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Construction Method Statement for the Proposed Basement Extension

to

2 Denning Road London NW3 1SU

Client

Mr and Mrs J Khavari

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Construction Method Statement

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INDEX

1. INTRODUCTION

1.1 We were instructed by Mr J Khavari to assess the engineering feasibility of forming a basement space at 2 Denning Street, London NW3 1SU. The property is a large detached three storey house featuring an existing partial basement.

1.2 An architectural arrangement has been prepared by Mr J Khavari of KNM Architects showing the proposed basement. It is to be constructed below the corner courtyard and the garages facing Denning Road and Willoughby Road to provide a basement swimming pool and a cinema room.

1.3 This Report presents the outcome of our investigations and presents our proposed methodology for forming the basement space.

1.4 Appendix 2 has a selection of photographs taken of the site.

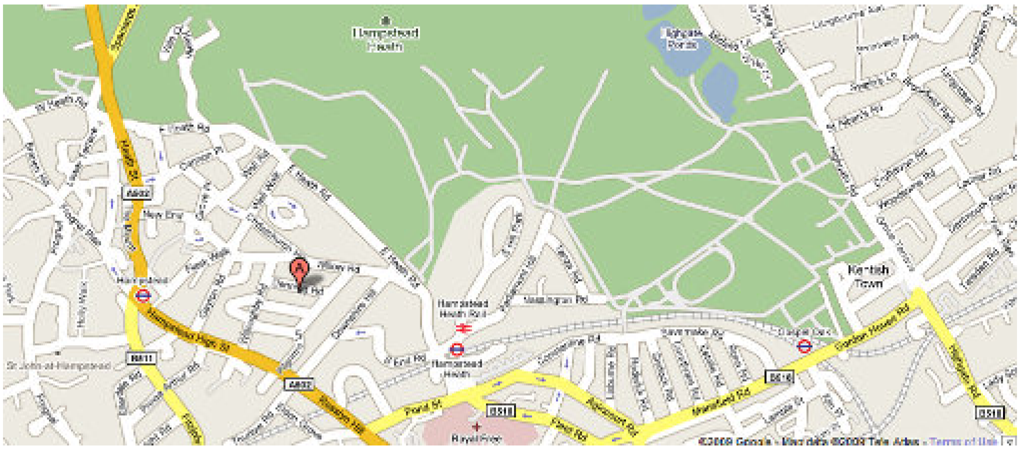

Fig 1: Location Plan (courtesy of google maps)

2.0 SITE DESCRIPTION

2.1 The existing house at 2 Denning Street was constructed in the late 19th century. *'A History of the County of Middlesex: Volume 9'* by C R Elrington (Editor), T F T Baker, Diane K Bolton, Patricia E C Croot, states that the estate (comprising Denning, Willoughby, Kemplay, and Carlingford Roads and Rudall Crescent) was laid out by the British Land Co by 1878, and houses there and on the Willow Road frontage were complete by 1886.

2.2 The house is spread over three storeys and also features an existing basement which is currently being used as a self-contained one-bedroom residential unit. The house is largely square on-plan, and the ground floor is occupied by a number of interconnected reception rooms, with six bedrooms and bathrooms on the upper two storeys. The corner of the site is occupied by three garages and one parking space, with the space between the house and the garages being used as a small garden.

2.3 The local geology of the Hampstead Hill is characterised by a layer of the Claygate and Bagshot sands covering a thick stratum of London Clay which forms the great bulk of the hill. A clay stratum is the preferred material for underpinning works as the cut face of the excavation will normally support itself long enough to allow the concrete works to be carried out and for the concrete to gain sufficient strength to retain the soil permanently. If sandy ground is encountered temporary support can be provided by timber boarding until the concrete has been placed. It also provides a good material for bored piling since the walls of the shaft remain vertical during the process, providing a good and straight face of the pile, as well as offering good soil shear and compressive strength.

2.4 The site was subject to a detailed soil investigation for the basement underpinning works carried out in 2004. Although the report is fairly comprehensive, the boreholes were only taken down to a depth of some 3m, as this was the depth of the proposed underpinning. As expected, the investigation has revealed London Clay at the depth of some 1.5m, with sandy clays over.

2.5 Further soil investigation was carried out in August 2010. An additional borehole was sunk to a depth of 15m to record the underlying strata and to establish the ground water table. The borehole was sunk in the lower courtyard, hence the level of the top of the borehole corresponds to a level some 1.0m below the level of the top patio. The borehole recorded no changes in strata, with clays down to the level of the bottom of the borehole. Some water seepage was observed at a level of -5.5 (some 1m below the level of the proposed basement), with the standing water table established at a depth of some 11.6m. The full soil inspection report ref G/081004/101 is attached to this planning application.

2.6 The risk of water ingress into the excavation will depend on the presence of sandy layers within the clay stratum. The initial investigation has established the ground water level below the level of the excavation. We have also been able to obtain historical borehole records and these confirm that the ground water table is deep. Although the ground water table varies with time, it is likely to remain at or below the level of the propose excavation. Some dewatering may be required during the construction phase should seepage occur.

2.7 We have not seen any records of utility services – it is possible that drains and other service pipes pass under the garden from the main house or from the gardens of the adjacent properties. These will need to be identified and accommodated in any basement works.

3.0 STRUCTURAL WORKS AND PARTY WALL MATTERS

3.1 For domestic scale works there are three techniques mainly used for creation of basement areas. These are:-

3.1.1 traditional underpinning – the ground underneath the existing foundations is excavated in short sections and mass or reinforced concrete is cast into the hole to form a “pin”. The length of the pin is typically 1m to 2m. The pins are constructed in a “hit & miss” sequence which preserves the stability of the building above as the construction proceeds. The pins are normally connected by steel dowel bars – once the sequence of pin construction is complete the remaining soil can be excavated to create the basement.

3.1.2 piling – two types exist : driven and bored. Driven piles are precast concrete or steel and are hammered into the ground. This type is not appropriate here because of very limited access and the vibrations are likely to damage the existing buildings and the noise would likely to cause problems with neighbours. Bored piles are created by using a piling rig to drill a hole into the ground to a calculated depth – the hole is filled with concrete and steel reinforcement. The pile depth is calculated so that once the construction of piles is complete and the soil in the basement is excavated there is sufficient pile embedded into the underlying soil to ensure the wall created is stable. Because the piles are formed using a piling rig if there is restricted headroom or difficult access piling may not be practicable. However, in this particular case the piles are to be installed externally, and hence the headroom would not present a problem.

3.1.3 conventional Retaining Walls - Where it is possible to create an oversize excavation, in which conventional construction techniques can be used, retaining walls provide the most cost-effective and the safest solution. A large inclined or stepped excavation is performed and the freestanding retaining wall is constructed in reinforced concrete or using reinforced concrete blocks which are then in-filled with structural concrete. The excavation is then backfilled once the concrete has set.

3.2 In this case the fact that the basement walls lie on the boundary of the plot creates Party Wall Act issues, namely:

3.2.1 if either Denning or Willoughby Roads are public highways which are the responsibility of the local highway authority (Camden Council) they have an interest in ensuring that (for both the temporary/construction and permanent cases) any retaining walls are capable of withstanding any loading from the heaviest possible vehicles (typically fire engines/refuse vehicles) etc).

3.2.2 the garage wall – the existing garage is currently under long lease by the owner of the main house, and as such Party Wall notice must be served to the tenant. As referred to earlier, this wall supports a flat roof of the garage and any underpinning of the wall to create a basement will have to accommodate the loading from this roof. This means that the construction technique used has, ideally, to be able to be constructed from outside the garage.

3.3 Considering the above constraints we have prepared a structural scheme which is shown in the planning drawings ref. 0908-466-107 to 112.

3.4 A combination of different techniques is to be used to form the new basement walls taking into account different party wall and access conditions. These new sections of wall would carry the horizontal retaining pressure from the retained soil, as well as the vertical loading of the existing garage walls and the weight of the 1.0 to 1.3m of soil to be placed over the new basement to allow for the tree replanting zones. The load needs to be taken down to a level beneath the new basement level:-

3.4.1 Contiguous piling is proposed to the boundary walls adjacent to the pavement at Denning and Willoughby Roads. The proposed piling is to be adequately sized and is to be embedded sufficiently deep into the London Clay for it to remain stable during construction. It is a common technique and is relatively quick to install with minimum disturbance and it is to provide a safe restraint to the public pavement.

The retained height of the soil varies is generally around 3.5m under the latest proposal. As such, it is possible to design the piles as cantilevered freestanding retaining walls. Alternatively, a much more practical solution may be to provide temporary and permanent props to the tops of the piles. For this reason we may recommend a two stage construction schedule where the shallower cinema section of the basement is to be constructed first. This would allow for the swimming pool piles to be propped of the cinema room structure before excavating to a full depth of the swimming pool. The piles are to be accurately sized following a detailed ground investigation carried out at a later date and prior to the start of construction.

Following the demolition of the existing boundary wall, it should be possible for the piling rig to access the courtyard and install the piles from within the site, and avoid disruption to the public roads. The public pavement will be occupied for the minimal amount of time to allow for the wall to be demolished and the piles to be installed. Once this is done, the temporary fencing can be moved almost in-line with the original fence adjacent to the newly installed piles to allow for the remainder of the basement to be constructed.

3.4.2 The underpinning to the garage wall is to be constructed in five sections using a hit-and-miss pattern to preserve stability. It is a conventional and cost-effective technique. Since the vertical load from the garage wall is nominal, it should be possible to construct the pins eccentric to the wall to maximize the available space in the basement. It may be necessary to provide temporary restraint to the pins for the construction phase of the works to prevent the lateral movement of the top or the bottom of the pin. Some underpinning may also be required to the existing bay-window of the house adjacent to the new swimming pool.

3.4.3 The retaining walls at the junction of the main house and the basement are set well away from the walls and footings of the main house. It should be possible to construct these walls using conventional cut and fill methods to save on the construction cost. We have found a quick and the cost-effective solution for constructing retaining walls is by using hollow concrete blocks with vertical and horizontal reinforcement inserted in the voids and joints within the blockwork. The hollow blocks are then in-filled with structural concrete to form a solid wall. This method of construction saves on the cost of formwork associated with casting solid RC walls. The same technique can be adopted to form the swimming pool and cinema walls facing the car-port area. The backfill material must provide a suitable growing medium; hence the replaced soil should conform to the existing soil profile.

3.5 Once the structural works are complete (including any drainage works necessary) insulation and waterproofing will be installed.

3.6 The construction of the basement will result with the removal of a large amount of excavated material, as well as delivery of large amount of concrete and topsoil in the latter stages of construction. A Construction Management Plan should be prepared with assistance from the Camden Council Transport Planning department. The clients hereby agree to a Section S106 contribution towards preparing the CMP.

3.7 It is also assumed that the section of the pavement at Willoughby Road and Denning Road and the vehicular crossover will likely be damaged during construction. For this reason council will seek a S106 Legal Agreement to cover the cost of repaving the footway. The clients hereby agree to a S106 Legal Agreement to cover the cost of repaving.

4.0 SPECIALIST TECHNIQUES REQUIRED

4.1 We enclose in Appendix 4 literature describing some of the specialist techniques required for this work:

4.1.1 mini-piling rigs
4.1.2 underpinning

5.0 ENVIRONMENTAL ISSUES

5.1 By environmental issues we mean the potential for temporary and permanent impacts on the local environment from the works.

5.2 Temporary impacts include:-

5.2.1 Noise – the majority will come from the operation of mechanical plant, particularly compressors, excavators, piling rigs and hydraulic breakers. Normally conditions will be applied to any planning consent limiting the intensity and duration of noise arising. It may be necessary to restrict noisy operations to particular periods of the day.

5.2.2 Vibration – works which involve breaking out or drilling into existing hard structures has the risk of transmitting vibration to adjacent buildings.

5.2.3 Dust – a planning condition may require the damping down of dusty activities.

5.3 The biggest sources of disruption associated with the construction of the basement will be piling and excavation works associated with the use of heavy machinery on-site. However, with careful planning, it will be possible to finish the works in the minimum amount of time. The piling, which is the most disruptive operation, can be done relatively quickly, after which the excavation can be completed in some two-three weeks whilst adhering to normal working hours.

5.4 The use of piling will cause minimal disruption to the local traffic. As described previously, it can be carried out from within the site, with temporary fence for the pavement to allow for the demolition of the existing boundary wall and the installation of the piles. This should not take more than two weeks, after which it should be possible to reposition the temporary site fencing almost in-line with the existing boundary wall. Some disruption is to be expected for the delivery of materials and removal of spoil, but not more than what is expected for any other type of construction works.

5.5 Energy Use and CO_2 Emissions - Great care must be taken in reducing the impact of buildings on the environment. It is considered that 25% of CO_2 emissions come from the construction industry including the emissions associated with manufacturing materials, transport, construction and demolition of structures. Generally the excavation of basements requires moving large quantities of material, and installation of concrete. However, over the long term, basements are generally better insulated by the surrounding earth, providing savings in heating and cooling costs. In addition, above standard insulation, and low energy lighting should be installed to the building to reduce long term impact. To reduce the use of artificial lighting and mechanical ventilation, an atrium is to be provided to bring natural light into the bedrooms. The contractor should also consider using recycled materials in the construction of this basement.

5.6 No permanent negative impact is to be expected of this purely residential development.

6.0 EFFECTS OF THE BASEMENT DEVELOPMENT ON WATER RUN-OFF AND THE WATER ENVIRONMENT IN THE LOCAL AREA

6.1 The site was subject to a detailed soil investigation for the basement underpinning works carried out in 2004. In total, two trial pits were excavated down to a depth of some 3m. No ground water table was recorded at the time, neither at the bottom of the trial pit, or at the interface between the sands and the clays. In addition, as described earlier, the historical borehole records indicate that the ground water table was very deep. Further investigation was carried out in August 2010, and the standing ground water table was recorded at a depth of 11.6m below the existing ground level. Slight water seepage was observed at a depth of 5.5m, which is also below the level of the proposed basement.

6.2 Although the ground water table varies in time, it is unlikely that it is near the surface and the site is near the top of the hill. As such, the proposed basement extension is unlikely to adversely affect the local water environment of the area or water runoff. The site is not situated within a flood zone.

7.0 CONTRACT STRATEGY

7.1 It seems to us that the procurement and management of the project could be taken forward in several different ways.

7.2 There is a clear difference in the skills and experience required of the contractor carrying out the basement construction compared to those needed for the general fit-out, superstructure and finishing works.

Option 1

7.3 The Architect acts as the overall Contract Administrator and prepares a single contract specification. A standard RIBA JCT conditions of contract would be used. A main building contractor would be appointed following a competitive tender and he would be responsible for appointing and managing a specialist sub-contractor to carry out the basement groundworks. We would provide design services only for the basement and structural design of the limited superstructure elements.

Option 2

7.4 The Architect acts as the overall Contract Administrator but prepares two contract specifications – one for the basement shell and one for the fitting out and superstructure works (to include alterations to existing building). Each contract would be tendered separately and managed sequentially. The basement contract could proceed before the other has been let (or even tendered). Appropriate JCT conditions of contract would be used. We would provide design services only for the basement and structural design of the limited superstructure elements.

Option 3

7.5 We are appointed as Engineer to a separate groundworks contract which we would prepare and administer. The conditions of contract could be JCT Minor Works or, our preference, the Institution of Civil Engineers Minor Works Contract. The Architect would prepare a separate, follow-on contract for all other works. We would supervise all the works to create the basement shell – when complete our contractor would leave site and the building works contractor would take over the site and complete his works. Our appointment would include design services as above.

7.6 We consider Option 3 is a good one because the most expensive element of the work can be subject to proper price competition. The Architect (with all due respect) is not an expert on groundworks and we feel better control of the groundworkers will be achieved if we have direct responsibility for managing them.

8.0 HEALTH AND SAFETY ISSUES

8.1 The construction of basements is generally hazardous. A detailed health and safety plan must be prepared by a competent contractor and approved by the local authority prior to the commencement of work. It must include at least the following issues.

8.2 Access on site – Safe and adequate access must be provided to all parts of the site, and site must be kept tidy. All edges where people could fall from height must be provided with double guard rails and all holes must be safely covered. Adequate lighting must be provided, as this is a below-ground development.

8.3 Adequate welfare facilities must be provided and kept well maintained and clean. A section of the flat is to be allocated for welfare facilities. Welfare facilities are to include a site office, changing rooms, washing facilities, clothes storage, etc.

8.4 All temporary works must be carefully designed, constructed and inspected to ensure the stability of the structure during all stages of the construction. We believe that our preliminary design allows for this as described in previous chapters and as indicated in the attached drawings.

8.5 Excavations - Serious injury or even fatal injury could occur if a worker gets trapped in inadequately supported excavation as well as from falling objects and ingress of water/gases into excavation. Adequate safety procedures must be in place at all times. When the excavated material is likely to be sands, sheeting must be provided and adequately propped. Barriers must be provided at the edge of the excavation to prevent people falling in, and ladders provided for access. Materials, spoil and plant must be stored away from the edge of the excavation to reduce the chance of a collapse.

8.6 A detailed method statement and sequence of works must be prepared and approved in connection with the proposed underpinning and piling works. Please see previous sections explaining the steps required to ensure the stability of the structures. All specified temporary horizontal and vertical propping must be provided as per the design. In addition, adequate emergency procedures need to be developed and put in place.

8.7 There is a risk associated with working in the vicinity of underground services to include damage to existing services, electrocution, gas, explosion/fire, release of sewer gases and contamination of water supplies. A utilities search of the area has been performed, and all public utilities appear to run under the pavement and under the street. The stability of these services must be maintained throughout the Works. In addition, private services must be identified and adequately marked, isolated and secured during the construction.

8.8 Standard procedures should be utilized for safe loading and unloading of goods and staff must be adequately trained for safe manual handling of materials and goods. In addition, staff should be trained to safely use and maintain tools, hoists and other machinery. Dangerous parts must guarded, eg gears, chain drives, projecting engine shafts. Adequate over-night storage must be provided to prevent theft and damage.

8.9 Loading and unloading goods and traffic management – There is a risk to both the workers and general public/pedestrians associated with loading and unloading goods. An exclusion zone must be set-up and a method of loading/unloading must be prepared. Adequate safety footwear and gloves must be utilized. Traffic management measures have been addressed in the previous chapters.

8.10 Emissions and Hazardous substances – The site must be kept well ventilated to prevent the build-up of hazardous gasses. Provide a high capacity ventilation system with backup. Finally, the soil should be inspected for the presence of radon, with measures taken to mitigate the risk if radon has been detected. Other hazardous substances such as asbestos, lead, solvents, paints, cement and silica dust must be identified at an early stage, and these should be adequately cared for and used in a safe manner.

8.11 Fire – To prevent burns or smoke inhalation injuries, adequate procedures must be put into place. Reduce the quantity of flammable materials, liquids and gases kept on site to a minimum, and store these properly. Flammable gas cylinders must be properly maintained, and always be returned to a ventilated store at the end of the shift and valves checked. Smoking and other ignition sources should be banned in areas where gases or flammable liquids are stored or used. Suitable fire extinguishers and fire blankets must be easily accessible and properly maintained.

8.12 Noise – some aspects of noise have already been dealt in the previous chapter. In addition to protecting the neighbours from excessive noise, further measures are required to protect the workers on site. All sources of noise should be identified and assessed. Workers using such plant should be trained and provided with ear protection. Investigate measures of reducing the amount of noise produced by existing plant, or consider replacing noisy plant.

8.13 Site must be properly fenced off and secured to prevent injury to general public. The skips must be lit. When the work has stopped for a day, the site must be secured, all ladders and access must be removed, the plant must be immobilised, and all dangerous materials must be safely stored.

8.14 A health and safety plan must describe the appropriate procedures for emergencies and for reporting accidents. All staff must be trained to know their role in the event of emergency. First aid provisions should be good enough. Suitable persons should be employed to work on site and must possess adequate training and experience for the job, and all staff and subcontractors should receive adequate health and safety training and be provided with the required safety equipment.

8.15 The information in this chapter is based on the "The absolutely essential health and safety toolkit for the smaller construction contractor"" published by HSE

9.0 DISCUSSION

9.1 This Report is in Draft form and will be expanded as more information becomes available and the project brief is finalised, and once planning has been granted.

9.2 It is expected that the underlying soils will be London Clay (ie clay) which is the preferred material for underpinning works. The latest soil investigation confirms this assumption. The ground water level was recorded well below the level of the proposed basement, as such we can confirm the proposed basement extension is unlikely to adversely affect the local water environment of the area or water runoff.

9.3 Utilities searches are still required prior to the commencement of the works.

9.4 The formation of the basement can be achieved by a combination of traditional underpinning and bored piling techniques, as well as traditional retaining walls. Full details described earlier in the report and indicated in the planning drawings.

9.5 The council is rightfully concerned about the impact of construction traffic, and the applicant agrees to a Section S106 contribution towards preparing the CMP. Similarly, the applicant agrees to a S106 Legal Agreement to cover the cost of repaving the public footpath upon completion of the construction works.

9.6 Success will depend on proper planning and control of the construction process. We would recommend running the groundworks and building works contracts separately. We suggest that we should project manage the groundworks contract with assistance from an independent QS and the Architect.

9.7 We suggest the following timetable should be achievable:-

Further investigations / liaison with the local Authority re planning and working methods / start Party Wall procedures	2 to 3 weeks
Design to tender ie outline sizing sufficient for tender purposes	2 to 3 weeks
Tender process	4 weeks
Finalise design, including submissions to Building Control	4 weeks but can overlap with site works
Groundworks and structural package	16 to 20 weeks
Architects package	8 weeks

9.8 We have not inspected the footings and the structure of the existing building which is covered, unexposed or inaccessible and we are therefore unable to confirm the structural arrangement adjacent to the existing property.

9.9 The property has been inspected and considered in its present state and configuration as of September 2009. It does not cover any additional works that may have been carried out after this date.

APPENDICES