31 Culross Street, London W1
Monitoring Method Statement, Scope & Specification

Project information

Project Reference No. 7865059

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Address: 31 Culross Street, London W1K 7HF

Introduction

A monitoring scheme will be implemented during the construction works to ensure that movements remain within predicted levels. The monitoring will continue until the main structural works are complete with a reduced monitoring scheme carried out until the issue of the Certificate of Practical Completion.

Individual datum's or remote datum's will need to be established depending on access and sightlines on site, however it would be a preference to establish a single datum for measurement for all properties and monitored locations that refer to the architects set datums.

This document sets out the scope and specification of the monitoring requirements.

Roles and Responsibilities

The Contractor shall have the primary responsibility for installing the instrumentation works and recording the movements.

The Contractor shall be responsible for co-ordination and implementation of the monitoring system.

The Contractor shall check that the Employer has obtained the necessary approvals before fixing monitoring points on structures belong to others.

The Contractor shall have the responsibility for ensuring timely reporting of monitoring results. The Contractor shall also be responsible for undertaking a prompt review and assessment of each set of monitoring results and shall reach a conclusion based on the monitoring data and implement any necessary actions.

The Contractor shall be responsible for obtaining Method Statements for all construction works that include full provision of contingencies to limit movements if trigger levels are reached, as below. These contingencies shall be agreed in advance with the Engineer.

The Engineer shall act as an external independent reviewer of the monitoring reports.

Prior to commencement of any demolition work the Contractor shall ensure that individuals have been identified, one within each organisation, that shall be responsible for ensuring that all the requirements of this Specification are adhered to.

Monitoring Strategy

Overall Strategy

A suitable qualified company is to be engaged to independently carry out 3D geospatial monitoring to the proposed structure and adjacent structures. Vertical, lateral and horizontal displacements will be recorded. Further stations can be fitted to any locations as requested. A site plan is included to show the proposed locations being monitored.

Crack monitoring of existing cracks if required will be carried out using "tell tales"

Groundwater levels behind the basement retaining walls will be monitored during the excavation works.

The Contractor retains the responsibility for temporary works and may also choose to carry out additional monitoring, such as during critical operations.

The clients representative shall allow a contingency sum for additional monitoring works that may be required as the project develops, for example at critical time period in excavation works or following damage to buildings adjacent to the site.

Types and number of Instruments

This Specification addresses the installation and monitoring of the following types of instruments:

- 3D targets installed as single points and as vertical arrays of 2 no. for measurement of vertical and lateral displacement;
- 'Tell tales for crack monitoring at selected points if required, to be agreed with the Engineer;
- Monitoring of groundwater levels, measurement will be taken against agreed datums to monitor water levels against the proposed formation level of the works and assess potential impacts of this during the works.

The reading of all instrumentation shall be the responsibility of the Contractor. All instruments shall be read at the frequency specified below and reported in a format that complies with the requirements set-out.

The Contractor shall replace any damaged instrument/points as deemed necessary by the Engineer because without it movements cannot be understood.

The work shall comply with all relevant legislation and regulations.

All equipment used on this contract shall be suitable for its specified purpose.

Monitoring locations

Approximate locations of monitoring points on existing structures are indicated on attached drawing. Locations of monitoring instruments are discussed below. The exact locations of all instruments shall be confirmed on site by the Contractor and agreed with the Engineer prior to installation.

3D targets

3D targets shall be installed at the locations shown, generally in pairs vertically, except where indicated otherwise.

Crack monitoring

Provision shall be made for the installation of tell-tale studs to monitor cracks in the existing buildings and party walls should this be necessary.

Groundwater monitoring

Ground water will be monitored as excavations are opened to confirm the readings the assumed groundwater levels at design stage. Levels will be recorded against agreed datums so that impact on proposed formation levels can be ascertained.

Monitoring frequency

The following minimum monitoring frequency shall be established as shown in Table below:

Instrumentation	**Phase of Construction**				
	Prior to demolition	During retaining wall installation	Excavation operations	New superstructure	Fit-out
Movement monitoring	Twice	Fortnightly	Weekly	Fortnightly	3 monthly
Crack monitoring	Once	Fortnightly	Weekly	Fortnightly	3 monthly
Groundwater monitoring	N/A	Weekly	Fortnightly	N/A	N/A

The monitoring frequency may be increased to suit critical construction activities occurring on site.

Visual inspections

The Contractor shall be responsible for undertaking a daily visual inspection of the existing superstructure. This is to ensure that no unexpected movements have occurred. If there is any suspicion that unexpected movement is occurring, then the Engineer shall be notified and an extra round of readings shall be taken immediately.

Specification for instrumentation

3D targets

Measurements of vertical and horizontal displacements of existing structures shall be carried out using 3D monitoring using total stations and 3D targets on structures.

3D targets shall be installed at the approximate locations shown on the attached figures and as agreed with the Engineer. The prisms shall be robustly attached and adequately protected to prevent accidental damage or displacement.

All levels shall be reported relative to suitable agreed Datum.

The tolerance shall be as follows:

- Vertical displacement ± 1.5mm
- Horizontal displacement ± 1.5mm

Crack monitoring

Measurements of vertical and horizontal displacements across existing crack locations as required are to be undertaken using tell tales measuring displacements to the following tolerance:

- Displacement in any direction ± 0.25mm

Reporting of results

Construction reports

Installation Reports

Installation reports shall be provided for each monitoring system installed, and shall contain details of:

i) Method of installation;
ii) Plans of monitoring locations;
iii) Diagrams showing installation details;
iv) Status of instrumentation with details of any currently inoperable instruments;
v) Baseline results.

PDF Update Reports

PDF reports shall be provided for each monitoring system at intervals in accordance with above within 48 hours of the readings being taken and shall contain details as given below in the Final Report section below.

All computer data files and calculation sheets used in processing the data shall be preserved until the end of the contract. They shall be made available for inspection at the request of the Engineer.

Final report

Within three weeks of the conclusion of monitoring, as agreed with Engineer, the Monitoring Contractor shall submit a final monitoring report. The report shall contain the following information:

a. the date and time of each reading.
b. the initials of the person who made the reading on site and the name of the person who analysed the readings.
c. the tabulated monitoring results. Any results which show movements exceeding the specified Amber or Red trigger levels should be highlighted in the report.
d. graphs showing vertical and horizontal movements with time. Key dates should be marked with a brief explanation of their significance. The timescale should be “real”, i.e. Each day is equal to the same amount of time.
e. start and completion of significant construction events (e.g. demolition, piling, etc.), and any events on site which could affect the validity of the results of any of the surveys.
f. any damage/replacement of the instrumentation or difficulties in reading.
g. the calibration constants or equations that are being applied, justification by reference to the most recent calibration and the dates they were determined.

Columns of numbers should be clearly labelled together with units. Numbers shall not be reported to a greater accuracy than is appropriate. Graph axes should be linear and clearly labelled together with units.

At the end of the monitoring programme the Monitoring Contractor shall provide a CD or DVD of all the pdf and EXCEL files used to carry out the interpretation, including any photos.

Erroneous data

All data shall be checked for errors by the Contractor prior to submission. If a reading appears to be erroneous (i.e. it shows a trend which is not supported by the surrounding instrumentation), he shall:

a. Notify the EA and Engineer immediately;
b. Resurvey the point in question and the neighbouring points;
c. If the error is repeated, he shall attempt to identify the cause of the error.

Both sets of readings shall be processed and submitted, together with the reasons for the errors and details of remedial works. If the error persists at the next survey visit, the Contractor shall agree

with the Engineer how, the data should be corrected, e.g. by correcting the readings after the error first being identified to a new base reading.

The Contractor shall rectify any faults found in or damage caused to the instrumentation system for the duration of the specified monitoring period. It should be noted that the equipment supplied should be robust and adequately protected against normal levels of interference expected on a construction site or in the operational building.

Responsibility for instrumentation

The Contractor shall appoint a qualified person to be responsible for:

1. Managing the installation, reading of instruments and checking accuracy of readings;
2. Reporting the results in a format which is user friendly to all parties as detailed above;
3. Immediately reporting to all parties any damage, complaints or compensation claims for damage.

The Contractor shall have a Technical Manager who shall regularly review the monitoring data before the data is reported in respect to:

1. Ensuring that all monitoring points can be read at the specified monitoring periods;
2. Checking accuracy and validity of readings with respect to local construction activity;
3. Instructing further reading where there is doubt;
4. Reporting and implementing previously agreed contingency procedures where required;
5. Ensuring all processed data and reporting is clear and, in a manner, easily understood.

The Contractor shall also develop within relevant sub-contractor's method statements, appropriate stabilisation measures, that can be implemented in the event trigger levels are exceeded.

Monitoring triggers and contingency plans

Monitoring trigger levels

The following monitoring trigger levels are proposed:

Instrumentation	Amber trigger level	Red trigger level
Measurements of vertical and horizontal movement of existing structure, including party wall properties.	+/-4mm	+/-8mm
Measurements of vertical and horizontal movement of garden walls.	+/-6mm	+/-10mm
Movements of piled walls measured on capping beam and on lower targets after their installation	+/-5mm	+/-7mm

Regarding potential jumps in the movements between consecutive readings, if at any time the readings between consecutive surveys vary by a limit of 3mm (orange alert) the frequency of the monitoring readings will have increased until the rate of increase stabilises. If at any time the change in readings varies by a limit of 4mm (red alert) works are to cease immediately, and the monitoring company will inform the project engineers, together with the appointed surveyors.

Where temporary works are carried out, the Contractor shall carry out a building damage assessment of the existing structure and neighbouring structures in accordance with 'Burland (2001) "Assessment methods used in design" in CIRIA Special Publication 200: Building response to

Tunnelling: case studies from the construction of the Jubilee Line Extension, London. Volume 1: Projects and methods'. The Contractor shall demonstrate that his temporary works will not result in a category of damage beyond Category 1 'very slight damage'.

Contingency plans for ground movements

General

The Contractor shall obtain Method Statements for key elements of the works and these shall address all the contingencies proposed when trigger levels are reached and in respect of all proposed actions and their timings. The purpose of these contingencies is to ensure that the rates of measured movements are significantly reduced, immediately on implementation. Construction activities that the Method Statements shall cover will include:

1. demolition, excavation and temporary propping of existing structures;
2. underpinning.
3. construction of new ground floor.

The contingencies proposed on reaching trigger levels shall be agreed with the Engineer prior to the relevant construction works commencing.

Amber trigger

If any amber trigger level is reached, a review shall be carried out immediately and involving all Parties with responsibilities identified here. The review shall establish:

- Which site operations are responsible for the movements;
- The rate of movement and whether these operations are likely to lead to further excessive movements;
- Any necessary change to the frequency of monitoring;
- The need for and process of implementation of the pre-arranged contingencies as defined in the Method Statements.

Red trigger

If any red trigger level is reached, any site work affecting the occurrence of the red trigger shall cease immediately.

A review shall be carried out immediately, as at amber trigger level, and pre-arranged contingencies implemented as agreed.

Appendix A: - Monitoring Location map.