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Job No. 16.306

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Project:

28 Canfield Gardens, London, NW6 3LA

Codes of Practice: Super Structure Steel EN3 / Reinforcement BS-5950 (MRA)
Concrete BS-8110
Timber BS-5268
Masonry BS-5628
Loading BS-6399

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Appendix-C: Site Analytical Services; **Basement Impact Assessment** ref:16/25536-2 December 2016 (including QTS Environmental Ltd & Fairhurst Consulting Civil Engineers reports).

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Ref 16.440

Proposed Engineering Impact Assessment & Construction Method Statement/Sequence of Works for:

28 Canfield Gardens, London, NW6.
Basement Construction Scheme

This method statement is to be read in conjunction with all relevant specifications, drawings and geotechnical report. Any variations deemed necessary due to site conditions are to be agreed with all relevant parties prior to carrying out the work. No works are to be carried out until all adjoining parties are in agreement and full legal permissions are granted.

The work consists of:

1. Forming a basement below the existing mid-terrace former self-contained (now divided into flats) domestic property via the construction of a new reinforced retaining walls & foundations in sequenced sections.
2. Forming lightwells for the new basement to the front & rear elevation of the property via the construction of a new reinforced retaining wall & foundations in sequenced sections.

PRE-CONSTRUCTION INFORMATION/DESGIN REQUIREMENTS

Site Conditions

The property is a three storey domestic terrace divided up into flats, with further rooms having been created in the pitched roof space and a full height coal cellar below the right-hand side of the property (when viewed from the front). It is located on the North side of the street which runs from the Northeast to Southwest. From historical records the property was likely constructed in the late 1800's. The building is set approximately centrally of the site with gardens to the front & rear. This row of properties forms the South side of a symmetrical quad development with a shared green space to the centre. The development is bordered all sides by broad roads with wide pavements and other similar sized buildings.

The main entrance to the building is located in the south façade within the confines of the property's main private garden. There are mature trees within the boundaries, adjacent to the front boundary walls, to many of the properties along the street. The road level rises gently to the east of the property.

Existing structure

The existing building is a solid masonry construction with red Stock bricks to the external front and rear walls. The Party Walls are a similar construction with large chimney breasts and a continuous stack at roof level running along them, with multiple flues at each level. The internal partitions are typically brick at lower levels with timber studwork with plasterboard panels in the newer loft construction.

The roof was formed originally as a series of rafters & batons (covered in grey slate style tiles) braced with large horizontal purlin lines spanning between the external walls and propped intermediately with vertical and diagonal bracing supported on the tops of the internal partitions. The purlin lines are typically still in place with vertical timber bracing within the new room partitions bearing on beams within the floor depth back to the original load bearing positions.

The floors are formed of timber joists spanning front to back on the left-hand side of the building and side to side across the right-hand side (including a suspended timber floor at ground level) bearing intermediately on the two perpendicular spine walls spanning front to back and side to side respectively. The communal staircase on the right-hand side of the property is a timber construction with flights running side to side and half landings/ 180° winders against the right-hand side Party Wall.

Site Investigations

- Trial pits and boreholes with laboratory testing have been carried out to the front & rear of the property by Site Analytical Services Ltd.
- Environmental Report has been carried out by QTS Environmental Ltd (for Site Analytical Services Ltd).
- Ground Movement Assessments have been carried out by Fairhurst Consulting Civil Engineers (for Site Analytical Services Ltd).
- Contamination Report has been carried out by Envirocheck Ltd (for Site Analytical Services Ltd).

The results of these can be found in the following documents:

- Site Analytical Services; **Report on a Phase-1 Risk Assessment** ref: 16/25536 December 2016 (Envirocheck Ltd report).
- Site Analytical Services; **Factual Report on a Ground Investigation** ref: 16/25536-1 December 2016 (QTS Environmental Ltd report).
- Site Analytical Services; **Basement Impact Assessment** ref: 16/25536-2 December 2016 (QTS Environmental Ltd & Fairhurst Consulting Civil Engineers reports).

Geology

By reference to the One Inch Geological Survey Map the property is constructed on London Clay. The borehole logs (**Factual Report on a Ground Investigation page-11**) indicate that there is a layer of made ground between natural ground level and a depth of 2.4m (approximately level with the depth of the cellar) with stiff brown sandy silty clay to a depth of 7.2m and stiff brown blue sandy silty clay beyond that.

This would be typical of this type of construction where the ground was excavated to the basement level across the site and the foundations laid on the compacted Clay around the whole site. The void below the section of building without a basement would then be infilled with material until it was near ground level (with a shallow void below the underside of the suspended floor for ventilation purposes.

London Clay is a highly shrinkable unstable material and is generally susceptible to movement due to moisture desiccation from tree roots. There are mature trees at the edge of the property's boundary and beyond. It was not possible to confirm the species of the trees. However from their general appearance it is our opinion that they are most likely low to medium water demand trees. From reference to the NHBC Guidelines; Chapter 4.2: "Building near trees" the minimum foundation depth below ground level required to prevent the tree roots adversely affecting either the foundations directly or the soil below should be less than 2.5m. Due to the proposed basement head height between finishes the proposed foundations will be in excess of this.

Groundwater was not encountered during the auguring of the boreholes and Site Analytical Services note "the soils remained essentially dry throughout" (**Factual Report on a Ground Investigation page-5**). Stand pipe logs were taken after four months. Groundwater was encountered at a depth of 1. 02m below ground level within Borehole-2 and was not encountered within borehole-1 during September 2016. In November 2016 groundwater was encountered at respective depths of 5.78m and 0.53m below ground level.

By reference to Camden Geological, Hydrogeological and Hydrological Study (1999), Talling (2011) and Barton (1992) a tributary of the "lost rivers" River Westbourne was located within 5m of the site (**Basement Impact Assessment page-8**). However these watercourses have since been largely lost through a culverting system as the area has become more urban. By reference to the Environment Agency's Flood Warning maps the site is not in a "high risk of flood" zone and is at no greater risk than any of the surrounding area.

The change in groundwater levels between July and November are likely due to seasonal effects and also changes in drainage conditions. It is unlikely that the contractor will meet the groundwater level at the time of the works. However method statements for dealing with any water encountered should be provided before construction commences in accordance with good construction purposes.

Design of retaining walls to the habitable sections of the basement will be carried out with a typical groundwater level of two thirds the height of the wall and a temporary height of three quarters as prescribed in the British Codes of Practice to account for any seasonal change in water levels. Lightwell walls are to include weep-holes and floor level drainage to prevent water build up.

By reference to the Bomb Sight census maps between the 7th of October 1940 & the 6th of June 1941 High-Explosive bombs were recoded landing in Canfield Gardens to the West of Fairhazel Gardens and to the East of the intersection with Compayne Gardens. No bombs are recoded falling within or adjacent to the terraces boundaries. Therefore it is unlikely that the bombs had any adverse effect on the Superstructure or the ground below.

Design Risk Assessment

We consider that this project does not pose a significant health and safety hazard. The refurbishment of the building is relatively straightforward. Construction poses standard levels of risk appropriate for working in a site adjacent to raised ground level and structures and with structure overhead.

An Engineer Designed system of temporary props along with carrying out excavations in sequenced sections will reduce risk to an appropriate level for a contractor with the necessary experience in groundworks/basement construction.

Maintenance of the structure does not require special consideration.

As part of our design we will consider/include the following:

- Reinforced concrete structures are to be designed in accordance with the relevant British or European Standard Codes of Practice.
- RC-Walls to external areas are to include weep-holes near their finished base level to reduce water pressure forces on the rear face.
- RC-Walls to internal areas are to be designed with a standard ground water level of 2/3 the height of the wall with a temporary ground water level of ¾ the height of the wall for flood conditions. (These are in excess of conditions expected on site).
- RC-Walls are to be designed to resist a surcharge force of 5.0KN/m^2 applied to the raised ground level behind them when it is used as a garden (or similar) and a surcharge force of 10.0KN/m^2 applied to the raised ground level behind them when it is used as a road.
- All vertical and Lateral Loads applied to the new structures & foundations are to be calculated in accordance with British Standard Codes of Practice BS-6399.
- All underpinning and construction of retaining walls is to be carried out in sequenced 1.0m wide sections to reduce risk of ground movement.
- Dry Packing is to be installed between new RC Walls & existing foundations to reduce and control rates of settlement.

Final detailed drainage design will be carried out by the Architect and/or a specialist drainage contractor. A Sump pump is to be included to remove water from the base of the structure as necessary.

As noted above the design incorporated within the project is based on simple engineering and construction principles. Normal construction risks are within the capability of a competent Contractor with experience in reinforced concrete construction.

All risks have been reduced as far as possible. We have referred to Construction Industry Council CDM Guidance for Designers Technical Guidance notes T20.002, 005 and 015 together with T10.002 during the design process.

CONSTRUCTION PHASE

General:

At all times the existing structures will be carefully monitored to ensure no damage due to unsupported work occurs.

During the works inspections will be made by the temporary works engineers* as deemed necessary.

All work will be carried out in a logical sequence with due regard for health and safety issues.

Any unforeseen problems encountered will be notified to both the permanent and temporary works engineers to enable a solution to be agreed upon.

The Permanent Works Engineers (Martin Redston Associates) will be available to answer site queries and attend site to advise on methods of working and provide engineering assistance as required.

*: **The term** Temporary Works Engineer shall refer to either the design engineer for the propping company's design department (if appropriate) or the propping sub-contractors site engineer.

If neither of these is suitable then either the Permanent Works Engineers (Martin Redston Associates) or another Independent Chartered Consulting Engineer is to be instructed to assume responsibility by the client.

General Monitoring

Fix level stations to entire length of the wall where necessary.

Fix level stations to neighbouring property where necessary.

Remote datum is to be used.

Readings are to be taken and returned on a weekly basis until further notice.

Contractor Requirements

Contractor is to be responsible for:

Site Health & Safety requirements,
Provision of Site welfare facilities,
Erecting hoarding to secure site & site access points security,
Ensuring demolition works are carried out using hand tools (to limit damage by vibration),
Installing all necessary protective coverings to exposed elements where required.
Ensuring competency of all sub-contractors allowed onto site.

Access:

Where possible all works and storage are to be within the site boundaries allowing free & clear access to the surrounding vehicle/pedestrian pathways.

Should limited access to the adjacent property's gardens or the road be required for the safe installation of safety hoarding etc. the following will be applicable;

- Spreader timber will be placed on horizontal surfaces prior to works commencing.
- Plastic sheeting is to be fixed across the lower 1.5m of walls to adjacent properties which border the site to prevent dirt & discolouration of brickwork.
- Compressible material is to be placed against walls to adjacent properties which border the site to when contractors are working in close proximity with tools.
- Garden plants within adjacent property borders to be listed, temporarily covered if necessary and replaced if significantly affected/damaged by works.
- Roadways will not be blocked. However contractors standing on them to work shall be protected by temporary barriers.
- Look-outs shall be provided to ensure contractors and members of the public are not at risk while lorries or other vehicles are delivering/unloading materials or collecting waste materials from the site.
- On completion all protective materials will be removed.
- The area worked on will be clean and handed over as per the original condition.
- In unlikely event any damages caused these will be made good by the contractor.

All protective materials should stay in place until all such tasks are completed.

Construction Sequence:

1 **Propping & Preparation**

- Construct temporary hoarding to perimeter of site & protect any materials to the edge of the communal areas to the development.
- Inspect existing structure, noting any damage to walls.
- Make good any minor damage to lower levels that could be adversely affected by works.
- Install temporary props in accordance with Temporary propping Engineer's documentation.
- Set up all & connect all necessary site amenities for contracting staff and designate type & size of storage areas.
- Inspect & alter temporary hoarding as necessary for site conditions.
- Clear site of any unnecessary materials prior to commencing works.

2 **Excavating Garden & Forming front Lightwell Retaining Walls**

- Demolish existing non-load bearing garden walls and fences on boundary
- Working in strips not exceeding 1m long excavate to required depth adjacent existing structure.
- Install base & wall starter bar reinforcement in accordance with Engineers Drawings & Specifications. Reinforcement shall be to EC2 with bars to be grade 500.
- All reasonable care is to be taken to prevent injuries to persons working near exposed bars etc. (threaded couplers would be suitable).
- Shuttering (to be designed by contractor) & Waterproofing materials (to Architects Specification) to be installed ready for casting of concrete.
- Soil condition to be checked on site to ensure ground behind new foundation & wall is fully backfilled and compacted. If necessary install galvanized sacrificial metal shuttering behind back of base (& wall) to prevent soil slippage.
- Cast new concrete base and allow 24 hours to cure. Starter bars to extend 40d above kicker to base for lapping purposes (see details for bar sizes).
- All new concrete below ground to be Ready Mix sulphate resisting cement conc. Grade 35.
- Ready mix concrete must be obtained from a plant that holds a current certificate of accreditation under the quality scheme for ready mix concrete.
- Install reinforcement for wall (including waterproofing detail to kicker interface) & shuttering (to be designed by contractor) ready for casting of concrete.
- Vertical & horizontal reinforcement to wall installed in accordance with design information and any reinforcement schedules provided by the engineer.
- Cast new concrete wall (concrete grade to match base) ensuring ground behind new foundation & wall is fully backfilled and compacted (if sacrificial shuttering is not used). Check at regular intervals to ensure this during construction.
- Repeat steps above in accordance with Engineers Sequence.
- Soil may be back filled over bases and against walls to end of site to form access ramp if required by contractor.
- Never excavate two adjacent strips without allowing 3 days between operations.
- When adjacent sections are opened up the exposed concrete surfaces should be thoroughly cleaned of all loose material & scabbled to form a good key.
- No concrete is to be placed when the ambient air temperature is less than 5°C.
- Once underpinning is complete re-construct boundary walls/fences on top of RC-Retaining walls to Architect & Engineers Specifications.
- Form lined weep holes in external sections of RC-Retaining wall at 900mm centres horizontally & a minimum of 100mm above level of Kicker waterproofing.

3 **Demolition of Ground Floor.**

- Floorboards to be lifted and stored off site for reinstallation later.
- Verify ground level & install Props to brace existing structural walls above floor level.
- Remove floor joists as necessary to allow clear access to walls for excavation.
- Limited use of pneumatic or power tools may be allowed begin breaking out. Hand tools to be used wherever possible.
- Props to be adjusted as necessary during the works.

4 **Formation of Basement to House.** (excavation & retaining wall underpinning)

- Working in strips not exceeding 1m long excavate to required depth adjacent existing structure.
- Install base & wall starter bar reinforcement in accordance with Engineers Drawings & Specifications. Reinforcement shall be to EC2 with bars to be grade 500.
- All reasonable care is to be taken to prevent injuries to persons working near exposed bars etc. (threaded couplers would be suitable).
- Shuttering (to be designed by contractor) & Waterproofing materials (to Architects Specification) to be installed ready for casting of concrete.
- Soil condition to be checked on site to ensure ground behind new foundation & wall is fully backfilled and compacted. If necessary install galvanized sacrificial shuttering behind back of base (& wall) to prevent soil slippage.
- Cast new concrete base and allow 24 hours to cure. Starter bars to extend 40d above kicker to base for lapping purposes (see details for bar sizes).
- All new concrete below ground to be Ready Mix sulphate resisting cement conc. Grade 35.
- Ready mix concrete must be obtained from a plant that holds a current certificate of accreditation under the quality scheme for ready mix concrete.
- Install reinforcement for wall (including waterproofing detail to kicker interface) & shuttering (to be designed by contractor) ready for casting of concrete.
- Vertical & horizontal reinforcement to wall installed in accordance with design information and any reinforcement schedules provided by the engineer.
- Cast new concrete wall (concrete grade to match base) ensuring ground behind new foundation & wall is fully backfilled and compacted (if sacrificial shuttering is not used), check at regular intervals to ensure this during construction, to within 75mm of soffit of existing footing and allow 24 hours to cure.
- Ram Dry Pack sand/cement (3:1) Mortar between new and existing footings.
- Repeat steps above in accordance with Engineers Sequence.
- Never excavate two adjacent strips without allowing 3 days between operations.
- When adjacent sections are opened up the exposed concrete surfaces should be thoroughly cleaned of all loose material & scabbled to form a good key.
- No concrete is to be placed when the ambient air temperature is less than 5°C.

5 **Formation of rear Lightwell.**

- Working in strips not exceeding 1m long excavate to required depth adjacent existing structure.
- Install base & wall starter bar reinforcement in accordance with Engineers Drawings & Specifications. Reinforcement shall be to EC2 with bars to be grade 500.
- All reasonable care is to be taken to prevent injuries to persons working near exposed bars etc. (threaded couplers would be suitable).
- Shuttering (to be designed by contractor) & Waterproofing materials (to Architects Specification) to be installed ready for casting of concrete.

- Soil condition to be checked on site to ensure ground behind new foundation & wall is fully backfilled and compacted. If necessary install galvanized sacrificial metal shuttering behind back of base (& wall) to prevent soil slippage.
- Cast new concrete base and allow 24 hours to cure. Starter bars to extend 40d above kicker to base for lapping purposes (see details for bar sizes).
- All new concrete below ground to be Ready Mix sulphate resisting cement conc. Grade 35.
- Ready mix concrete must be obtained from a plant that holds a current certificate of accreditation under the quality scheme for ready mix concrete.
- Install reinforcement for wall (including waterproofing detail to kicker interface) & shuttering (to be designed by contractor) ready for casting of concrete.
- Vertical & horizontal reinforcement to wall installed in accordance with design information and any reinforcement schedules provided by the engineer.
- Cast new concrete wall (concrete grade to match base) ensuring ground behind new foundation & wall is fully backfilled and compacted (if sacrificial shuttering is not used). Check at regular intervals to ensure this during construction.
- Repeat steps above in accordance with Engineers Sequence.
- Never excavate two adjacent strips without allowing 3 days between operations.
- When adjacent sections are opened up the exposed concrete surfaces should be thoroughly cleaned of all loose material & scabbled to form a good key.
- No concrete is to be placed when the ambient air temperature is less than 5°C.
- Once underpinning is complete construct basement sump pump room to Architect & Engineers Specifications.
- Form lined weep holes in external sections of RC-Retaining wall at 900mm centres horizontally & a minimum of 100mm above level of Kicker waterproofing.

This Statement has been produced and checked by the following Engineers:

Project Design Engineer:.....

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Practice Principal Engineer:.....

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