Form

134 ½ ABBEY ROAD, LONDON NW6

STRUCTURAL ENGINEER'S DESIGN STATEMENT IN SUPPORT OF PLANNING APPLICATION

Job No: 132085

Date: February 2015

Prepared by Chartered Engineer: Rob Markovits CEng MIStructE

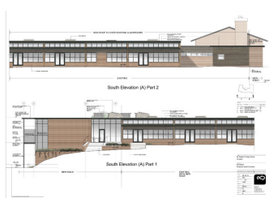
Revision: P2, March 2015

Residential

Commercial

Conservation

Retail



Education

Art

Hotels

Period

FORM Structural Design

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Form

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Revision:	
P2	

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PREAMBLE

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TERMS OF REFERENCE

We were appointed by the client to prepare a supporting Structural Design Statement in support of a Planning Submission for the sub-structure works at 134 ½ Abbey Road

Introduction

1.0 Introduction

This report has been prepared as a supporting document to the planning application for a single level basement extension for the full footprint of the property. This document outlines the approach to the structural alterations proposed and predominantly presents an outline structural scheme for the construction of a new basement to the front property to form a new car lift and new basement to the remaining entire footprint of the property 134 ½ Abbey Road

FORM Structural Design Ltd have undertaken the design and seen through to completion over 250 subterranean projects over the past 5 years. As consulting structural engineers for the project we will undertake the design of the sub-structure elements and where necessary the super-structure elements. FORM will also visit site at key stages to inspect the works and it is expected that an experienced ground-works contractor would be appointed for the work and this contractor will also undertake the design of the temporary works which would be prepared for review and comment by FORM.

2.0 The Site and Existing Building

The property is a detached property that has 2 storey's with a single storey projection to the front that is thought to be a recent addition. The property is accessed via a set of 6 steps from the prevailing ground level to the front drive area to give an elevated ground floor. A small detached studio building is also present in the driveway area which is modern construction.

The era of construction for the original property is estimated from the late 18th Century where it is noted on historical maps that an original Coach House is on the site and it is expected that the coach house remains in part but now combined with recent additions and extensions probably built within the last 30 years in similar London stock bricks and similar detailing to give a sympathetic outlook to the surrounding buildings.

A detailed investigation will be made prior to any works being carried out to ascertain accurate as built information prior to carrying out subterranean works and final design.

Figure 1: street view

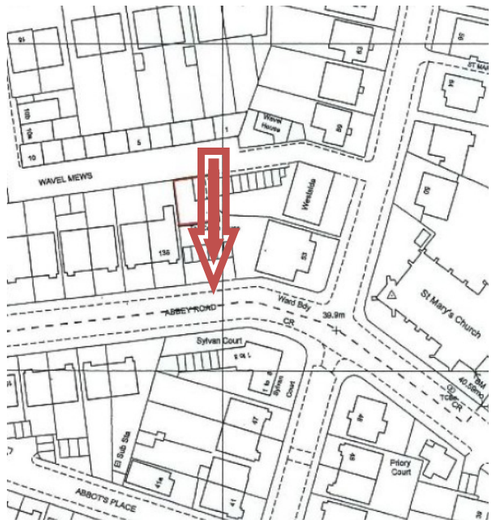

Figure 2: location Plan

Site Information

3.0 Ground Conditions/Geology and Slope Stability

The 1:50,000 scale Geological maps of England and Wales, sheet 256 for North London show the site directly underlain by the London Clay to depth. A site investigation including boreholes and trial holes has been carried out to ascertain the soil design parameters for the sub-structure design and this is included in the Appendices at the rear of this report.

The borehole has been carried out to ascertain the soil design parameters and to record ground water levels for the sub-structure design. The expected London Clay has been proven at the site at depth of 10.0m below ground level and bearing pressures of around 120kN/M² are to be expected at 4-5m below prevailing external ground level. Ground water was encountered during drilling investigations, but it is understood that this was a locally encountered perched water strike.

Abbey Road has gradient a ground level in the region of +20.0m AOD and a gentle gradient rising to the East.

The site gradients are not considered problematic in terms of slope stability and as a result of the proposed works should not present a significant risk to the surrounding properties.

The excavation will be carefully sequenced to take the soil conditions into account and designed to resist lateral pressures by the proposed retaining walls.

4.0 Watercourses, Site Hydrology and Existing Trees

A desk top study and review of “The Lost Rivers of London” indicates that the River Tyburn” is 1.0Km to the East of the site has its source in the West Hampstead area. The River Westbourne is around 1.0Km to the West of the site and flows through West London via “The Serpentine” in Hyde Park into the Thames at Chelsea Creek near Battersea.
The River Thames is located 8.50kM to the South of the site.

The possibilities of encountering ground water within sub-soils must be borne in mind and as seasonal variations in the ground water are to be expected. The contractor will be required as part of his method statements measures in place to deal with ground water should it appear during the main excavations & general basement works. Regardless of site water conditions the retaining walls will be designed to BS 8102 for a head of water at 1.0m below prevailing ground level.

A check on the Environment Agency website has shown that the site is within Flood Zone 1 and is generally not at risk of flooding from the river or sea or groundwater.

It is understood that no significant existing trees protected or otherwise are located within the property boundary or surrounding the site and therefore we do not expect the works to have impact significantly on surrounding vegetation.

5.0 Underground Structures/Archaeology

Existing tube lines from London Underground Tube system (Metropolitan/Jubilee) are located to the East of the site at Swiss Cottage and Finchley Road, to the West of the site is the Bakerloo line. The closest is the Bakerloo line, Kilburn station at 750m due South of the site.

A check on the Cross Rail website shows the site is outside of the safeguarding zone for the future Chelsea-Hackney line.

6.0 Existing Utilities and Underground services

A Thames water asset search has been requested.

7.0 Boundary conditions and adjoining properties

To the front of the property it is proposed to install a reinforced concrete basement to form a garage/workshop and the basement will also extend into the body of the existing property by approximately2.0m from the main front wall. The basement will be formed using contiguous piling techniques in conjunction with underpinning. An inner RC liner wall will be provided in front of the piling and underpinning and where required a new RC slab to form the ground floor.

The main property will have a fully reinforced concrete underpin wall installed in a hit/miss traditional fashion and to form the light-well to the rear contiguous piles are being proposed. The underpinning walls are to be designed as propped in the permanent condition by the new concrete ground floor slab.

Full condition surveys are taken before the works start as per usual party wall procedure as a record of condition prior to construction work beginning.

- To the rear of the site is Wavel Mews and there are no buildings directly affected by the works proposed.
- To the very front of the site is a boundary wall to the pavement of Abbey Road, a masonry boundary separates the property from the public realm and the basement for the car stacker is approximately 8.0m away from the highway/pavement.
- To the Western boundary (LHS, when viewed from front) is the neighbouring property of 136 Abbey Road and this is part of a terrace of semi detached traditional Victorian era load-bearing masonry residential properties. The property of 136 has 3 storey’s above ground and also a lower ground floor. The two properties are separated by a 2m+ brick construction party fence wall to the front of the property. The main flank wall to the property of 136 is approximately 1.30 away from the flank wall of 134 ½
- To the Eastern boundary (RHS) the existing studio single storey building to the front is located adjacent site boundary with rear of 53 Priory Road and there are no adjacent buildings to this boundary until we reach the flank wall of the garage structure to the property of 55 Priory Road which are directly adjacent to the boundary garden wall of 134 ½ Abbey Road

Development Proposals

It is proposed to construct a basement below the front drive area of the and below ground floor level of the existing property.

8.0 Sub-Structure & Basement Construction

The proposals for the basement construction take account of the development proposals as indicated on the architect's drawings, anticipated ground conditions, the stability of the neighbouring properties, health and safety considerations and the physical constraints of the site. (See drawings appendix A for proposed structural arrangement). The underlying principal to the new basement extension is to create a concrete retaining structure that will transfer all new structural loads back into the competent sub-soil in a uniform raft like manner with minimal settlement.

Works to the Left Side flank wall adjacent to the property at 136 Abbey Road

The flank wall to property of 134 ½ Abbey Road is to be underpinned as shown on the attached drawings within Appendix A. The underpinning will be carried out using reinforced concrete and in a hit/miss manner. The underpinning will require propping in the temporary condition back to the central berm. The underpinning will be designed for the soil conditions and parameters of the site investigation report.

The underpinning will be designed for the following loads:

- Super-structure loads from the walls, floors and roof above.
- Surcharge from adjacent neighbouring ground floor build of 5.0kN/M² (10.0 to front elevation)
- Water pressure head of 1m below prevailing ground level, as per BS8102.
- To limit settlement a SBP of c.120kN/M² will be used for the base design.

Due to the nature of the adjacent party walls a careful manner of approach is required by the contractor to ensure that the stability of the party walls will be maintained at all times during works. A suggested method statement has been prepared and is contained with the drawings in Appendix A and B

All Refer to Appendix B for Outline Construction Statement & Underpinning Specification.

Works to the Right Side flank wall adjacent to the property boundary of 53/55 Priory Road

The flank wall to property of 134 ½ Abbey Road is to be underpinned as shown on the attached drawings within Appendix A. The underpinning will be carried out using reinforced concrete and in a hit/miss manner. The underpinning will require propping in the temporary condition back to the central berm. The underpinning will be designed for the soil conditions and parameters of the site investigation report. The corner to the garage block of the garage to 55 Priory Road will need to be underpinned and extra care will need to be taken here, if necessary sacrificial props and sheeting may be needed.

Works to front of the site

The basement construction here will generally be by using contiguous piled wall techniques and these will mostly be installed externally to form the retaining structure, the piles will, where possible, designed as free standing cantilever's to minimise propping and give an open excavation.

The piling will be designed for the following loads:

- Super-structure loads from the walls, floors and roof above as required.
- Surcharge from any adjacent neighbouring ground floor build of 5.0kN/M²
- Water pressure head of 1m below prevailing ground level, as per BS8102.

A suggested method statement has been prepared and is contained with the drawings in Appendix A and B

9.0 Temporary Works Systems and Principals to be used

No structural works will commence without a detailed temporary works design, drawing and calculation package in place including all necessary method statements.

For the under-pinning to the wall the works associated should be relatively straightforward and involve traditional methods for propping of the underpinning.

To minimise temporary works it is proposed to form a RC beam below the existing walls within the property and this will be constructed using a "Pynford stooling method" which requires section of the wall to be supported on a stool arrangement and once complete steel reinforcing bars are installed to form a cage and concrete filled. The beam that is formed can span between either temporary supports in the form of piles or sections of underpinning that are designed for the temporary load support condition.

10.0 Impact on adjacent structures & potential ground movement to adjoining properties

From our experience of similar basement excavations the category of movement expected for this element of work would be a category 0/1 of the Building Damage classification table based on Boscarding and Cording / Burland and Potts. **SEE APPENDIX C**.

We do not envisage any significant damage occurring as a result of the proposed works so long as they executed in accordance with general good practice and the agreed method statement for the works. Should any damage to adjacent buildings present itself then it would be dealt with in the normal party wall procedure to review the damage against the conditions surveys that had previously been carried out with a view to carrying out repairs to the party wall surveyor's satisfaction.

The chosen contractor will need to have a proven track record on ground works of this nature and technical back up in the form of a competent temporary works designer. Refer to the BIA report produced by CGL for further movement related studies.

11.0 Excavation of Soil

The procedure for soil disposal and traffic management of the site would need to be agreed beforehand with the Highways department and appointed contractor, the construction management plan is to be drawn up and approved accordingly. A protective hoarding around the site will need to be installed and it would appear there is sufficient space for a skip to be located on site within the hoarding.

All of the works, particularly the sub-structure are to be carried out in a manner in which minimises any noise and vibration that may affect the neighbouring properties. The footpath and street adjacent to the site should be cleaned each evening

The engineer will make a site visit at each of the points detailed in the sequence of construction. The ground works contractor will provide detailed method statements for the works and temporary propping to the basement for approval by the engineer prior to commencement of the works.

12.0 Waterproofing and Drainage systems

The proposal is to provide a cavity drainage arrangement as the waterproofing system to give a grade 3 basement to BS 8102. The system will require an arrangement of channels and a sump chamber that will pump any collected water to the existing drainage connection.

13.0 Demolition, Recycling, Dust/Noise Control & Site Hoarding

The demolition works are to take place within the hoarded confines of the site. Above the 6 foot plywood hoarding line any scaffolding is to be clad with monoflex sheeting to minimise any dust or debris from falling onto the neighbouring streets.

Materials such as stock-bricks, re-useable timbers, steel beams etc are to be recycled where possible.

To minimise dust and dirt from the demolition phase of the project, the following measures shall be implemented:

- All brickwork and concrete demolition work is to be constantly watered to reduce any airborne dust.
- Demolished materials are to be removed to a skip placed in front of the site which will be emptied daily.
- The pavement to the sides of the property is to be washed and cleaned down each day.
- Any debris or dust / dirt falling on to the street and public highway will be cleared as it occurs by designated cleaners and washed down fully every night.

Building work which can be heard at the boundary of the site will not be carried out on Sundays and Bank Holidays and will be carried out within working hours as agreed with the council. Where possible, non-percussive techniques are to be used.

14.0 Super-structure

Repairs in the form of stainless steel bars will need to be inserted at facade/party wall junctions and at all cracked party wall junctures. The extent of these will need to be confirmed after all internal finishes have been removed.

15.0 Appendix A: Form Structural Design Drawings

Document No.	Title	Revision
132085 L(23) 11	Proposed Basement Plan	P1
132085 L(23) 12	Existing and Proposed Ground floor	P1
132085 A(28) 11	Existing and Proposed Section AA	P1
132085 A(28) 12	Existing and Proposed Section BB	P1

16.0 Appendix B: Suggested Structural Method Statement

Suggested Construction Method Statement –

To be agreed with contractor's Temporary Works engineer

Proposals - It has been proposed to construct a new basement level below the existing ground floor and external driveway.

Suggested numerical outline sequence as follows:

1. Locate all existing services and identify those affected by the new works and take necessary actions as required by M+E engineer/statutory body.
2. Check all boundary conditions with trial holes and invite engineer to inspect and if necessary update his design information. Contractor/temporary works engineer to carry out plumb line survey and report back to engineer.
3. Submit temporary works proposals to engineer for comment.
4. Soft strip to remove all internal non-load bearing partitions and remove all existing plaster finish to determine extent of any cracking and repair required to the party walls and front facade. Carry out remedial works to walls that seem to require immediate restraint.
5. Underpin walls as shown on drawings in a hit/miss sequence with temporary cross propping as required by design. Maximum pin width 1100m and in a standard 1,3,5,2,4 sequence. Prop underpinning back to central berm.
6. The remaining 75mm gap between the underpinning and the cleaned foundation/wall is to be dry packed the following day and a minimum of 48 hours is to elapse before excavating any adjacent underpin. Back fill underpinning after completion.
7. Construct Pynford Beams cast with support onto underpinning designed as required for temporary loads as needed and or alternatively consider using sacrificial piles to speed up the process.
8. Once all main walls underpinned and internal loadbearing walls have Pynford beams installed now progress with excavations and introduce lateral propping and top and near base of underpinning.
9. Construct basement slab with all necessary drainage runs beforehand.
10. Complete ground floor slab which will complete the basement box structure to the main house.
11. Contiguous pile to form front basement for car lift area and construct capping beam.
12. Cross prop as required to suit pile design calculations and reduce level of soil and add a further prop above level of new slab.
13. Cast basement slab to car pit area with all necessary starter bars.
14. Cast liner wall to piles.
15. Install drainage/sump pits as required.
16. Remove cross props and make good and apply finishes to Architects specification.

Underpinning Specification:

To be read in conjunction with the Preliminaries and General Conditions.

WORKMANSHIP: The work shall be carried out in accordance with the Engineer's drawings and instructions and to the approval of the Architect and the Building Control Officer. This specification is intended to be used for mass concrete underpinning.

Any other sequence of operations or method of working proposed by the Contractor is to be submitted to the Architect and copied to the Engineer and agreed in writing a minimum of 14 days before work is to be commenced on site.

CONTRACTORS RESPONSIBILITIES: The Contractor shall be responsible for the safety of the underpinned structure and provide all necessary shoring, strutting and bracing to ensure its safety and stability at all times.

SERVICES: The Contractor is also to carry out a survey of the property and adjacent area to establish the location of obstructions such as service runs or drains. Any obstruction found is to be brought to the attention of the Architect / Engineer. The Contractor is to allow for any temporary support to the services or obstructions during the underpinning.

CONSTRUCTION SEQUENCE: The underpinning is to be undertaken in short sections not exceeding 1.1 metre in length. The underpinning is to be undertaken on a 'hit and miss' sequence as shown on the drawings.

No adjacent pin is to be excavated until a minimum 48 hours after the adjacent pin has been cast and packed up.

The Contractor is to provide drawings marked up to show the proposed sequence of underpinning a minimum of 14 days before work is commenced.

EXCAVATIONS: Excavation shall be to the depth and width shown on the drawings. However, where tree roots are encountered new underpins are to extend 600mm below the last trace of any root activity. The sides of the excavations shall be adequately shored and propped to prevent subsidence or slip of the soil. Soil faces behind the pin and at the formation level shall be undisturbed.

Any soil faces behind the underpinning that require to be retained shall be by precast concrete poling boards. The boards are to have holes to enable the void behind the boards to be grouted up. The poling boards are to be measured as left in.

INSPECTIONS: All excavations are to be inspected by the Engineer and/or the Building Control Officer. Minimum notice of 24 hours is to be given when excavations are ready for inspection.

PREPARATION: The sides of the completed pin are to be thoroughly cleaned and scabbled to the satisfaction of the Engineer.

The soffit of the existing footings is to be levelled off and cleaned of all loose or detrimental material.

No projecting partitions of the existing footings are to be trimmed except as shown on the drawings or directed by the Engineer.

The Contractor must provide shear keys.

Allow for 150 deep x 100 wide shear keys across width of scabbled interfaces at 1m maximum vertical centres. Minimum 2 per face. Form in timber or polystyrene. Alternatively provide reinforcing bars as indicated on the drawings

ANTI-HEAVE PRECAUTIONS: Before carrying out concreting introduce anti-heave precautions in the form of clay master as directed by the Engineer to the faces of the excavation.

PLACING CONCRETE: The concrete for the underpinning is to be mass concrete and poured continuously to 75mm below the soffit of the existing footing. The concrete is to be fully compacted using a mechanical vibrator.

The top 75mm of the pin is to be filled to the full depth and width of the void with a well rammed C35 concrete using 5mm – 10mm coarse aggregate and “Conbex 100” expanding admixture by Messrs Fosroc UK Limited in accordance with their instructions. The filling of this void is to be undertaken 24 hours after the stem concrete has been poured.

CONCRETE GRADE: On works where a full specification has not been provided, a FND2 mix should be used. This has characteristic 28 day strength of 35N/mm² and is suitable for Class 2 sulphate soils.

OVER-EXCAVATION: Except where noted otherwise on the drawings, areas of over-excavation are to be backfilled with a granular material and compacted in 225mm layers to provide a stable sub-base compatible with the final finishes.

SPOIL: The contractor will include in his prices for the removal of all spoil arising from the works which is not suitable for backfilling purposes.

RECORDS: A full record of each section underpinned is to be kept on site and readily available for inspection by the Engineer or Building Control Officer.

17.0 Appendix C: Building Damage Classification

Building Damage Classification Table

Building Damage Classification[1] (after Burland et al, 1977 and Boscardin and Cording, 1989)				
Damage Category	Degree of Damage	Description of Typical Damage and Likely Form of Repair for Typical Masonry Buildings	Crack Width[2] (mm)	Max Tensile Strain (%)
0	Negligible	Hairline cracks.	< 0.1	0 to 0.05
1	Very Slight	Fine cracks easily treated during normal redecorations. Perhaps isolated slight fracture in building. Cracks in exterior brickwork visible upon close inspection.	0.1 to 1	0.05 to 0.075
2	Slight	Cracks easily filled. Redecoration probably required. Several slight fractures inside building. Exterior cracks visible : some repointing may be required for weather tightness. Doors and windows may stick slightly.	1 to 5	0.075 to 0.15
3	Moderate	Cracks may require cutting out and patching. Recurrent cracks can be masked by suitable linings. Tuck-pointing and possibly replacement of a small amount of exterior brickwork may be required. Doors and windows sticking. Utility services may be interrupted. Water tightness often impaired.	5 to 15 or a number of cracks greater than 3	0.15 to 0.3
4	Severe	Extensive repair involving removal and replacement of sections of walls, especially over doors and windows required. Windows and door frames distorted. Floor slopes noticeably. Walls lean or bulge noticeably, some loss of bearing in beams. Utility services disrupted.	15 to 25 but also depends on number of cracks	Greater than 0.3
5	Very Severe	Major repair required involving partial or complete reconstruction. Beams lose bearing, walls lean badly and require shoring. Windows broken by distortion. Danger of instability.	Usually greater than 25 but depends on number of cracks	

Notes:

1. The table is based on the work of Burland et al (1977) and includes typical maximum tensile strains for the various damage categories used in the second stage settlement analysis.
2. Crack width is only one aspect of damage and should not be used on its own as a direct measure of it.

End of Report