Form

St PAULS MEWS, LONDON, NW1

Movement Monitoring Specification

Job No: 142176

Purpose of Issue: Preliminary
Rev: P1

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Monitoring of Adjoining Properties

The proposals are considered low risk in terms of movements to adjoining property and party walls. All temporary works arrangements/proposals will be designed to limit the category of movement to “Category 1” or less.

See the Building Damage classification table below based on Boscardin and Cording / Burland.

Table extract from showing Classification of Damage

Table 2.5 *Classification of visible damage to walls (after Burland* et al, *1977, Boscardin and Cording, 1989; and Burland, 2001)*

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain ε_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible.	< 0.1	0.0–0.05
1 Very slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	< 1	0.05–0.075
2 Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weathertightness. Doors and windows may stick slightly.	< 5	0.075–0.15
3 Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5–15 or a number of cracks > 3	0.15–0.3
4 Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15–25 but also depends on number of cracks	> 0.3
5 Very severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	usually > 25 but depends on number of cracks.	

Outline movement monitoring regime- to be developed by contractor

This outlines the methodology and best practice which is going to be utilised to monitor and detect movement to the properties adjoining St Pauls Mews during the construction of the new basement. The primary purpose of the monitoring is to observe movement to ensure that it is within the expected ranges. This will enable the early detection of any unexpected behaviour and the rapid implementation of any remedial actions if required. The

contractor will need to have a full time engineer on site that shall be responsible for undertaking the monitoring and issuing to the adjoining surveyors. The Contracts manager for the project shall be responsible for checking the monitoring and that it is issued to the appointed surveyors.

Monitoring

The contractor should monitor the position of points on adjacent and party structures as agreed with the Party Wall surveyors and their appointed engineers.

Monitoring should be started before the works commence in order for a background set of mean data to be obtained as a benchmark for future readings. An EDM shall be used to record the three-dimensional position of the retro targets fixed to adjoining structures.

Control Stations

Control stations will be installed outside of the site. The location of these will be targets placed on stable structures outside the zone of influence of the proposed works. More than one control point shall be installed in case one is lost.

Installed targets

The contractor should monitor the level and on-plan position of retro targets installed. The monitoring specialist is to confirm required locations of monitoring points to ensure all areas in question can be assessed for line and level. The access for the general site works will be sufficient for positioning the targets. Externally fixed targets will be removed after the project and the use of a degrading adhesive at their fixing point will be back to as before the project within 6 months of the completion of the project.

Frequency of Monitoring

The frequency of the monitoring shall vary depending on the risk of the activities on site. During piling, underpinning and excavation works, monitoring shall be undertaken weekly. Frequency shall be increased if the amber trigger level is reached. Once the new basement box is complete, monitoring shall be undertaken monthly, until the end of the project to confirm no long term movement is occurring. If movement is still occurring then this should be reviewed.

Surveying

The contractor should have the same engineer for the duration of the works and in order to maintain the consistency of the survey, the same engineer shall undertake the monitoring. Should the engineer be on leave or there is a change to the site personnel there shall be a formal handover to ensure the survey is conducted in a similar procedure. Surveys shall always closed back to control stations to check accuracy. The accuracy of positions of the retro targets surveyed would be checked by taking rounds of angles using both faces of the theodolites. The surveyor is to be shown calculated displacements of the retro targets immediately during the survey and thus be able to react to, further investigate and check results immediately.

Accuracy of instruments:

Use instruments with the following parameters:
Precise Level: Standard deviation 0.4mm for a 1km double-run
Absolute error ±1mm
Total Station Theodolite: Angular standard deviation ±5”arc
Distance standard deviation ±1/2mm+1ppm
Absolute error ±2mm

Reporting and Presentation of Information

The schedule and format of our measurements, data processing and reporting shall be tabular and graphical to enable simple interpretation of data. Construction activities shall be annotated on the graphical data to assist with the understanding of the cause of any movement. Both displacements and movements from the last survey shall be calculated and presented. Results shall be issued the adjoining engineers within 2 days of the survey. The weather conditions shall be recorded at the time of the survey along with any relevant items.

Monitoring, reporting and actions
Trigger levels shall be as recommended as follows:

Green/Amber Trigger Levels shall be 5mm in any plane x, y or z.
Amber/Red Trigger Levels shall be 10mm.

If amber trigger levels are met the frequency of the surveying shall increase to confirm that any movement has stopped whilst considering and preparing to implement any additional propping or change in methodology.

Amber level is to be set at 5mm and Red level to be set at 10mm; if either level is reached the project engineer will need to be notified immediately.

If amber is reached the project engineer will visit site to establish if the cause is due to contractor's construction/demolition method or if it is due to soil movement. The party wall advising engineer will also be invited to attend. If it is due to contractor's work method, this will be revised. If it is due to soil movement the geotechnical specialist will be notified and the bearing stresses of new foundations re-evaluated. Works will continue however monitoring intervals will be halved until movement is confirmed below amber level.

If red levels are reached all works are to stop immediately and the project engineer will visit site. A meeting will also be held with the surveyors and the party wall advising engineer to agree suitable actions. A site inspection is to be carried out to assess what, if any damage has occurred which will rectified as outlined in the party wall awards. The project engineer will establish if the cause is due to contractor's construction method or if it is due to soil movement. If it is due to contractors work method, this will be revised. If it is due to soil movement the geotechnical specialist will be notified and the bearing stresses re-evaluated.

Once a revised regime is established and agreed between the project engineers, the party wall advising engineer and the appointed party wall surveyors, works will continue however monitoring intervals will be halved until movement is confirmed to be within acceptable limits.