assessment would be made using their professional judgement as to the need to introduce additional levels of temporary works propping.

With the trigger level set below the threshold stated within the BIA, this would provide time to install any additional temporary works as decided by the Structural Engineer and specialist pile and temporary works designer and allow any subsequent creep post the installation of additional temporary works during the bedding in period to ensure the movement does not exceed that of the 10 – 15mm identified within GEA’s BIA.

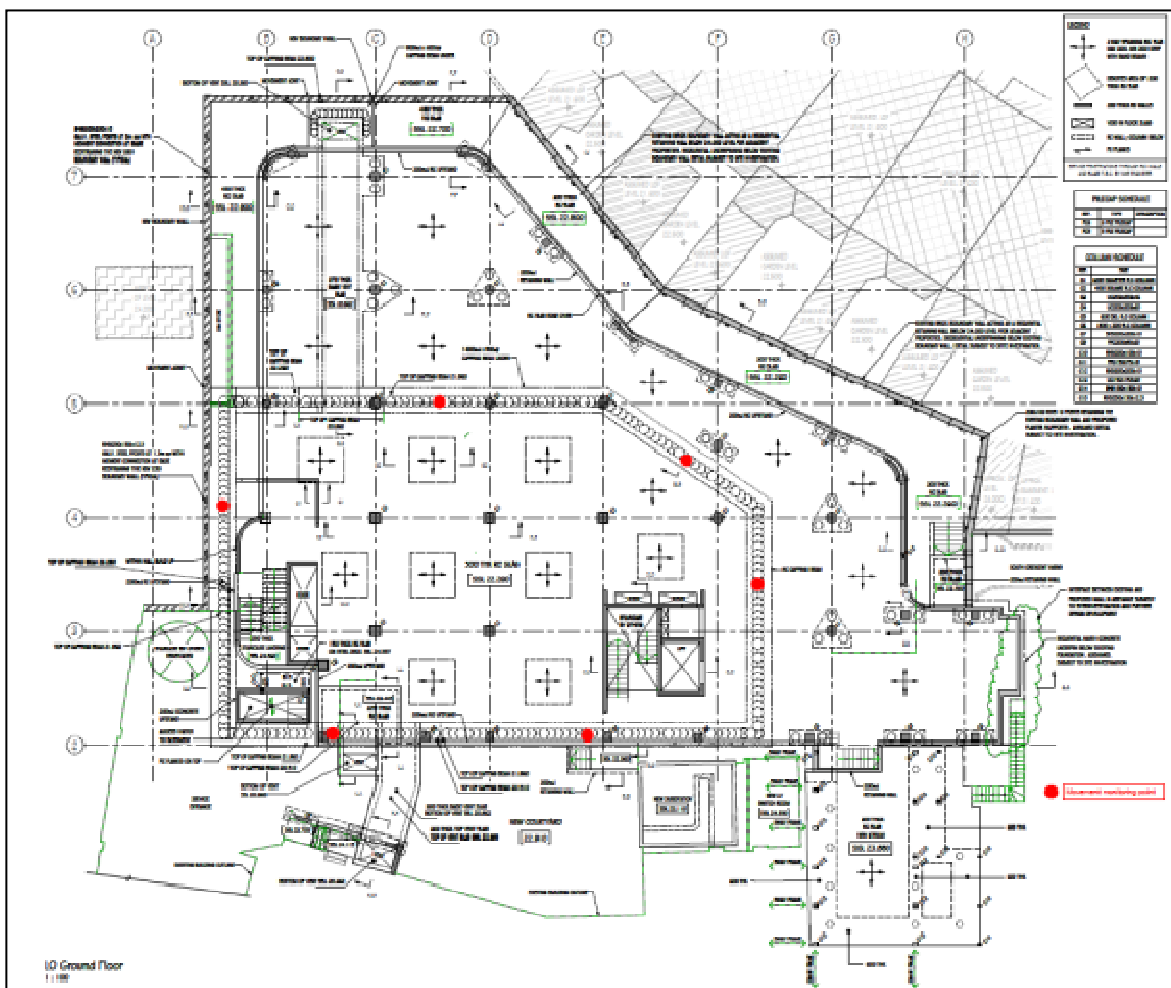


Figure 2 - Basement piled wall monitoring points.

Monitoring will commence ahead of the basement construction works to set baseline readings, and will continue for 1 month beyond the completion of the basement construction to monitor any movement post removal of any basement propping temporary works. All reports shall be prepared and submitted to the Structural Engineer for their review and comment and records maintained on site for inspection.