Form

24 HEATH DRIVE, LONDON, NW3 7SB

STRUCTURAL ENGINEER'S CONSTRUCTION METHOD STATEMENT

Job No: 162637

Date: 30th January 2018

Prepared by Chartered Engineer: Andy Ilsley C.Eng. M.I.Struct.E

Revision: P2

Residential

Commercial

Conservation

Retail

Education

Art

Hotels

Period

Form

Document Reference::	Construction Method Statement	
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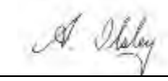
Andy Ilsley		30.01.18
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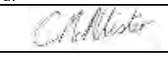
Charlotte McAllister		30.01.18

Preamble

This report has been prepared by Form Structural Design Ltd on the instructions of the project architects, Studio Kyson, acting on behalf of the client The Estate Office and is for the sole use and benefit of the Client. It has been prepared as a supporting document to the planning application for the redevelopment of the property at 24 Heath Drive. The proposals involve extending the existing lower ground floor level back in to the rear garden area. This report presents an outline structural scheme for the construction of the new subterranean structure.

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ABOUT FORM SD

Form has undertaken over 300 projects involving subterranean development, both new build and retrospective, using numerous techniques and sequences of construction. This extensive design, site and local geology/hydrology experience has positioned the practice as one of London's leading subterranean engineering design consultants.

Many of our subterranean projects are in the London Boroughs of Camden, Westminster, and RBKC, making us familiar with the most recent requirements of subterranean development.

Form has designed multi-level basements using techniques including open dig, underpinning (mass and 'L' shaped R.C. special foundations), temporary and permanent steel sheet piling, temporary and permanent concrete piled retaining walls, top down construction and tunnelling.

TERMS OF REFERENCE

We were appointed by the client The Estate Office to prepare a supporting Structural Construction Method Statement in support of a Planning Submission for the refurbishment development at 24 Heath Drive, London, NW3 7SB.

Contents

Form

1 Planning Policy

The table below provides a non-technical executive summary covering key aspects of the London Borough of Camden's planning requirements for Basements and Lightwells GPG4 and DP27, which also ties in with Camden's preferred policy DP20. The key aspects have been divided into specific headings for ensure all requested information has been provided for the planning application.

Extract Descriptions of Key Aspects from Camden Development Policies Basements and Lightwells GPG4 and DP27:	Reference Location within this Report	Compliance to GPG4/ DP27 Policy
A. The **Desk Study** information and an analysis of the findings in relation to the proposals. A thorough desk study has been completed and presented in the Construction Method Statement main text, it includes: a. The site history; b. The age of the property; c. The site survey; d. The geology and ground conditions –from the site investigation and British Geological Society borehole logs; e. Historic River Courses; f. Underground Infrastructure; i. Services; ii. Drains; iii. Tunnels; iv. Nearby basement developments in the area have been considered.	Section 2 Section 2.3 Section 2.3 Sections 2.1, 2.2, and 2.13 Section 2.4 Section 2.7 Sections 2.9, 2.10 and 2.11	✓
B. An appraisal of the **existing building structural arrangement** including previous alterations and any obvious defects, asses the condition and location of **adjoining buildings.**	Sections 2.2	✓
C. Assessment of a **site investigation** which is demonstrated to be relevant to the site together with **trial pits** showing existing foundations and the material they are founded on, for all walls which may be impacted by the proposed scheme. If **groundwater** is present, levels are to be monitored for a period of time.	Section 2.4 and refer to Gabriel Geo Consulting SI Report	✓
D. Details of the engineering design which is advanced to detailed proposal stage a. Ground conditions and ground water; b. Existing trees and infrastructure; c. Drainage; d. Flooding; e. Vertical and horizontal loading; f. Structural engineering general arrangement and details; drawing showing underpinning, piled walls etc	 Sections 2.4, 2.5, 2.6, 2.7 and 2.8 Sections 2.8 and 2.9 Section 2.9 and 2.12 Section 2.8 Sections 3.2, 3.3 and 3.4 Refer to Appendix A	✓
E. An analysis of the **upper aquifer** (when it exists) and how the basement may impact any groundwater flow.	Section 2.6	✓
F. Details of **flood risk, surface water flooding, critical drainage areas** and how these have been addressed in the design. A full flood report assessment to represent areas determined to be at risk.	Section 2.8	✓
G. An Assessment of **movement** expected and the effect of adjoining or adjacent properties, covering both short term and long term effects. Design and construction to limit damage to all buildings to a maximum of Category 2 as set out in CIRA Report 580	Section 3.4, 3.5 and 3.6. Also refer to Gabriel Geo Consulting BIA Report	✓

2 Site Information

2.1 Site Location

The site is located along Heath Drive near the junction of Ferncroft Avenue (Figure 1) and is within the Redington and Frognal Conservation Area. The site is a Grade II listed, detached property with double access from Heath Drive. Most of the property is as originally constructed from 1907, however two new side extensions from the 1970's have been constructed on Northeast side of the property.

Figure 1 - Site location on map and aerial view

2.2 Existing Building

The property is constructed in a typical manner for domestic use with loadbearing masonry walls supporting timber floors. The majority of the original buildings masonry appear to be in a sound condition, however a chimney on the Northern side of the property is showing signs of a historic lean which will be rectified in the proposed development, and the rear Bay window is showing signs of movement from existing suspected shallow footing.

The new garage extension to the North of the property is showing signs of historical subsidence which has caused cracking at high level.

Three trial pits were dug during the ground investigation to investigate the existing foundations and the condition of the soil they are bearing on. The full details can be found in Appendix B, Gabriel Geo Consulting's Ground Investigation Report.

A visual inspection of the superstructure identifies signs of non-structural cracking in the plaster and signs of damp. It was noted that the property has not been redecorated for a number of years.

An intrusive survey of the superstructure however has not yet been carried out and this report has been based on a visual inspection and experience of similar projects. Should works proceed, then a full survey of the existing structural elements would be carried out.

2.3 Site History

Since the property was built, it has always been for residential use in a residential area. The two maps in Figure 2 show that the site used to be in an undeveloped area which was later developed in to a residential area with more roads added and lots of housing built. The house was designed in an Edwardian style by noted architect C.H.B. Quennell in 1907 and is now a Grade II listed building.

Figure 2 - Historical Map, 1888-1913 (Left), and 1892 and 1905 (Right)

As can be seen form the map in Figure 3, the site and surrounding houses were not affected by bomb damage in WWII.

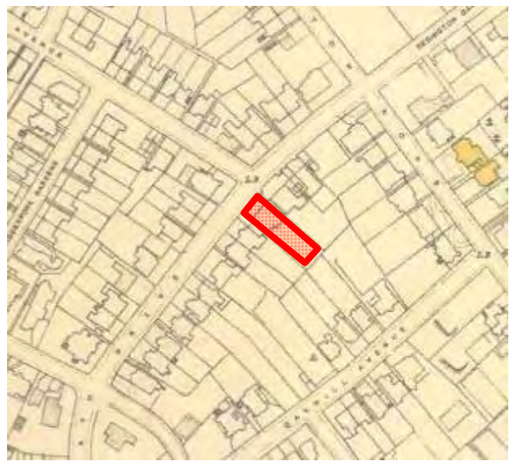


Figure 3 - Bomb damage map with the site location

2 Site Information

2.4 Ground Conditions/Geology

According to British Geological Survey (BGS) the site is underlain by the Claygate Member over the London Clay Formation. The nearest borehole logs are from 4 boreholes taken near each other approximately 300.0m to the west of the site. The report Made Ground to a depth of 0.15m-0.53, Claygate Member to a depth of 4.27m-5.79m and London Clay to a depth of 10.67m-15.39m, at the end of each borehole.

Gabriel Geo Consulting were instructed to undertake a site investigation to confirm the ground conditions and ground water levels. They undertook 3 borehole surveys where the findings are summarised in Table 1. The conditions encountered were as expected and can be summarised as follows, for full details refer to the Gabriel Geo Consulting report within Appendix B.

Table 1 - Borehole data form Gabriel Geo Consulting borehole logs

Description of Strata	BH1	BH2	BH3
Made Ground Concrete, crushed bricked, re-worked sandy, gravelly Clay	0.0m – 2.25m bgl	0.0m – 0.25m bgl	0.0m – 0.30m bgl
'Weathered' London Clay Formation Silty Clay, slightly sandy in places, often fissured and/or jointed	2.25m – 6.7m bgl	0.25m – 4.00m bgl	0.30m – 4.00m bgl
'Unweathered' London Clay Formation Sandy Clay (Confirmed with dynamic probe)	6.7m – 10.45m bgl (end of borehole)	4.00m – 6.00m bgl (end of borehole)	4.00m – 6.00m bgl (end of borehole)

The proposed basement extension will be founded in the 'weathered' London Clay strata which is susceptible to shrinkage or swelling. The conditions encountered are considered favourable for the excavation proposed for the extension of the basement. The construction techniques described on the following pages are common, and well established in the industry.

Standpipes were put into each of the three boreholes and monitored over a 7-week period. The first data was collected after 4 weeks and the water levels were found to be 2.2m bgl, 0.51m bgl, and 0.57m bgl for BH1, BH2, and BH3 respectively. The final reading was taken 3 weeks later with the highest water levels found to be 0.36m bgl.
Gabriel consulting advise the ground water level is taken at Ground Level for design purposes.

It is recommended that the Contractor is to utilise de-watering techniques during site works.

2.5 Slope Stability

The site is considered to be generally level and not cut into the side of hills or valleys therefore slope stability is not considered to be a problem.

2.6 Hydrogeology

The site hydrogeology indicated on the Environment Agency website 'What's in my back yard' (November 2017), can be summarised as follows:

- The hydrogeology of the site has been determined by the bedrock geology of the London Clay. According to the Environment Agency the bedrock geology is classified as a Secondary A Aquifer.
- Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
- For the Secondary Minor Aquifer at the site, the groundwater protection vulnerability to pollution is high. An area of high vulnerability means that the area can easily transmit pollution to groundwater. These areas are characterised by high leaching soils and the absence of low permeability superficial deposits.
- The site is not located within an Environment Agency Source Protection Zone (SPZ).
- The site is not located within the Hampstead Heath Catchment Zone.

2.7 Hydrology

There are no main rivers within 500m of the site.

A desk top study and review of 'The Lost Rivers of London' by Nicholas Barton confirms that the River Westbourne ran directly along Heath Drive as can be seen in Figure 4.

This correlates with Gabriel Consulting's site findings and neighbour's testimonies to high ground water levels and possibly a stream bed in the rear garden.

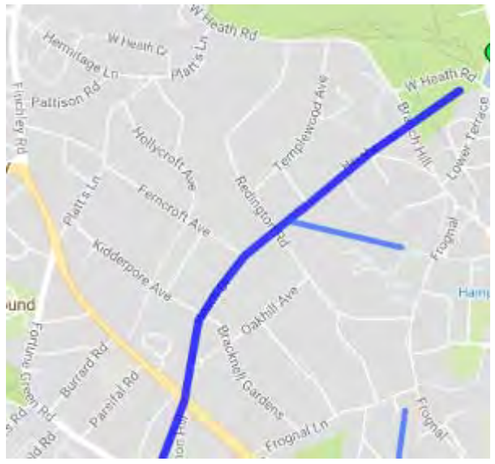


Figure 4 - The route of the 'Lost' River Westbourne along Heath Drive

2 Site Information

2.8 Flooding

2.8.1 Tidal and Fluvial Flooding

The Environment Agency classifies the site as being in Flood Zone 1, Figure 5, meaning there is a low probability of flooding. A flood risk assessment does not need to be carried out for developments in Flood Zone 1. The proposed development can therefore be constructed and operated safely in flood risk terms and is therefore appropriate development in accordance with the National Planning Policy Framework. There are no records of any tidal or fluvial flooding in the local area.

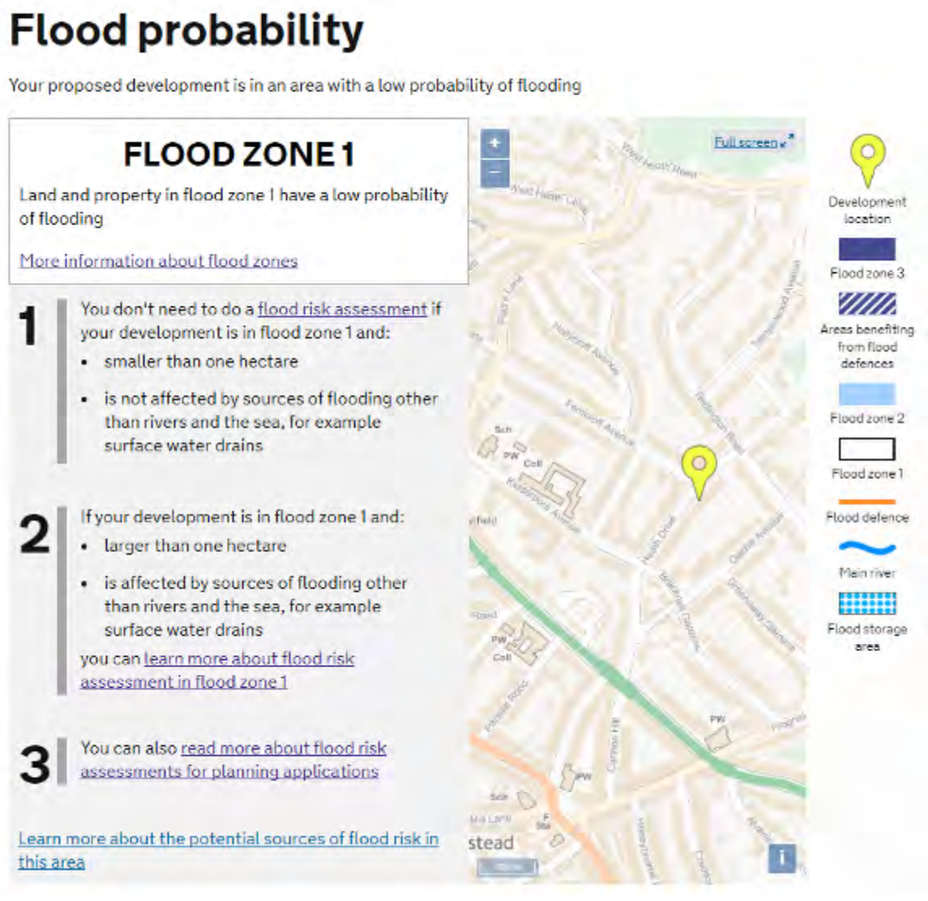


Figure 5 - Flood Probability Map (Environment Agency, November 2017)

2.8.2 Surface Water Flooding

As can be seen in the map in Figure 6, Heath Drive, just outside the development is at a low risk of surface water flooding. This is likely due to this being the path of the 'Lost' River Westbourne as discussed in Section 2.7.

The London Borough of Camden Flood Risk Management Strategy identifies key locations at risk from flooding. The site is not located within any of these 'key locations' areas.

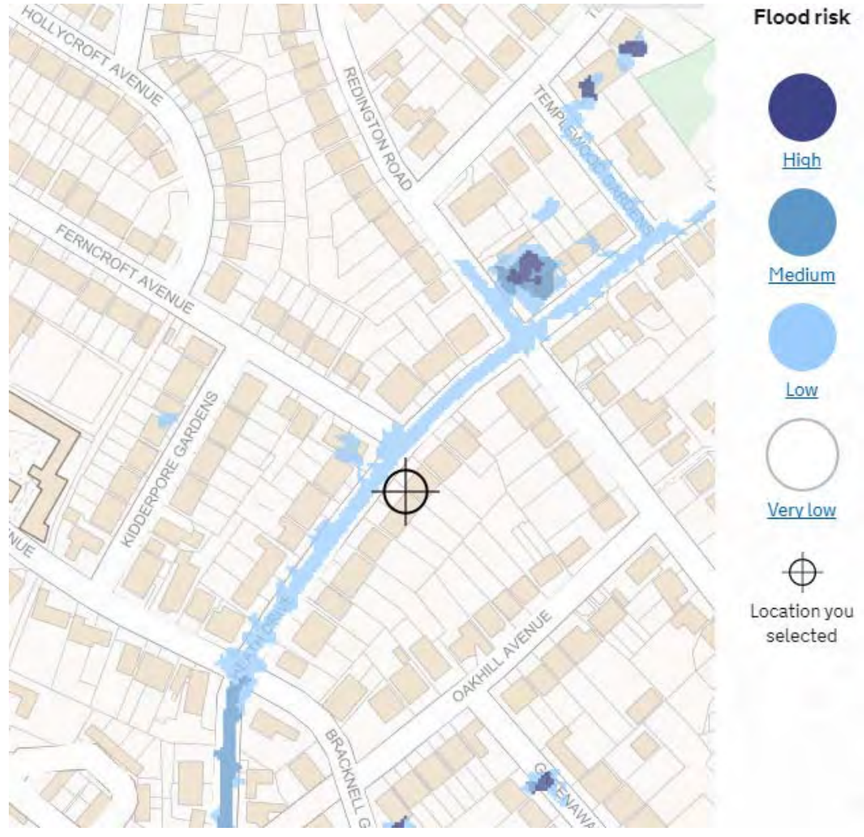


Figure 6 - Flood risk from surface water (Environment Agency, November 2017)

2.8.3 Surface Water from On-Site

The proposals create a negligible increase the extent of the existing impermeable hard-standing across the site. On this basis the total amount of water entering into the sewer system as a result of the development will not increase.

2 Site Information

2.9 Underground and Overground structures

A desktop study has confirmed that there are no tube tunnels within the vicinity of the site, the closest being 1.2km away, and therefore it not be necessary to advise London Underground asset protection department to check alignments as agreed works will not affect any existing tunnels or access shafts. From looking at the Crossrail 1 and Crossrail 2 route maps, neither are close to the site location.

2.10 Underground Drainage

The Below Ground Drainage design has been developed by Edward Pearce Mechanical and Electrical Consulting Engineers. It is understood that surface water and foul will be drained by utilising the existing gravity fed system where possible and the minimal amount of water entering the new Basement level via the cavity drain system will fall to a sump below the new Basement slab level. From the sump it will then be positively pumped to the outfall. A non-return valve will be installed at the main outfall to ensure the lower slab areas are not flooded by the combined sewer system in times of sustained heavy rainfall.

2.11 Existing Utilities

2.11.1 Water

A site survey of the existing drainage routes has been completed by Mechanical and Electrical Consulting Engineers. Please refer to their planning submission for further information.

2.11.2 Gas and Electrical

It is to be established whether any gas or electrical services run under the site. If so they will be diverted where required.

If required, services will be diverted and replaced to modern day standards where necessary as determined by the Mechanical and Electrical Engineer for the project. All services that are required to pass through new structure will be sleeved and articulated accordingly to allow for future movements and settlements of the surrounding structure.

2.12 Arboriculture

Mature trees are present in the rear garden and on the footway of Heath Drive to the front of the property. An Arboriculture Report completed by Eight Associates identifies 25 trees, 2 hedges and 1 group present on site.

7 trees are to be retained which includes 2 Lime trees in the highway and 5No. trees (Sycamore, Oak, Horse Chestnut and Lime) at the rear of the garden. The remainder are to be removed either due to their condition, to benefit the remaining trees or in the case of the minor shrubs due to construction works.

It is understood that the proposed development will have negligible impact on the roots of the retained trees.

2 Site Information

2.13 Boundary Conditions

The site is situated on the southeast side of Heath Drive, with 23 Heath Drive to the Northeast and 25 Heath Drive to the Southwest.

To the front of the house there is a paved carriage driveway extending the full width of the property to the footway of Heath Drive. This driveway is bounded by trees and beds/planting areas containing shrubs and plants, located along the frontside of the property, between the driveway and the footway of Heath drive spanning between the two access points to Heath Drive from the driveway, and along the boundary for 24/25 and 24/23. The flower bed alongside the upslope 24/23 boundary is raised and supported by a low stone retaining wall. A narrow side passage runs alongside the south-western side of the house which connects the front drive to the rear garden. This passage is mainly asphalt with crazy paving in front of the side gate which is in poor condition.

To the rear is a large garden approximately 35m long with paving stones covering the first 2m. The garden is then lawn, shrubbery, and weeds with a few small trees up to some stone steps. The steps are set centrally within a small retaining wall, supporting the raised garden level beyond. After this point the whole garden is largely overgrown with weeds, and unkempt shrubbery, with some large trees to the back and sides.

Northwest (Front) Boundary

- The Northwest boundary along the front of the site is with the footway of Heath Drive.

Southeast (Rear) Boundary

- Along the rear of the site, a wooden fence separates the rear garden of the site with the end of the rear garden of 2a Oakhill Avenue. Refer to Figure 7.
- The wall is approximately 3.5m high and runs the length of the adjoining properties.

Northeast Boundary

- To the Northeast boundary, the existing garage runs along the boundary line between the development and 23 Heath Drive.
- Beyond the drive, there is paving between the house and the boundary line where the house steps back in.
- 23 Heath Drive steps up to a slightly higher level than the proposed site.

Southwest Boundary

- To the Southwest boundary, a paved alleyway lies between the development and 25 Heath Drive, Figure 8.
- At the boundary line, between the paved alleyway and 25 Heath drive, runs a wooden panel fence
- 25 Heath Drive steps down to a slightly lower level than the proposed site.

Figure 7 - View of rear boundary

Figure 8 - View of alley at the west boundary between the proposed site and 25 Heath Drive

3 Development Proposals

3.1 Sub-Structure and Basement Construction Constraints

The proposed development of the site includes the lowering of the existing Basement and extension to create a new subterranean level beneath the rear footprint of the existing property above and into the garden area. The structural proposals are described on the drawings contained within Appendix A of this report. They have been developed by Form SD in conjunction with the architects and the contractor to address the specific site constraints and characteristics including:

- The ground conditions
- The stability of the existing property
- The stability of the neighbouring properties
- Health and Safety considerations
- The physical site constraints

During the site set up the selected contractor will ensure that the main access route through the existing property is cleared, with particular care taken to protect the existing fabric of the existing listed structure.

Due to the sensitivity of the property the demolition, excavation, and piling works have been identified as particularly sensitive operations and the following precautions will be taken:

Noise, Dust, and Vibration

Due to the close adjacency of neighbouring properties and the general sensitivity of the site within a residential area the design has been developed to absolutely minimize the impact of the development during construction.

We have identified a number of simple general measures that the contractor will be expected to undertake to minimise the impact of the site operations including:

Noise:

- For all operations identify working method that use equipment or modes of operation that produce less noise.
- Reduce the need for noisy assembly practices by assembling off site where possible.
- Keep noisy plant as far away as possible from the site boundaries.
- Adopt working hours to restrict noisy activities to certain periods of the day.
- Minimise the drop height into hoppers, lorries or other plant.

Dust:

- Reduce the amount of dust through, cutting, grinding, and sawing by assembling off site where possible.
- Equipment fitted with dust suppression or a dust collection facility should be used
- Stockpiles of sand or similar dust generating materials will be covered.

Vibration:

- For all operations identify working method that use equipment or modes of operation that do not vibrate.
- Reduce the need for assembly practices by assembling off site where possible.

Vibration and the monitoring there of is discussed further in Section 3.2 below. Subterranean Construction Techniques.

3.2 Sub-Structure and Basement Construction Techniques

The demolition, excavation, underpinning and piling works have been identified as particularly sensitive operations and the following precautions outlined below will be taken:

Prior to any of these operations commencing the site will be inspected by a Structural Engineer to ensure that procedures have been satisfactorily implicated. Further regular site inspections will be made by the Structural Engineer to supervise throughout the duration of these operations.

Excavation:

The soil will be excavated and removed by hand due to height restrictions and the sensitivity of the Ground Floor, which is to remain. The waste material from the excavations and demolition is then bagged up and carried by hand through to the rear of the property. From here the soil is removed up and out of the site via electric conveyor belt system (Easykit 300 or similar). A gantry will support the conveyor and loading beam allowing the soil to be loaded directly on to the lorries as they sit under the conveyor. The gantry is erected to the front of the property allowing for lorries to pull into the site boundary. The footpath will remain open to the public throughout.

- All excavations for underpinning will be carried out in a traditional hit and miss sequence BY HAND, using only non -percussive hand tools to ensure that at any time during the works the integrity of the superstructure is not compromised.
- All excavation (other than for underpinning) shall be carried out by hand due to height restrictions to the remaining Ground Floor.
- Any compaction of hardcore shall only be carried out using non-vibrating methods.
- De-watering techniques are required throughout the basement construction.

Demolition:

The majority of the demolition is limited to the existing lower ground floor. All demolition works will therefore take place within the confines of the site towards the front of the property.

- All demolition of existing concrete shall be undertaken using non-percussive techniques and only cutting or bursting by hand shall be used.
- All demolition (excluding demolition of concrete works) shall only take place by hand.
- Dust suppression equipment (water sprays, pressure washers, ‘Dust Boss’) should be used during demolition.
- To avoid noise and vibration transference all connections to adjacent buildings should be first cut to spate the structures.

3 Development Proposals

Piling:

The site will be inspected by a Structural Engineer prior to the commencement of any piling to ensure the following procedures have been implicated. Further regular inspections will be made throughout the duration of the piling.

- An experienced piling Contractor is appointed to undertake the works and pile design. All method statements, drawings and calculations will be submitted to the engineer for review. All precautions taken to ensure that the works are to be carried out in a manner which minimises any noise and vibration must be described.
- It is anticipated that a tracked piling rig will be used similar to the Klemm KR708 shown in Figure 9 below. These can be operated in the confined areas and use Sectional Flight Augers (SFA) to bore from the existing ground level. The SFA process is considered to be virtually vibration free and one of the quietest forms of piling.

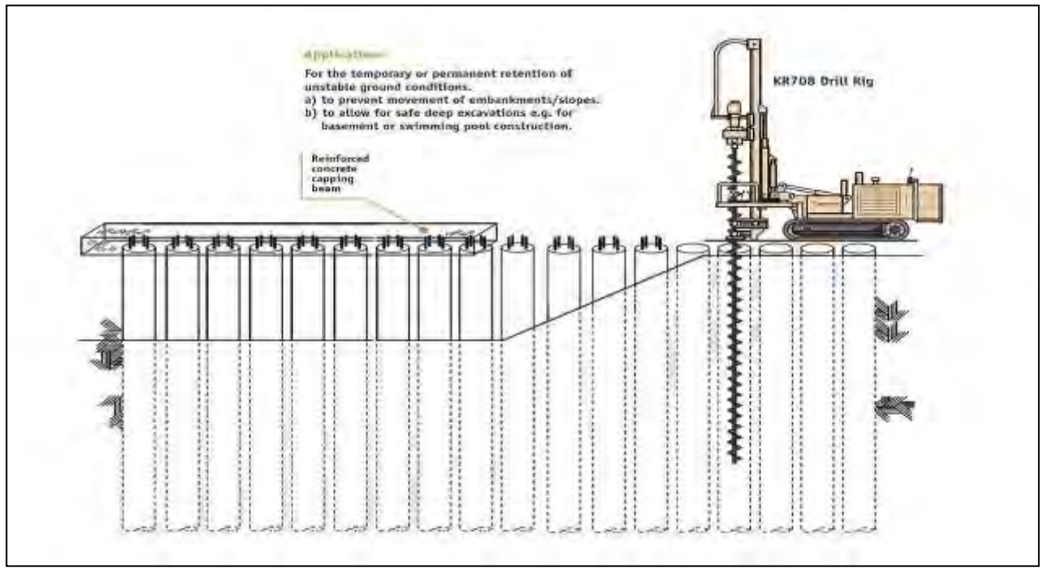


Figure 9: Piled Wall Method of Construction

Due to the high water table present on site secant piling is proposed to mitigate against soil migration through the installation of 'soft' piles drilled primarily and 'hard' piles installed second utilised to create a continuous piled wall. Please note de-watering techniques will still be required to manage water seepage entering the excavation.

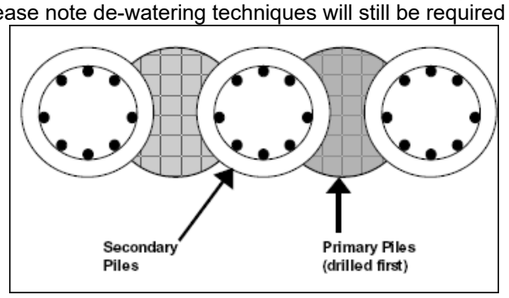


Figure 10: Plan of Secant Piles and Site Photo of Secant Piles

To aid in alignment of the secant piles a concrete guide wall is constructed at Ground Level for the piling rig to follow during installation. See Figure 10.

RC "L-Shaped" Underpinning:

As described previously the existing single storey Basement is to be lowered and extended beneath the rear of the property into the garden.

It is proposed to lower the internal high level ground floor foundations within the extension to match the typical existing Basement level throughout. As the external wall is not a shared party wall it is proposed to install special reinforced underpinning. These underpins vary in depth dependent on the level of the existing footing above. They are designed to take all lateral earth load, surcharge loadings, and vertical loading from the structure above without any additional elements.

As illustrated in the extract from our Section CC drawing below the proposed underpinning understood to be outside of the zone of influence of the foundation to the adjacent property at No.23. However adjoining property foundation depths are assumed and to be confirmed through the Party Wall liaison. Underpin construction is to be in short sections carried out in a fixed hit and miss sequence agreed beforehand. In the temporary condition shoring to the excavation will ensure that stability is maintained and there is no movement to the boundary wall foundation. In the permanent condition the RC wall is designed to act as a cantilever to ensure minimal deflection when connected to the basement slab which acts to prevent sliding.

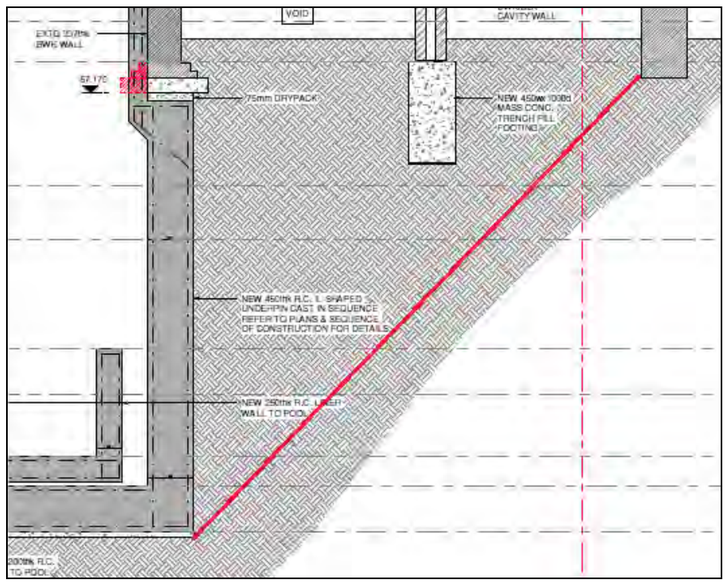


Figure11: Extract from Section C-C Indicating RC 'L' Underpin

The works will be carried out by an experienced groundworker to best practice and in accordance with the Form SD drawings and specifications found within Appendix A and B of this report. On this basis we would not expect significant movements and the structures above will therefore remain stable and unaffected by the works. A Contractor's method statement will be required at this stage for comment by the Engineer and Party Wall Surveyors.

3 Development Proposals

3.3 Sub-Structure and Basement Structure

The basement is to be constructed in bottom-up fashion due to the existing Ground Floor remaining in place and the restricted access.

The structural solution outlined below and within the sequence of construction within Section 5.0 of this report is indicated on the structural drawings found within Appendix A of this report. The Contractor may put forward alternative solutions to suit his programme and method of working. These will be reviewed by the design team but no proposals will be considered unless they can satisfactorily demonstrate that they satisfactorily minimise any noise and vibrations that may affect the neighbouring properties.

The first stage will be to underpin the existing shallow footings to a depth of the existing basement to allow for access and stability. A secant piled retaining wall can then be installed to the rear of the new basement up to the proposed new basement level. The piles are designed by the specialist contractor and early consultation with an experienced piling contractor will be critical to ensure ground movement due to pile installation and deflection is controlled and minimised.

3.4 Temporary Works

The previous section describes the methods for the construction of the basement and the associated Temporary Works required to maintain the stability of the excavation.

It is understood that due to the distance of the excavation from the neighbouring properties, and the construction methodology proposed, Temporary Works to neighbouring properties will not be required.

The Temporary Works will be designed by a Specialist. No works on site requiring the installation of any Temporary Works will commence on site without all the necessary drawings, calculations, and method statements in place which will require approval from the Structural Engineer. The envisaged construction sequence including the installation and removal of all Temporary Works is outlined on the Outline Construction Sequence drawings contained within Appendix A of this report.

3.5 Potential Ground Movement

The underpinning described in the previous section may cause localised settlements beneath the walls. However anticipated movements are expected to be minimal and suppressed by the stiffness of the above structure.

It is our experience that the potential for damage can be mitigated by appointing a suitably experienced Contractor familiar with propping techniques and sequential operations and by the Designer giving the necessary consideration to the risk by specifying measures to ensure that significant damage is avoided. This would typically be in the form of transitional underpins where we consider the structure above to be particularly vulnerable but otherwise by ensuring that the foundation transitions occur at inherently strong intersections of the more robust load bearing walls.

Gabriel Geo consulting have completed a Basement Impact Assessment and supplementary report, in which they expect that should any damage occur to the wall it will be limited to Category 2 (Slight. Cracks less than 5mm easily filled) based on the Boscardin and Cording / Burland and Potts Building Damage Classification Table found within Appendix B of this report. Refer to Gabriel Geo consulting's BIA Report for further information.

3.6 Potential Ground Movement to Adjoining Properties

The underpinning described in the previous section may cause localised settlements to party walls. However anticipated movements are expected to be minimal and suppressed due to the distance between the proposed works at the neighbouring structures.

The secant pile retaining wall will be designed to permit only very small movements during the excavation. The piles will be closely spaced to ensure that fine migration will be mitigated. As described previously a high water level is present on site therefore de-watering techniques are to be implemented to manage water which could seep into the excavation.

By adhering to stringent deflection criteria the potential for damage to any neighbouring properties will be minimal. It can be further mitigated by ensuring the appointment of a suitably experienced Contractor familiar with propping techniques and sequential operations such as "hit and miss" piling sequencing described in the previous section.

However, there will always be some movement as it can never be completely avoided and there are occasions where unforeseen conditions beneath the property which were not or could not be detected by the pre-construction investigations will result in more extensive damage. From our experience such an occurrence very uncommon and even then the damage would be limited to Category 1 (Very Slight, fine cracks less than 1mm) in the Damage Classification Table in Appendix B. These can be easily treated during normal decoration. This is confirmed in Gabriel Geo consulting's BIA report.

Monitoring of the adjoining properties will be undertaken throughout the works at regular intervals to ensure that the trigger values agreed under the Party Wall awards are not exceeded.

3 Development Proposals

3.7 Waterproofing and Drainage Systems

BS8102 – Protection of structures against water from the ground identifies three specific methods of water-resisting construction. Each of these options was considered during the preliminary stages of design:

Type A (Tanked Protection)
The tanking may be external or internal. By design it is assumed that the concrete offers no protection against the ingress of water and water vapour. Protection is therefore totally dependent on a continuous barrier system applied to the structure.

Tanked protection has been dismissed for this project due to the complexity of construction, the total dependency on this material providing the water and vapour barrier, plus the difficulties or repairing this system of protection.

Type B (Drained Protection)
The structural concrete box acts to minimise the ingress of water. Any moisture which does find its way into the basement is channelled, collected and discharged within the cavity created through the addition of an inner skin to both walls and floor. Vapour transmission may be prevented by ventilation of the cavity and by providing on effective damp proof membrane over the under drained floor.

A cavity drained system is proposed for this project on the basis that it is the most effective trouble free method of waterproofing. Sump pumps and an outlet drainage system both designed by a specialist drainage engineer will be required to remove any water ingress from the cavity drain.

Type C (Structurally Integral Protection)
The concrete box is designed and constructed in reinforced or prestressed concrete either minimise or prevent water penetration. Transmission of water vapour may not be wholly prevented. In addition an additive such as Caltite can be specified to significantly reduce the penetration of water vapour to negligible levels.

For this project the use of such an additive is not recommended as the guarantees to such products are typically limited to 12 years, their addition also significantly increases the cost of the concrete.

3.8 Superstructure

The superstructure works above the lowered Basement are limited to the works necessary to facilitate conversion of the loft space, and an above ground side extension. These are indicated on the structural drawings within Appendix A.

4 Site Management

This section of the report has been produced at Planning stage and before the main Contractor has been fully appointed. It sets out the systems and procedures that the Contractor will utilise in controlling the construction operations on site, to ensure progress of the project in the most safe and efficient manner possible and to minimise impacts on the local environment and surrounding amenity.

Tendering contractors will be made aware of the contents below (alongside any planning conditions). Once planning permission is granted, the appointed contractor will be responsible for the submission of a Construction Traffic Management Plan prior to commencement of development.

4.1 General Practice and Local Environmental Considerations

Construction operations are likely to have impact on residential amenity on a day to day basis. The Contractor will be expected to minimise the impact that the construction process could cause to the Local Environment and the neighbouring community. All care will be taken not to cause the primary environmental nuisances, noise and dust pollution. Below are actions that will be carried out to abate these problems.

Reduction in noise disruption will be achieved by:

- Coordinated delivery times to avoid peak traffic times.
- Ensuring all plant has sound reduction measures (mufflers, baffles or silencers)
- Strict adherence to the site working hours.

Reduction in dust pollution and other airborne debris will be achieved by:

- Ensuring that all materials transported to and from site are in enclosed containers or fully sheeted.
- During dry periods the works are to be damped down to control the generation of dust.
- Ensuring materials have a minimum of packaging.
- Ensuring all polystyrene and similar lightweight materials are weighted down
- Making sure all dust generating materials are adequately packaged.

In addition to the above provisions the following measures will be taken to reduce any further negative effects on the environment:

- Ensuring all contaminants kept on site are safely stored with the necessary procedures put in place for leaks and spillages etc.
- All temporary lighting, whether for the construction itself or for construction traffic, will be directional to ensure minimal light spillage across the site. The lighting will only be used as necessary during operational working hours.

Environmental issues are taken very seriously and the Contractor will be expected to employ good management practices to minimise the effects of noise and dust on the environment and local community.

4.2 Excavation of Soil

The soil will be excavated and removed using hand tools and a conveyor system running to street level.

Prior to works commencing, all neighbouring occupiers will be consulted to ensure that the construction process results in minimal disruption/disturbance. In particular, all reasonable endeavours will be made to organise vehicle arrivals/departures to avoid peak usage for neighbours i.e. early mornings, and early evenings.

The street adjacent to the development will remain open to the public throughout. It will be cleaned each evening and the frequency of vehicle movement will be confirmed by the chosen Contractor and approved by the Council before works commence.

Prior to the commencement of the works the specialist ground works Contractor will provide detailed method statements for all aspects of the construction for approval by the engineer. These statements will address:

- All the site-specific procedures described in the previous sections to necessary to minimises any noise and vibration that may affect the neighbouring properties.
- Construction requirements for Temporary propping, movement monitoring, and waste disposal.

Throughout the duration of the works the engineer will also make site visits at regular intervals to ensure that construction is being progressed safely and in accordance with the agreed methods and design information.

4.3 Demolition

The demolition works are all take place within the hoarded confines of the site. Any scaffolding that may extend above the 6-foot plywood hoarding will 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. As stated in Section 4.1 non-percussive techniques are to be used.

4.4 Rubbish Removal and Recycling

An important part of the site management process involves site cleansing, rubbish removal and recycling.

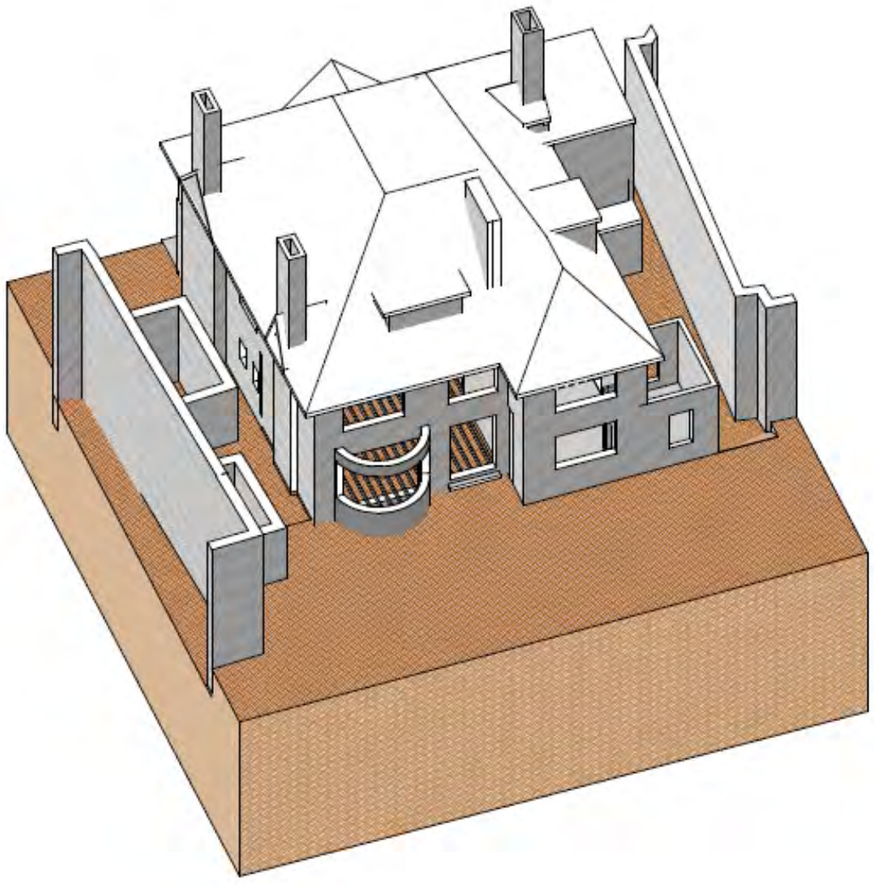
To reduce and manage site waste:

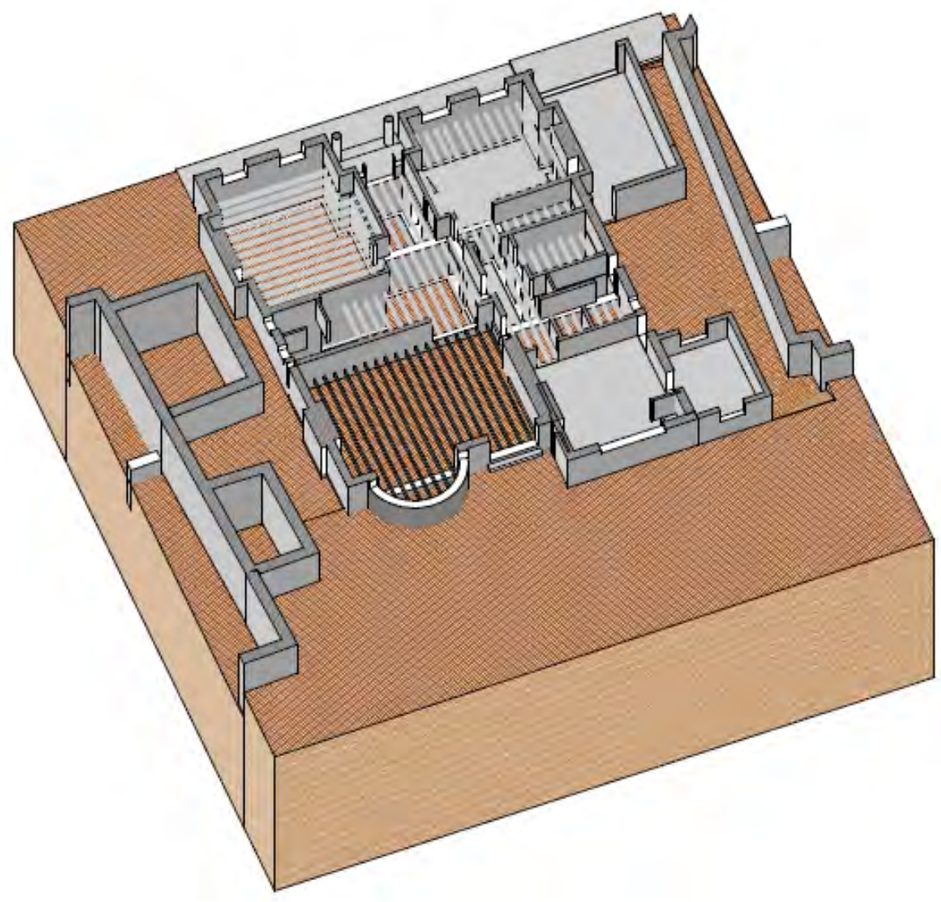
- The Contractor will ensure that all material removed from site is taken to waste recycling stations and separated for recycling where possible. Records of the waste recycling will be provided by the recycling stations.
- Segregate waste types to facilitate recycling activities.
- Ensuring that all Duty of Care and other legal requirements are complied with during the disposal of wastes.
- Consulting with suppliers to determine correct / appropriate disposal routes for waste products and containers.
- It will be the responsibility of each Contractor to keep the site area under his control safe from build-up of rubbish.

5 Outline Construction Sequence

The following section describes our envisaged sequence for the construction of the basement based on the construction and Temporary Works techniques described in the previous section. The Contractor may put forward alternative solutions to suit his programme and method of working. Regardless no structural works will commence without a detailed Temporary Works design, drawing and calculation package in place including all necessary method statements.

Axonometric View of Existing Structure

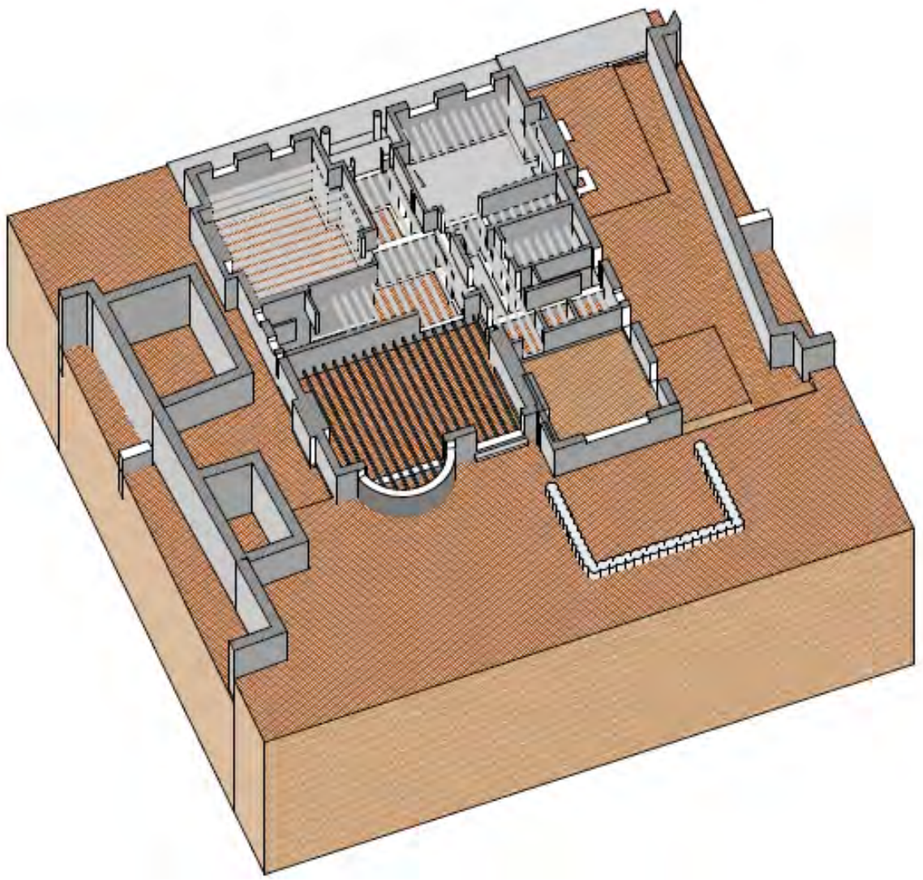




5 Outline Construction Sequence

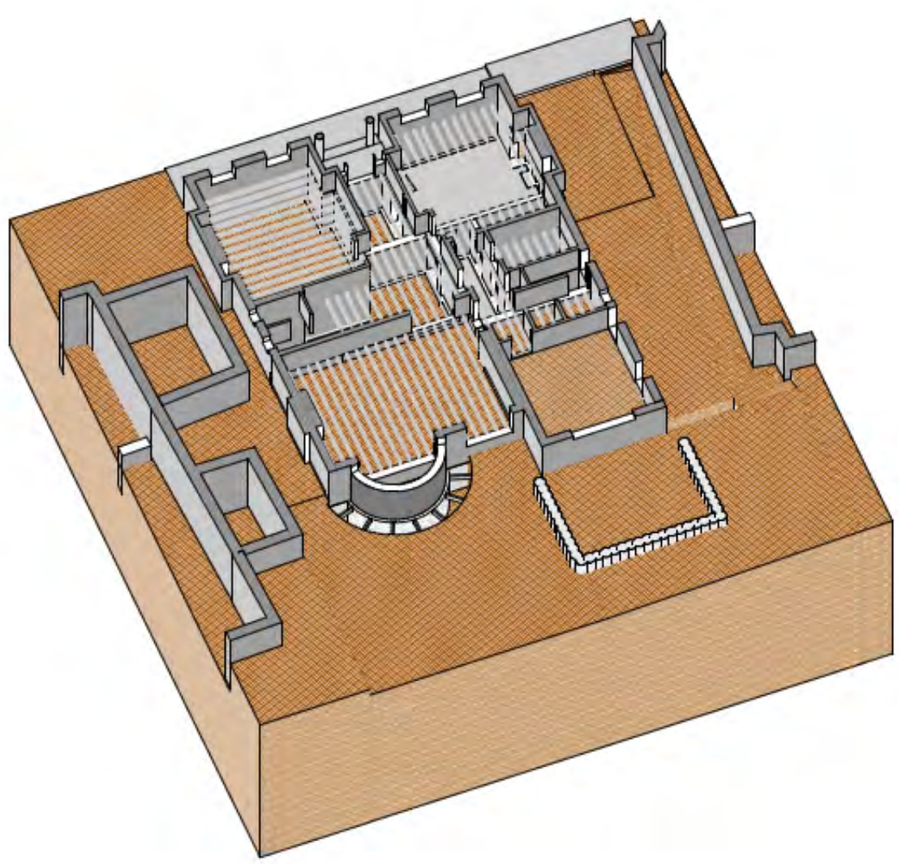
STAGE 1 – SITE SET UP, DEMOLITION AND PILING

- Mobilisation and prepare site with all necessary hoarding and associated health and safety and security requirements.
- Locate all existing services and identify those affected by the new works and take necessary actions as required by M&E engineer, drainage engineer and Thames water.
- Check all boundary conditions are as to be expected and report any variation to the engineer.
- Submit temporary works proposals to the engineer for comment.
- Carefully remove the existing non-original side extension and garage.
- Locally reduce the external area to the grade level below the new piling mat.
- Install appropriate piling mat. Compaction of hardcore shall only be carried out using non-vibrating methods.
- Install secant piles to perimeter of basement.



STAGE 2 – UNDERPIN BENEATH THE REAR WALL

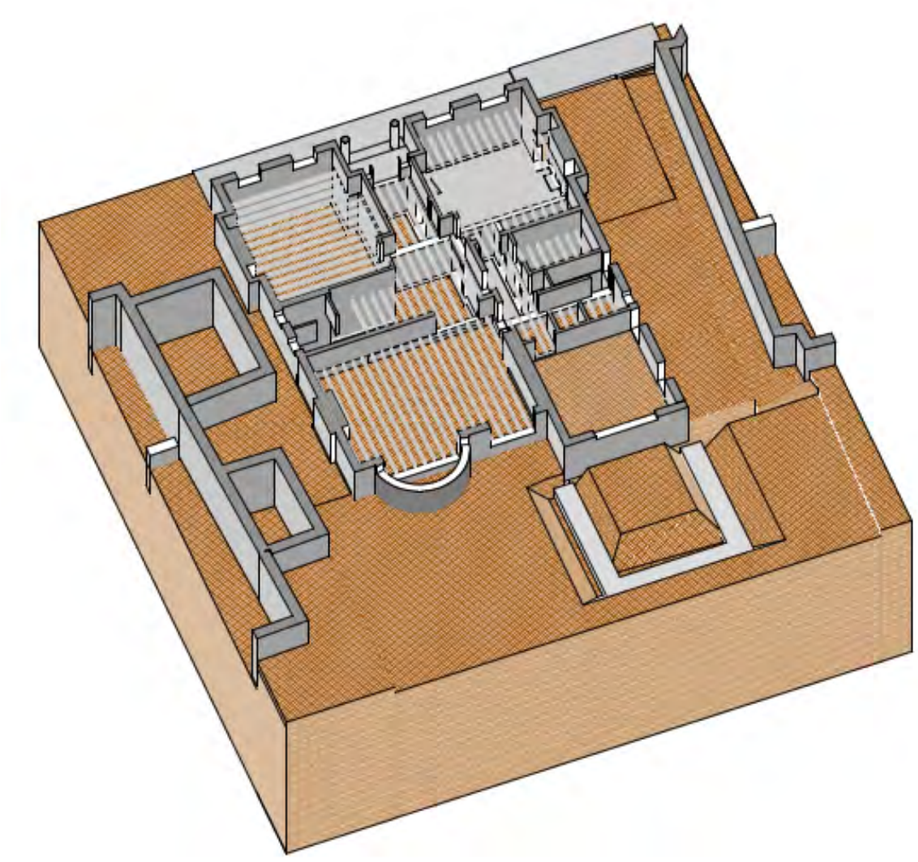
- Install transitional underpins beneath bay window
- Install the underpins beneath the rear elevation in a hit and miss sequence in accordance with the specification and install propping as required.
- Backfill the excavation.



5 Outline Construction Sequence

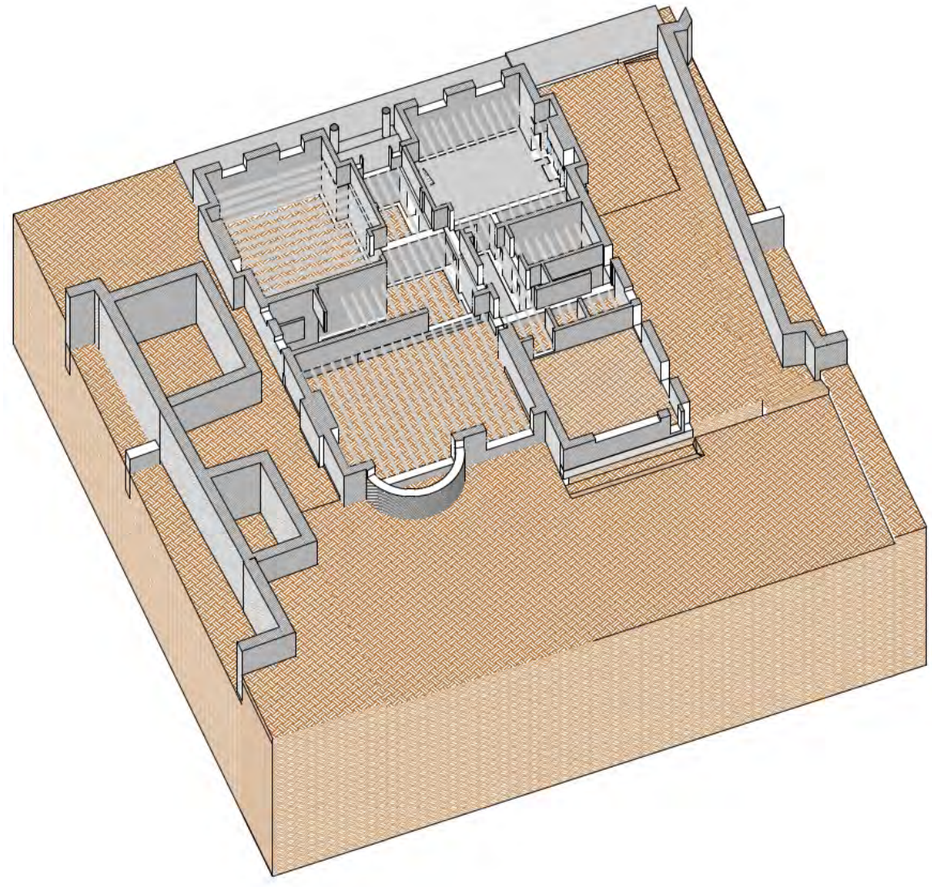
STAGE 3 – INSTALL PILE CAP

- Locally reduce the garden level in the pile cap area.
- Install the pile cap along all basement perimeter piles.



STAGE 4 – INSTALL PYNFORD BEAM TO REAR WALL

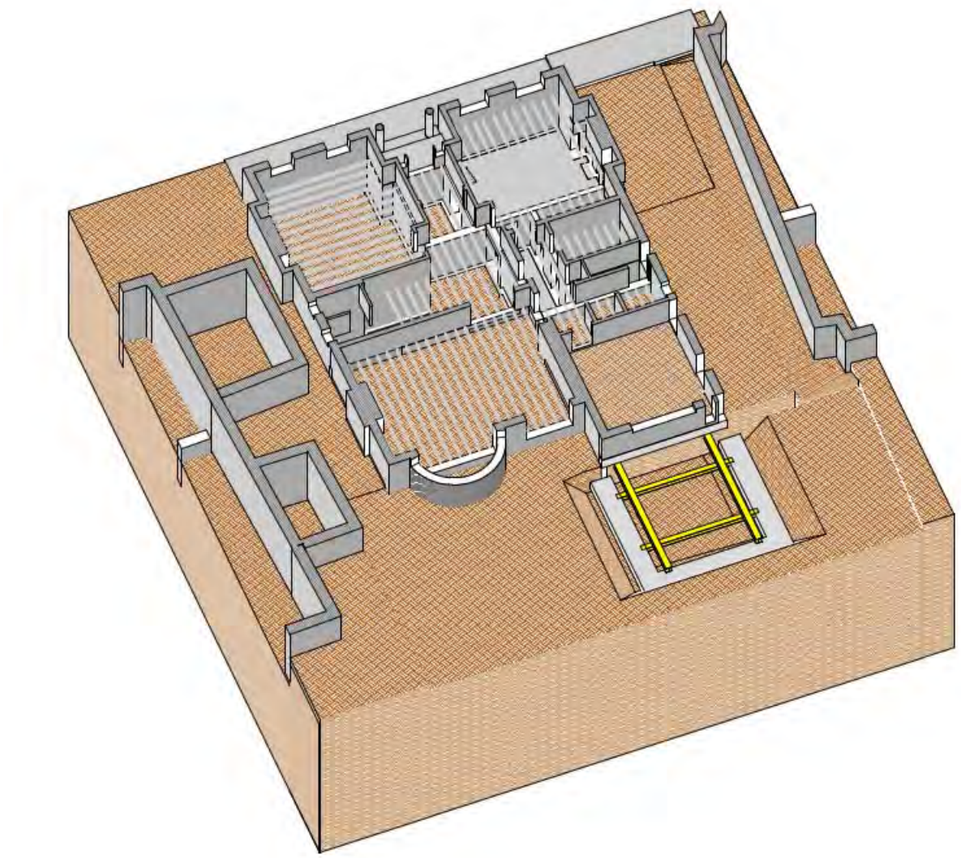
- Backfill the capping beam excavation where required for safe excavation for the Pynford beam.
- Carefully install Pynfords to the rear elevation wall in hit and miss sequence.
- Prepare reinforcement and cast new beam, allow curing.



5 Outline Construction Sequence

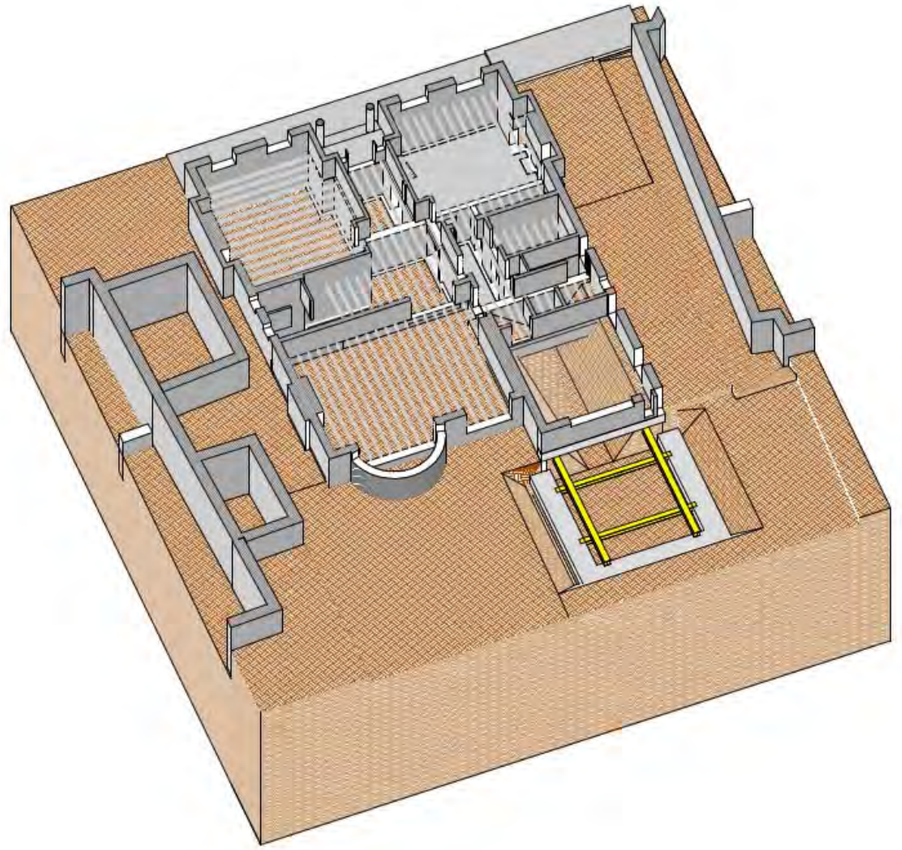
STAGE 5 – INSTALL NEEDLES TO PYNFORD BEAM

- Install temporary needle beams from the capping beam to the Pynford beam.
- Ensure the top of the needle beams are packed tight to the underside of the Pynford beam.



STAGE 6 – EXCAVATE BY PILING AND TUNNEL UNDER PYNFORD BEAM

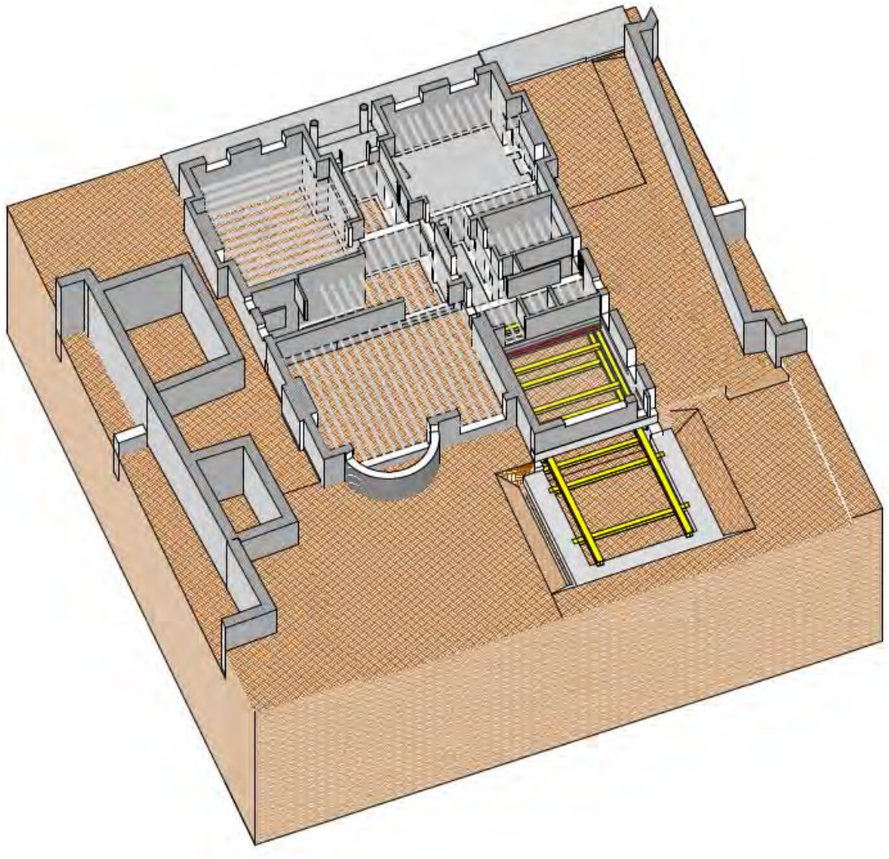
- Reduce ground level to underside of new capping beam and Pynford beam.
- Carefully tunnel centrally under building to existing cellar wall.
- Install propping as required.



5 Outline Construction Sequence

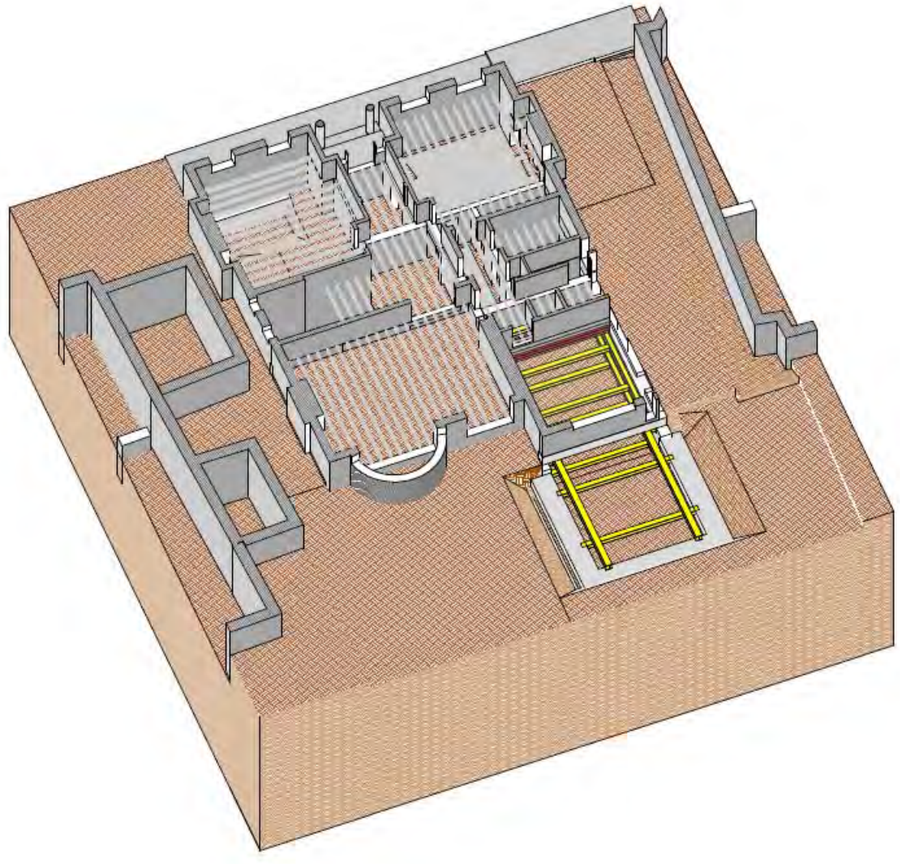
STAGE 7 – UNDERPIN HIGH LEVEL FOUNDATIONS FROM THE TUNNEL TO EXISTING BASEMENT LEVEL

- Install the underpins beneath the high-level foundation from the tunnel in a hit and miss sequence in accordance with the specification and install propping as required.
- Install props to either side of load bearing walls in tunnel.



STAGE 8 – UNDERPIN FRONT AND SIDE LOW LEVEL FOUNDATIONS TO PROPOSED BASEMENT LEVEL

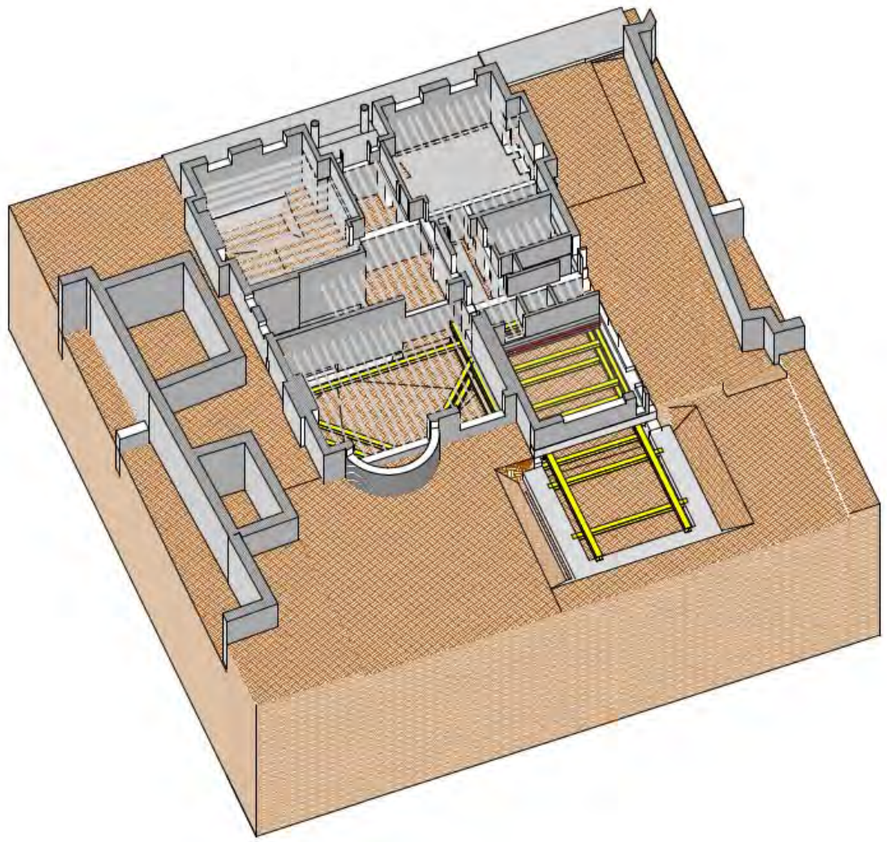
- Carefully remove existing backfill in front basement areas, installing temporary works where required.
- Install the underpins beneath the low-level foundation in a hit and miss sequence in accordance with the specification and install propping as required.



5 Outline Construction Sequence

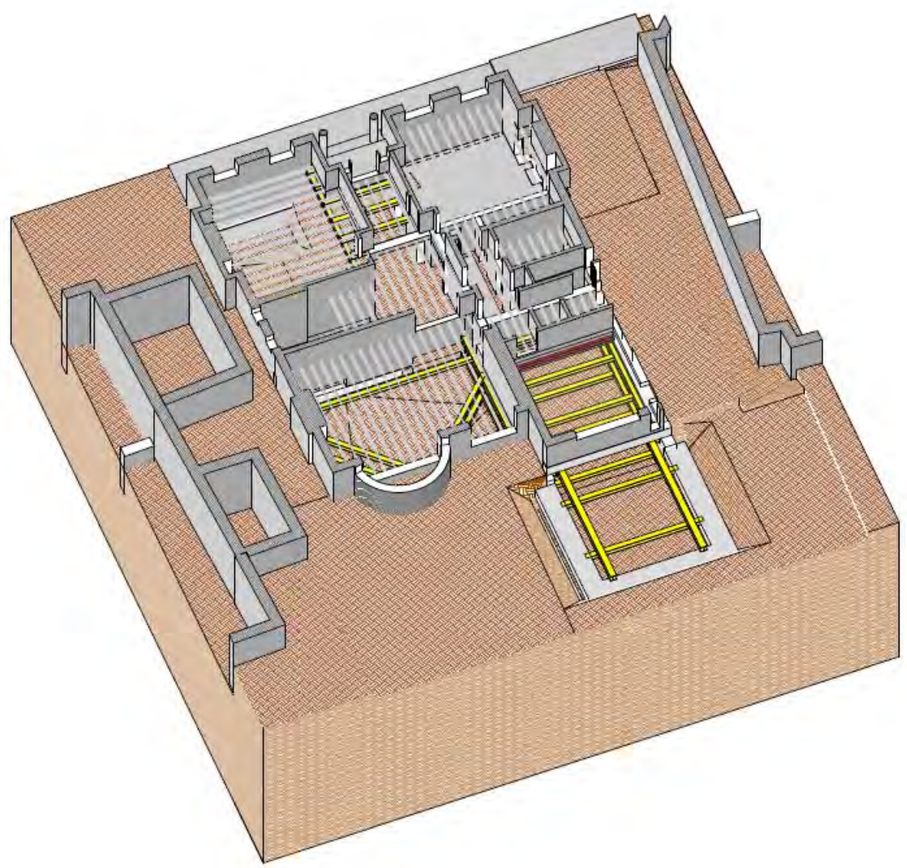
STAGE 9 – CONTINUE UNDERPINING HIGH LEVEL FOUNDATIONS TO EXISTING BASEMENT LEVEL

- Install the underpins beneath the high-level foundation in a hit and miss sequence in accordance with the specification and install propping as required.
- Carefully remove existing backfill in front basement areas, installing temporary works where required.
- Ensure that the underpins are supported with props and walers to ensure stability.



STAGE 10 – INSTALL INTERNAL NEEDLES BENEATH ENTRANCE

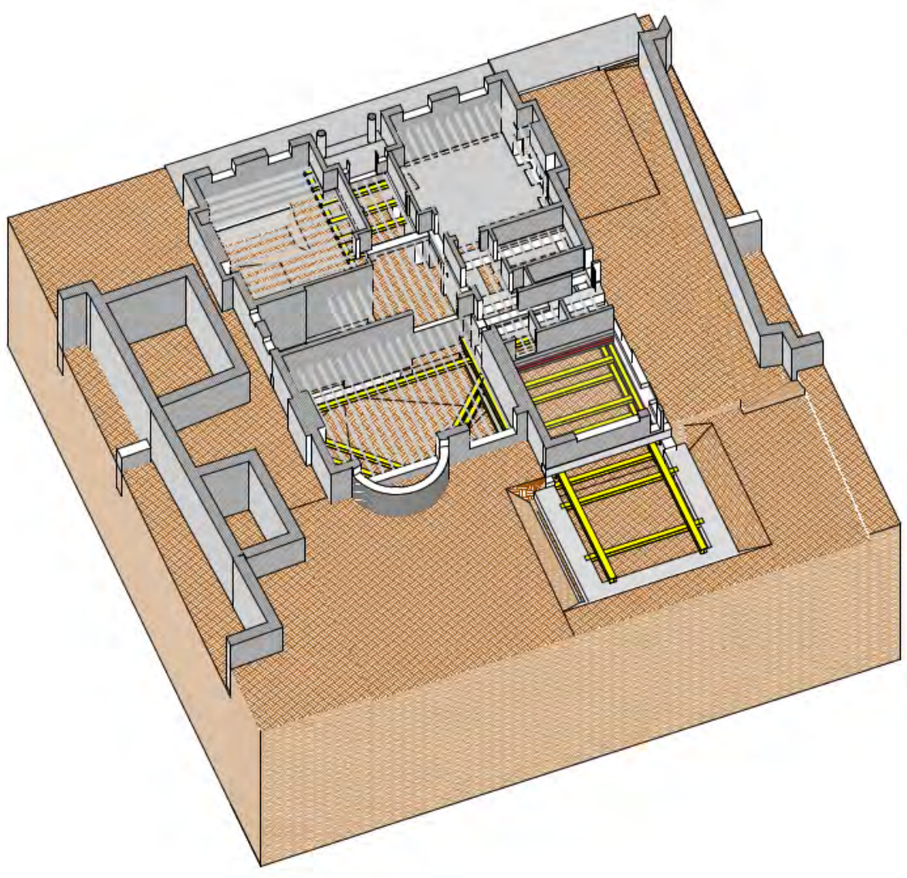
- Install temporary needle beams to the front facade from internal walls.
- Install temporary needle beams through the internal load bearing brickwork walls.
- Ensure the top of the needle beams are packed tight to the underside of the existing masonry.
- The needles are to be installed below the existing ground floor. This allows the masonry below to be removed providing an opened up working area at basement level while protecting the ground floor.



5 Outline Construction Sequence

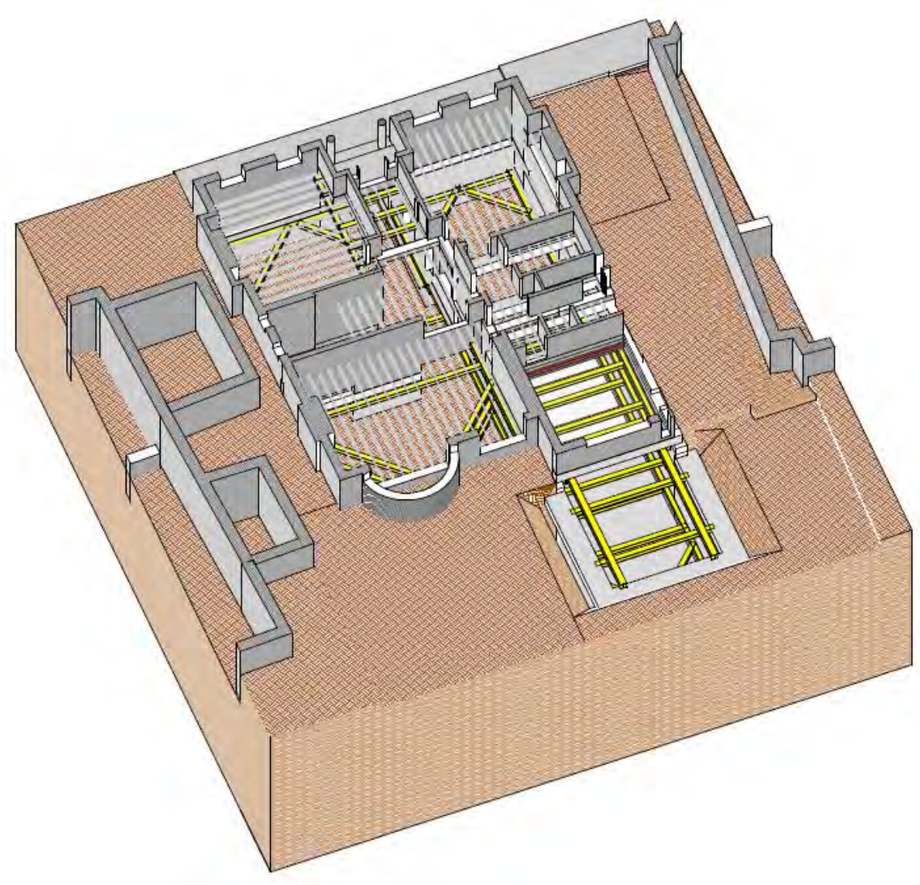
STAGE 11 – INSTALL PYNFORD BEAMS TO EXISTING LOAD BEARING WALLS ABOVE POOL

- Carefully install Pynfords to the load bearing walls over the pool in hit and miss sequence.
- Prepare reinforcement and cast new beam, allow curing.



STAGE 12 – INSTALL REMINDER OF PERIMETER WALL TO POOL SLAB LEVEL, AND INTERNAL WALLS TO PROPOSED BASEMENT LEVEL

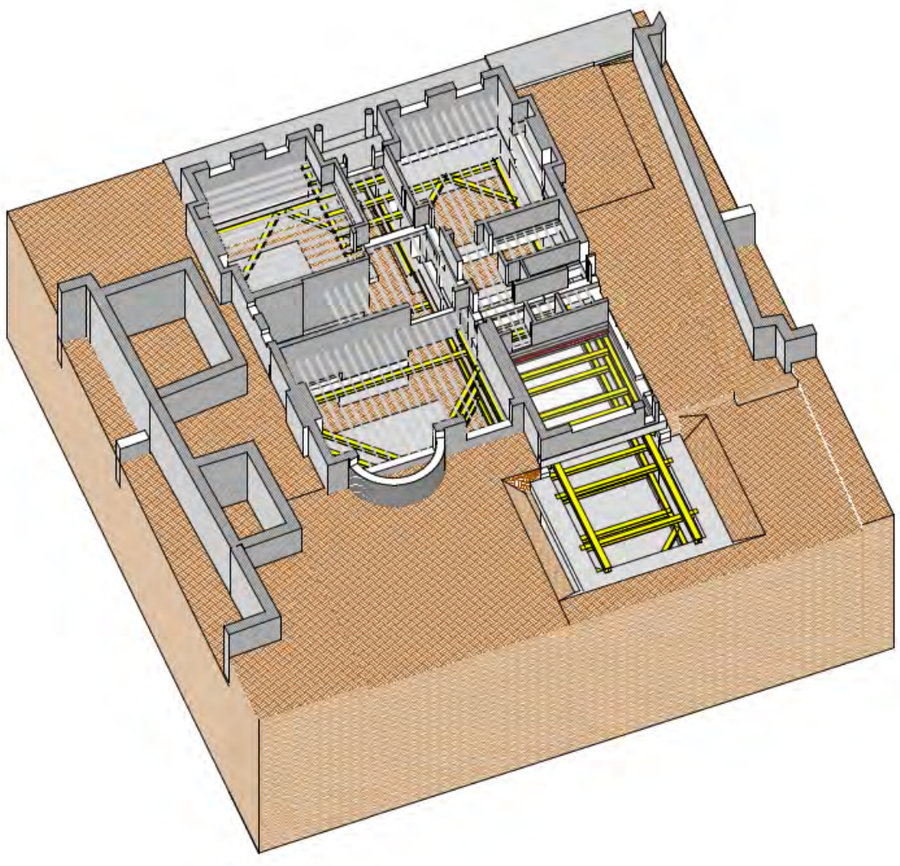
- Install the remainder of underpins to proposed basement level in a hit and miss sequence in accordance with the specification and install propping as required.
- Install underpins to proposed pool level in a hit and miss sequence in accordance with the specification and install propping as required.
- Ensure that the underpins are propped with props and walers to ensure stability.



5 Outline Construction Sequence

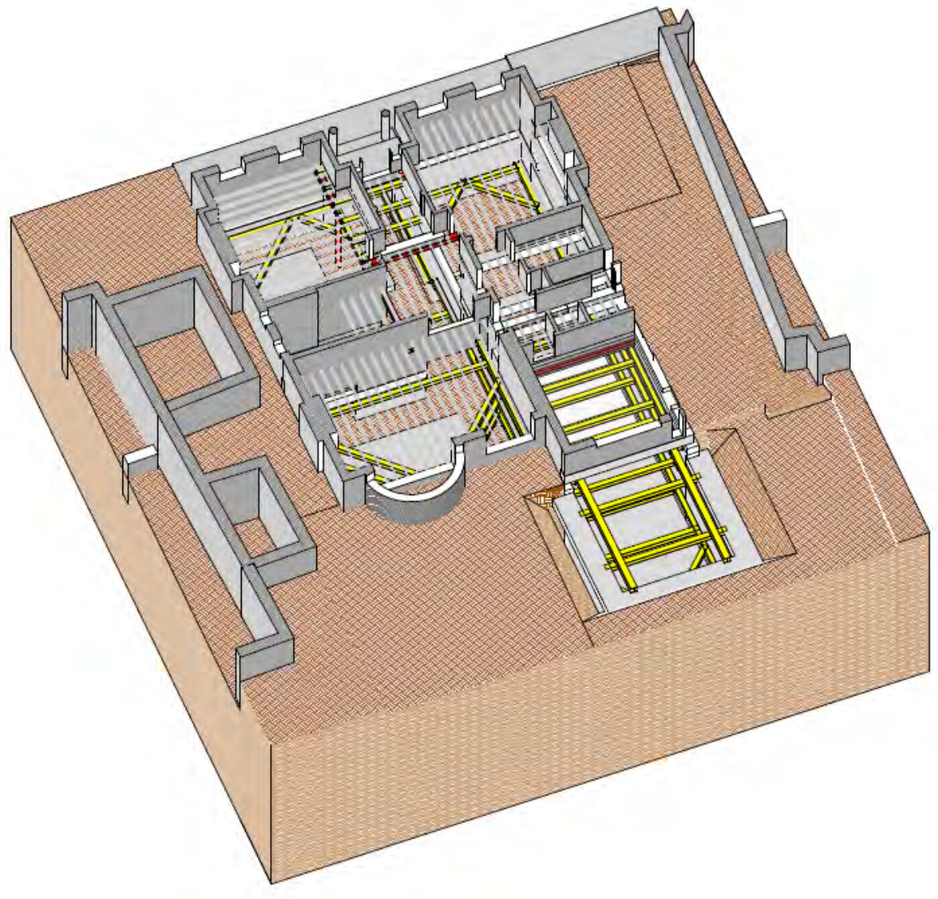
STAGE 13 – CAST BASEMENT RC SLAB AND RC LINER WALLS

- Prepare and cast proposed basement floor RC slab.
- Prepare and cast RC liner walls.
- Temporary works to be adjusted where necessary to ensure stability is retained.



STAGE 14 – INSTALL PROPOSED STEELWORK BENEATH ENTRANCE

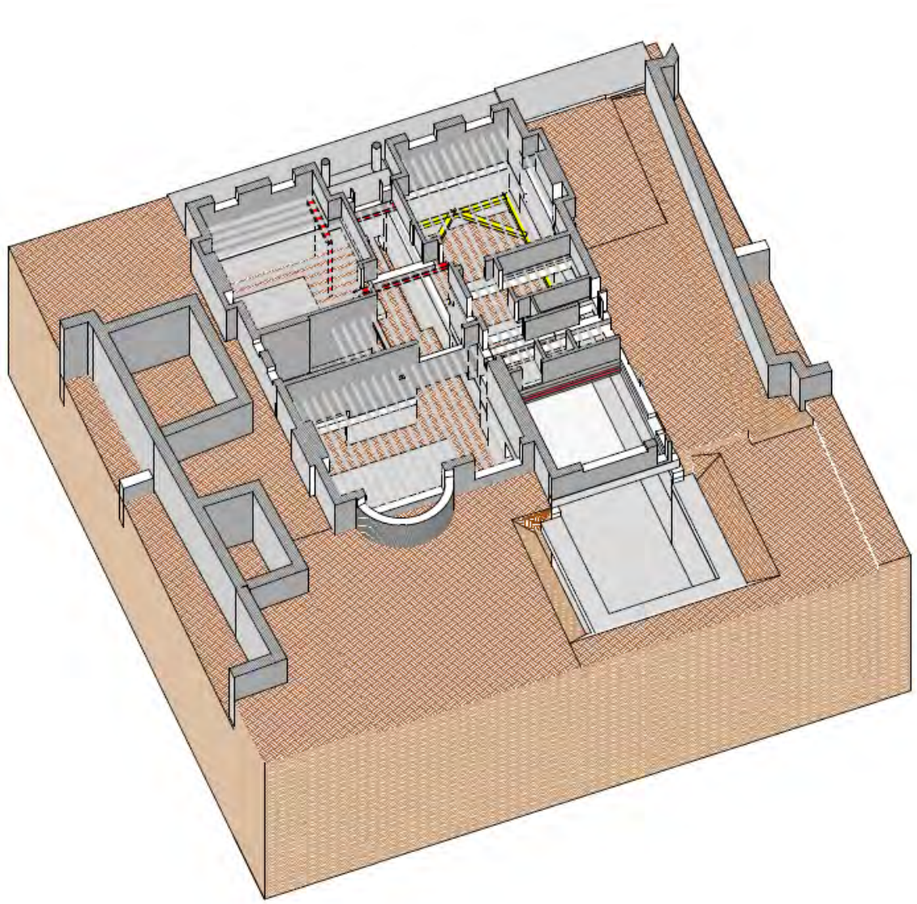
- Install new beams and columns to the underside of the entrance way load bearing walls.
- Ensure the top of the beams are packed tight to the underside of the existing masonry.



5 Outline Construction Sequence

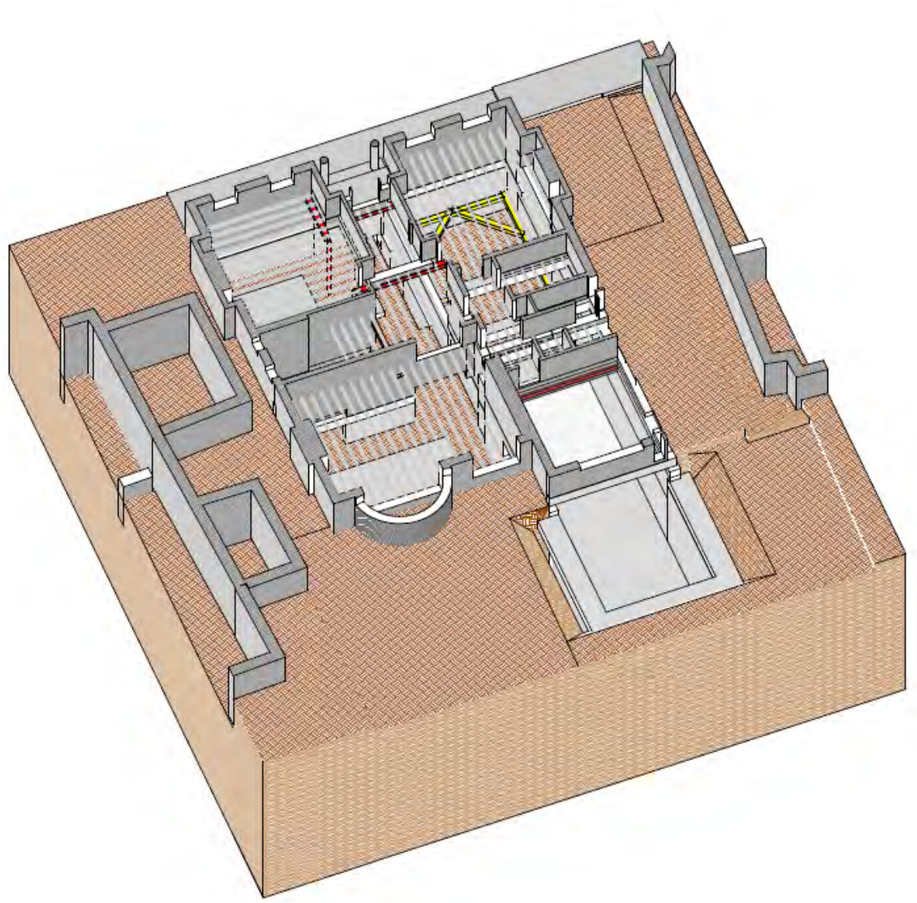
STAGE 15 – REMOVE TEMPORARY WORKS EXCLUDING PLANT AREA

- Following the previous stage the RC basement box beneath the house is now complete and the remaining horizontal temporary propping and vertical needles below can now be removed.
- Temporary works to the plant area are to remain.



STAGE 16 – INSTALL REMAINING UNDERPINS TO PLANT AREA

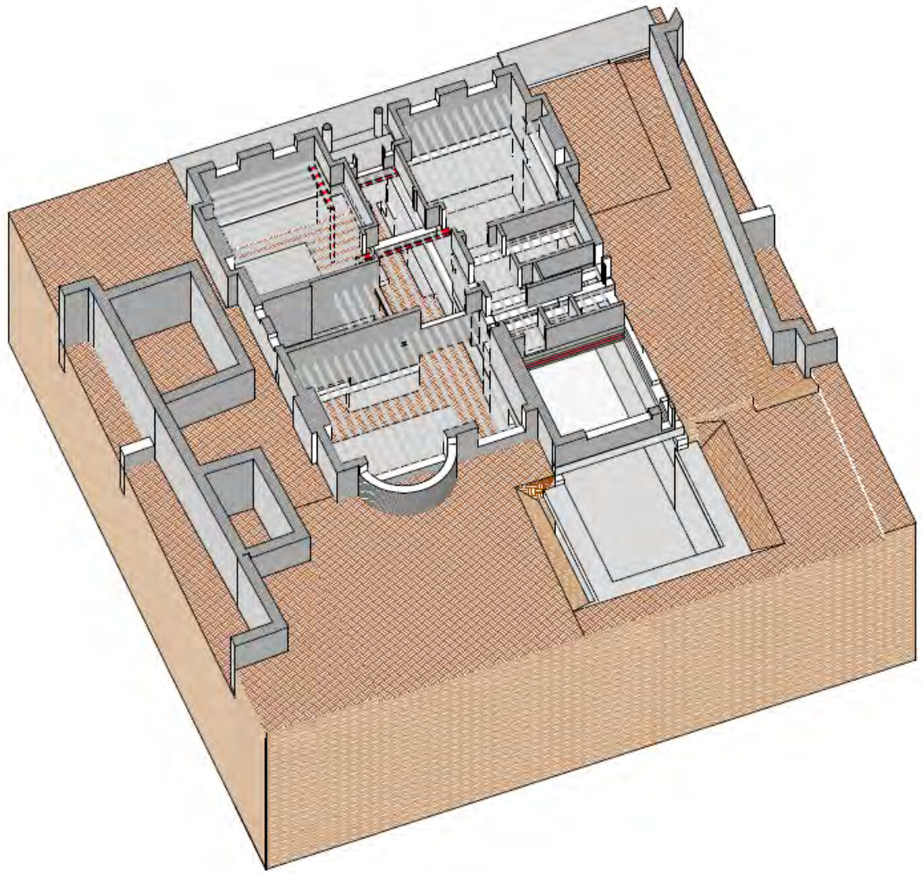
- Install the remainder of underpins to the plant area in a hit and miss sequence in accordance with the specification and install propping as required.
- Ensure that the underpins are propped with props and walers to ensure stability.



5 Outline Construction Sequence

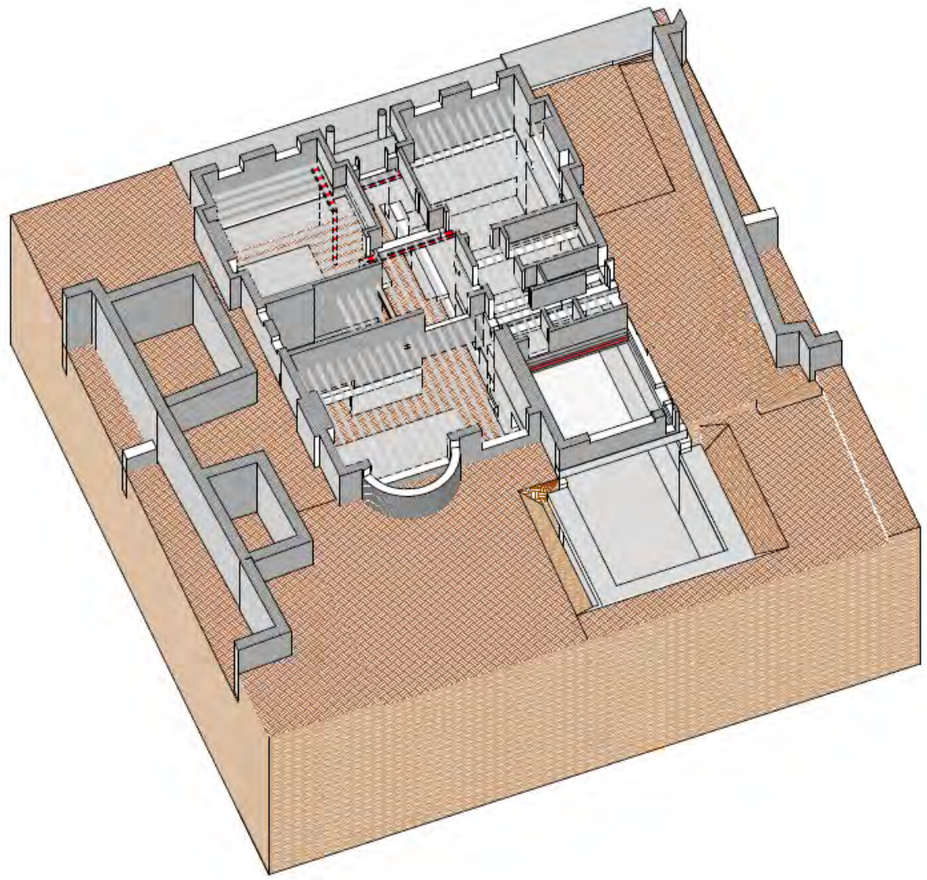
STAGE 17 – REMOVE REMAINDER OF TEMPORARY WORKS

- Following the previous stage the RC basement box in the plant area is now complete and the remaining horizontal temporary propping below can now be removed.



STAGE 18 – CREATE OPENINGS

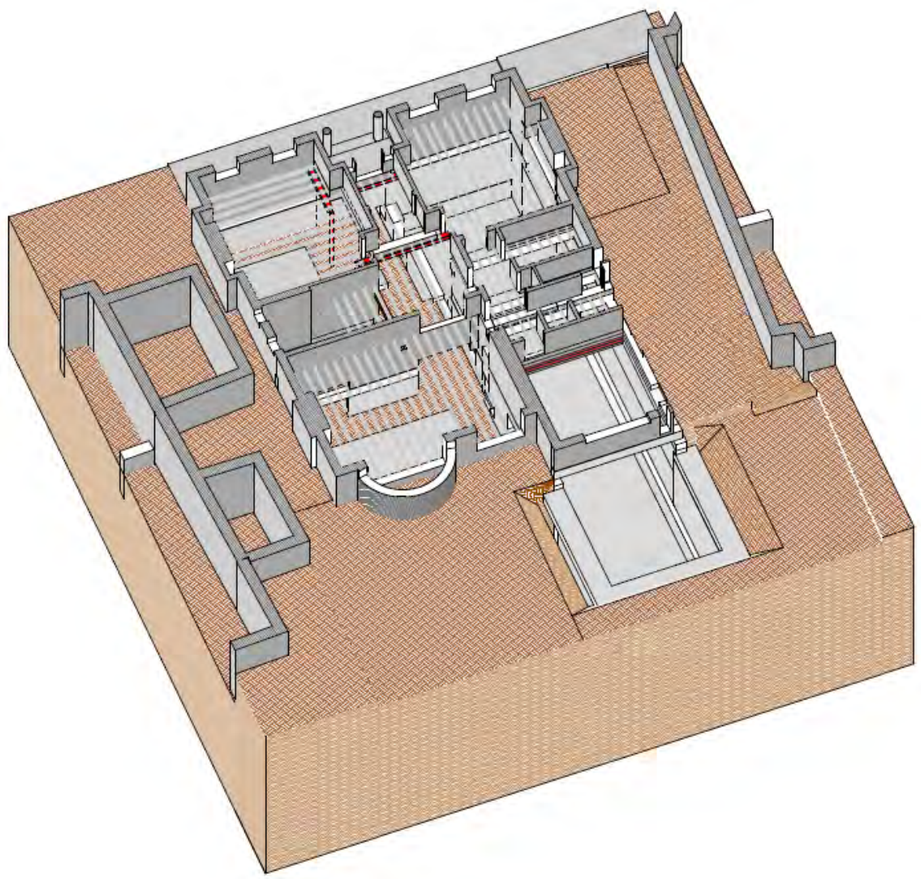
- Openings to be created in mass concrete underpins beneath Pynford beams, and existing low-level masonry.
- Openings to be created carefully by saw cutting or other techniques which have limited vibration impact on the existing structure over.



5 Outline Construction Sequence

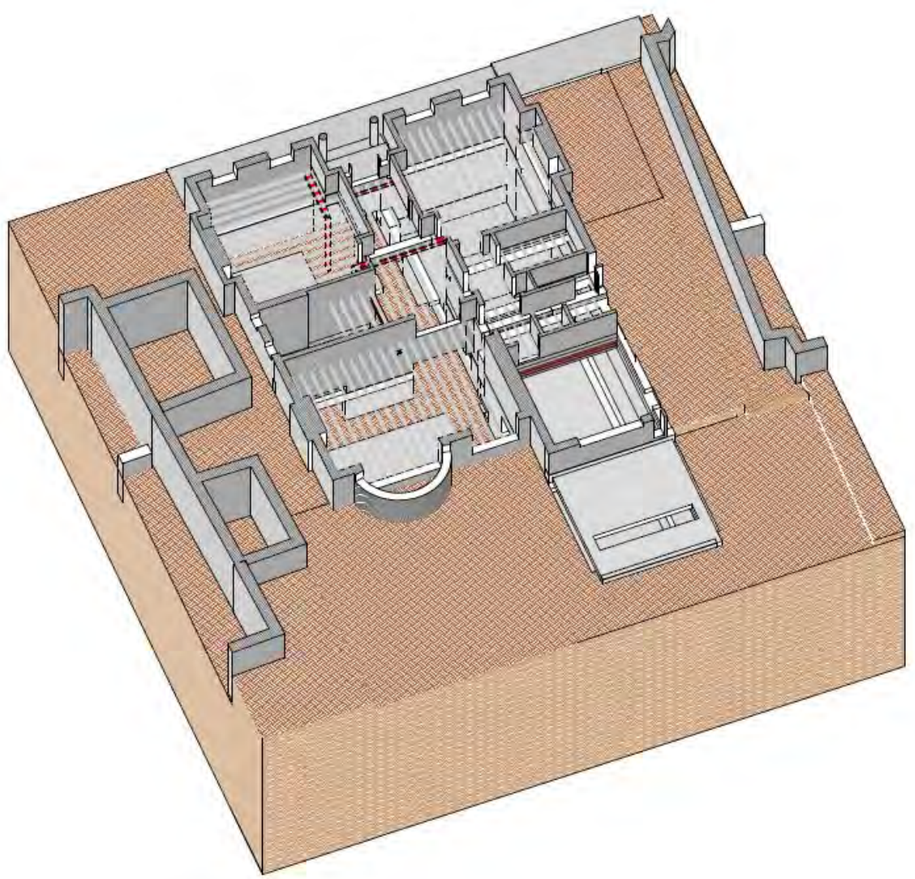
STAGE 19 – INSTALL NE RC POOL BOX

- Prepare reinforcement and cast RC pool box, allowing curing.



STAGE 20 – CAST RC SLAB TO CAPPING BEAM

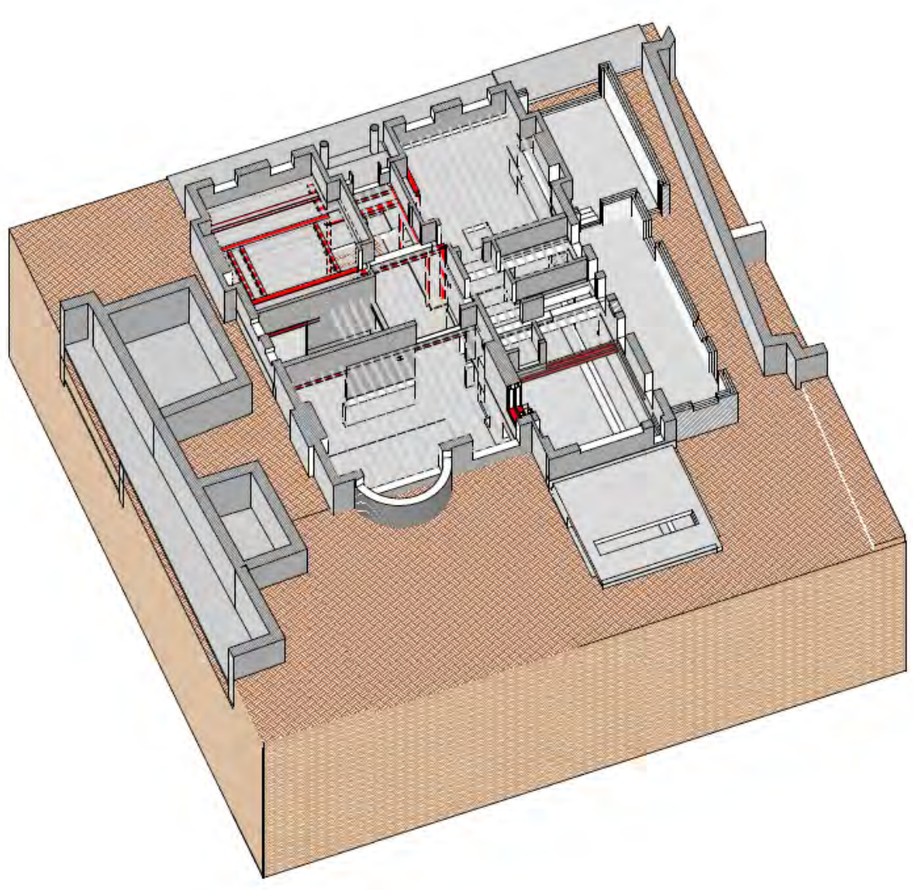
- Prepare reinforcement and cast new Ground Floor slab, allow curing and leave an opening for the proposed light well.



5 Outline Construction Sequence

STAGE 21 – INSTALL TRENCH FOOTINGS AND NEW EXTENSIONS

- Install trench footings for the side extension and garage.
- Footings beside 23 heath drive to be cast in hit and miss sequence similar to basement underpinning to mitigate under mining neighbouring footings.
- Once cured install new RC slab and beam and block flooring and continue with superstructure works.



STAGE 22 – COMPLETE THE RAMINDER OF STRUCTURAL INSTALLATIONS, NON STRUCTURAL INTERNAL FIT OUT AND LANDSCAPING

- Fit out the interior.
- Install landscaping.

Appendix A

Preliminary Form SD Structural Drawings

Drawing No.	Drawing Title	Revision
L(00)01	Existing Lower Ground Floor Plan	P1
L(00)02	Existing Ground Floor Plan	P1
L(17)01	Proposed Plant Level Plan	P2
L(17)02	Proposed Basement Level Plan	P3
L(23)01	Proposed Lower Ground Floor Plan	P3
L(23)02	Proposed Ground Floor Plan	P6
L(23)03	Proposed First Floor Plan	P3
L(23)04	Proposed Second Floor Plan	P3
L(23)05	Proposed Roof Plan	P3
A(28)01	Proposed Cross Sections A-A & B-B	P3
A(28)02	Proposed Cross Sections C-C & D-D	P4
A(28)03	Proposed Cross Sections E-E & F-F	P4
A(23)01	Proposed Sections & Details	P2
A(23)02	Proposed Upper Floor Sections & Details	P1
A(28)50	Proposed Steel Roof Truss – Sheet 1	P3
A(28)51	Proposed Steel Roof Truss – Sheet 2	P2
A(28)52	Proposed Steel Roof Truss – Sheet 3	P3
A(28)53	Proposed Steel Roof Truss – Sheet 4	P2

Appendix B

Burland and Potts Building Damage Classification Table

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.	

Notes

1. In assessing the degree of damage, account must be taken of its location in the building or structure.
2. Crack width is only one aspect of damage and should not be used on its own as a direct measure of it.

Form

Appendix C
Structural Calculations