STRUCTURAL ENGINEERING Ltd
58 Crossway, Welwyn Garden City, Herts, AL8 7EE
Tel: 01707 695466
Fax: 01707 692006
Web: www.sts-se.co.uk
Email: sia@sts-se.co.uk

Basement Impact Assessment – Structural Construction Method Statement

For the

Construction of a Basement

at 18 Ornan Road, London NW3 4PX

Client

Southfields Property Company Ltd

Status

Initial Issue

February 2016

Ref: 1206-667-BIA-SCMS

18 Ornan Road London NW3 4PX

Document Issue Sheet

Ref: 1206-667-BIA-SCMS

Basement Impact Assessment – Structural Construction Method Statement

	Name	Signature	Date
Prepared	Marko Nesovic, BEng		08/03/16
Checked	Siavash Sharif, BEng		08/03/16
Signed Off	Graham Fryer BSc, CEng, FICE		08/03/16

Version No.	Pages	Description	Chkd	Date	Aprd	Date
Initial Issue	44+2	Initial Issue	SS	08/03/16	GAF	08/03/16

CONTENTS

1.0 INTRODUCTION

1.1 We were instructed by Southfields Property Company Ltd to assess the engineering feasibility of constructing a basement to a building at 18 Ornan Road London NW3 4PX.

1.2 The initial architectural arrangement has been prepared in-house by STS Structural Engineering. This construction method statement should be read in conjunction with the STS Planning Drawings 1206-667-001 to 005 and STS Construction Method Statement Drawings 1206-667-CM1 and CM2. A selection of reduced planning drawings is included in Appendix 1. A selection of photographs taken of the site is included in Appendix 2.

1.3 This Construction Method Statement presents the outcome of our investigations and details our proposed methodology for forming the basement space.

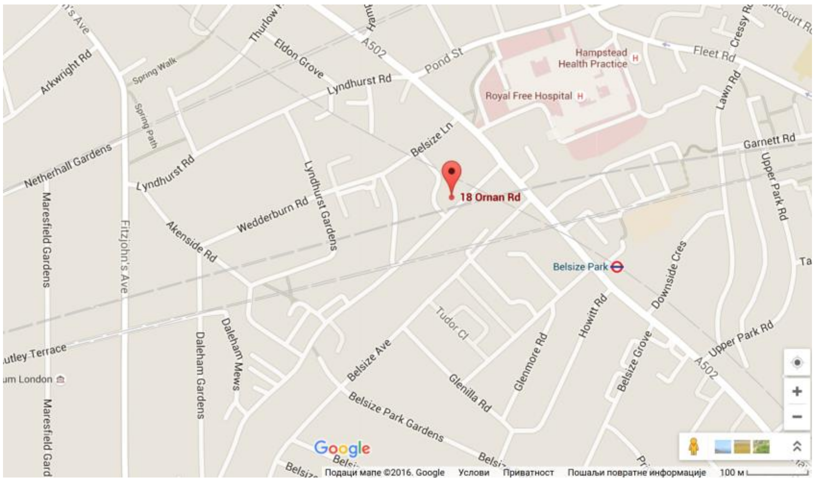


Fig 1: Location Plan (NTS) courtesy of google maps

2.0 SITE DESCRIPTION AND DESCRIPTION OF THE PROPERTY

2.1 The property occupies the ground floor flat of a converted large semi-detached Victorian house. The property is typical of the period and location, is of imposing appearance and features large rooms internally. To the rear, a single storey rear extension and a conservatory are probably later-date additions.

2.2 The external walls are of masonry construction with exposed red brickwork. The external brickwork is generally in a good condition for the age of the property, but we did survey some very minor defects such as minor hairline cracking to the corners of window openings and other hairline cracks. Furthermore, we did identify some localised repairs to the front and rear elevation masonry. Elevations feature a number of timber framed doors and windows which appear to be well maintained and in a fair condition.

2.3 The roof is tiled and pitched and appears to be in a fair condition, although we have only been able to survey it from the ground level. The rainwater goods appear to be in good condition with no notable defects or signs of decay.

2.4 The two rear extensions appear to be in good order with no notable defects. The conservatory features a large glazed roof and timber framed doors. It is unclear whether the insulation of the glazed elements complies with current building regulations to be used as a habitable room. However, it is well constructed and is in a very good condition.

2.5 Overall the external survey of the property confirms that the house is well-constructed and in a good structural condition with no significant defects or any signs of movement.

2.6 A number of mature and substantial trees are situated in proximity of the property. Furthermore, we have also been informed that a large Sycamore tree which has caused significant subsidence to no 20 Ornan Road has recently been reduced in size. There is also a smaller ornamental tree in front of the house at no 18, as well as a large 20m high Poplar tree across the street some 25m away. There are further trees within the rear gardens of no 18 and the adjacent properties. The presence of large trees can cause seasonal desiccation of the underlying clays leading to subsidence problems. We have also noted some signs of movement to the front boundary wall suggesting inadequate foundations or high plasticity soils.

2.7 The property does have a history of subsidence with past structural inspections carried out in 2000 and 2004 to assess the issue. These make reference to severe cracking to the front bay window – likely caused by the buckling of the piers and associated failure of the arch lintel. The 2004 report states that the failure is not subsidence related and also gives recommendations for immediate structural repairs and upgrades. We have not been able to survey any defects to the bay windows suggesting that that the repairs have been carried out to a high standard. The full extent of repairs cannot be established with a visual survey alone.

2.8 The property sits close to the London Underground tunnels. We have liaised with the London Underground and Network Rail (Anglia) to ensure that the proposed development will not adversely affect the existing tunnels. As it turns out, the existing tunnels are very deep and thus not likely to be affected by the works – LU and Network Rail do not object to the proposal in principle. Both the Land Stability Assessment and the correspondence with Network Rail has been submitted with the Planning Application and forms part of the Basement Impact Assessment.

3.0 INTERNAL SURVEY

3.1 The ground floor features three bedrooms to the front and a large living room and kitchen to the rear. The front bedroom features split-level accommodation with an en-suite provided within the raised gallery. The entrance to the flat is situated centrally within the front elevation, with the RHS side entrance door and stairwell serving the upper floor flats.

3.2 Internally, the property is in a fair condition and the finishes are fairly recent, which somewhat limits the inspection as it is entirely feasible that the finishes may be concealing structural defects. Overall, the condition of the property is good and we found few defects worth noting.

3.3 It is worth mentioning that some very minor signs of movement to the main front bay window in bedroom 1 were present in our initial inspection in 2012. The cracks were evident adjacent to the party wall (hairline diagonal wall cracking and ceiling cracks). The cracks were thin and did were not evident in the external survey. We consider the extent of cracking to be small and limited to the front LHS quadrant of the property, and as such is not a sign of a widespread structural problem. Nominal movement such as this is very common in Victorian properties constructed on clays.

4.0 SOIL INVESTIGATION INFORMATION

4.1 A full soil investigation has been carried out by Ground&Water Ltd accompanied by a full interpretative report. The SI data was based on 2No. boreholes and 2No. trial pits excavated to the front and to the rear of the property. The on-site information was supplemented with additional historic information, maps, etc. Please see the full report for more information.

4.2 As expected, the area around Ornan Road is characterised by London Clay overlaid by 1.2-1.75m deep deposits of made ground. London Clay is typically described as high plasticity firm to very stiff clay and generally blue in colour becoming brown when weathered. The clayey nature of the soil is generally a 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. The presence of gravels in the topsoil, however, means that some temporary support may still need to be provided by timber or metal boarding until the concrete has been placed and gained sufficient strength to retain the soil permanently should local site conditions necessitate this.

4.3 Trial pits have been excavated to the front and the rear of the property to establish the formation of the existing footings. These have been surveyed as fairly shallow, albeit fairly substantial with a concrete strip. It is unclear whether the concrete strip footing is original to the property or whether it was providing during past underpinning. The trial pits information is shown in the SI report by Ground&Water and reproduced in Appendix 3.

5.0 GROUND WATER CONDITIONS, HYDROGEOLOGY AND THE EFFECT ON GROUND WATER CONDITIONS

5.1 The Ground Investigation Report referenced in the previous chapter provides an in-depth ground water assessment. The ground water level was monitored during the drilling operation and as expected within deep clay deposits, no ground water table was surveyed.

5.2 The London clay strata is generally considered as non-productive and thus it is rarely the case that a ground water table establishes at depth. However, some perched groundwater is likely to be encountered during construction, especially within layers of sand or gravel that may be present within clay. Nevertheless, it is unlikely that the need for extensive dewatering measures during the construction of the new basement will arise. Some dewatering of small quantities of perched groundwater may be necessary which can be done using small submersible pumps.

5.3 For more information regarding the ground water conditions and Hydrogeology, please refer to the Ground & Water report and the H Fraser Consulting Basement Impact Assessment – Hydrogeology section.

6.0 EFFECT ON DRAINAGE AND THE IMPACT ON SURFACE WATER FLOODING

6.1 The proposed basement sits largely below the footprint of the existing dwelling house and its existing rear hardstanding area. Three small lightwells will be created, but the surface water runoff from hardstanding areas will is not expected to increase significantly as a result of the proposed development.

6.2 For more information, please refer to the H Fraser Consulting Basement Impact Assessment – Hydrology section.

7.0 PARTY WALL MATTERS AND CONSTRUCTION TECHNIQUES

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

7.1.1 the house shares a party wall with 20 Ornan Road. As far as we are aware, the adjoining property does not feature an existing basement, and thus underpinning will be required to allow for the new basement space to be created. Any underpinning of the party wall to create a basement at 18 Ornan Road will have to accommodate the existing party wall(s) and the loads they support. It also means that the construction technique used has to be able to be constructed from inside the land of 18 Ornan Road, and all works must be constructed subject to party wall approval. The new basement at 18 Ornan Road must be constructed in such a way, as to allow the owners of 20 Ornan Road to construct a similar basement extension at a later date if they so desire.

7.1.2 The new basement will be constructed within 3m of the flank wall of the adjoining property at 16 Ornan Road. A basement at 16 Ornan Road was constructed several years ago, and STS Structural Engineering was appointed as a checking engineer by the Party Wall surveyor to comment on the engineering proposal. With the information on-file it should be possible to compare the depths of the two basements, and if the proposed basement at no 18 is to be deeper, 3m notice should be served upon the owners of 16 Ornan Road.

7.1.3 the new development is situated more than 5m away from the nearest public highway.

7.2 For domestic scale works there are two techniques mainly used for creation of basement areas where it is not possible to create an oversized excavation in which conventional construction techniques can be used. These are:-

7.2.1 traditional underpinning and retaining walls – 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 around 1m. The pins are constructed in a “hit & miss”, conventional 1 to 5 under pinning 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. Propping to the base of the toes to prevent overturning & sliding will be required.

7.2.2 Piling – Bored piles are created by using a piling rig to drill a hole into the ground and filling it with reinforced concrete to form temporary or permanent basement retaining walls. Because the piles are formed using a piling rig, if there is restricted headroom or difficult access piling may not be practicable. Compared to underpinning, more space is lost in the basement due to the thickness of the piled wall which needs to be set away from the existing walls of the house to allow sufficient room for the rig to operate. Due to the size of proposed basement, potential loss of internal space and issues with access, piling is not deemed practical for this particular project.

7.3 We enclose in Appendix 4 literature describing some of the specialist techniques and tanking systems required for this work:

- *Underpinning*
- *Newton drained tanking systems*
- *Mabey props general information*

8.0 METHOD, TEMPORARY WORKS AND SEQUENCE OF CONSTRUCTION

8.1 It is essential to adopt the correct construction method to ensure that stability and serviceability of the existing building as well as that of the neighbouring properties is maintained at all stages of the construction. The structural scheme has been adopted considering the above constraints and is shown in the drawings.

8.2 This construction method statement should be read in conjunction with the STS Drawings 1206-667-001 to 005 and STS Construction Method Statement Drawings 1206-667-CM1 to CM2. In particular, the CMS drawings show the proposed construction sequence and the required temporary works. The new sections of basement wall would carry the horizontal retaining pressure from the retained soil, as well as the vertical loading of the new basement and wall and floors above down to a level beneath the new basement.

8.3 All of the basement walls would be formed using underpinning techniques. The sequencing of the underpinning works is critical in ensuring the stability of the building at all times. Underpinning is normally done in bays not exceeding 1m in length. Adequate support for at least two thirds of the length of the wall is to be maintained at all times. Sections of the work in progress at any one time are to be separated by a distance of at least 2.0m (two pins). The procedure has already been detailed in the previous chapter. All excavation of the pins is to be done by hand and with great care. A toe will be required at the bottom of the pins to prevent the bottom of the pin from sliding in and to provide adequate bearing area.

8.4 The party walls should be underpinned in reinforced concrete - subject to explicit special foundations consent. If consent cannot be obtained, these should be underpinned in mass concrete and then lined with a secondary RC wall internally to resist soil surcharge pressures.

8.5 To safeguard the stability of the pins during all stages of construction, adequate lateral props to the pins must be provided at all times. A steel grillage at ground floor level shall provide a permanent prop to the tops of the pins. Loadbearing walls will need to be supported with temporary needles to allow for the installation of some of the ground floor steels. A further set of props will be required closer to the toe of the pins to prevent sliding as confirmed by structural calculations.

8.6 A suitable construction sequence is to be adopted as indicated in the preliminary structural drawings. Please refer to drawing 1206-667-CM2 showing the outline construction sequence.

8.7 Further investigation is required to determine the formation of the perimeter wall footings and the extent of underpinning required. The typical underpinning details are included in the preliminary structural drawings, and the adequacy of these is justified by structural calculations (included in Appendix 5) based on the assumed existing foundations profile.

8.8 To create a soft transition between the new deep basement footings and the existing, shallower, footings of 20 Ornan Road, we would advise that transition pins be provided to all return walls. Thus would minimise the risk of differential long-term settlement and seasonal clay heave behaviour between the two types of footings. This can be done fully from inside the land of 18 Ornan Road using simple tunnelling techniques whilst providing temporary strutting as shown in the details provided.

8.9 The underpinning of loadbearings walls at 18 Ornan Road to a depth of some 3m to form the new basement will alleviate any long-term subsidence problems with this building by taking the depth of the footings below the tree root influence zone of the nearby trees.

8.10 A section of the flat should be allocated for the use of the contractor to provide site office facilities, welfare facilities incl. changing rooms, showers and W.C., as well as for the temporary storage of materials on-site and overnight storage of construction plant. There is a very real risk of overloading the ground and first floor structures if the refuse and building materials are inadequately stored and badly stacked.

9.0 SLOPE AND GROUND STABILITY

9.1 The immediate site and the surroundings are generally level, i.e. there are no natural or man-made slopes greater than 7º surrounding the property. Taking this into account and also due to the limited size of the proposed basement, it is not likely that the proposed development will initiate any slope instability.

9.2 The removal of soil to form the new basement relieves the overburden pressure from the underlying clays leading to heave in the short and long term. Assessment of the expected lateral and vertical movement has been carried out and the potential damage category assessed.

9.3 Please refer to the Slope and Land Stability report by Ground and Project Consultants which provides a detailed assessment and which forms part of this Basement Impact Assessment.

9.4 The construction of the basement will require that the proposed retaining walls are adequately designed and propped to ensure the stability of the soil and structures immediately adjacent to the proposed basement, however this has been addressed in the previous chapters.

10.0 ENVIRONMENTAL ISSUES

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

10.2 Noise – the majority will come from the operation of mechanical plant, particularly compressors, excavators, concrete pumps 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.

10.3 The proposed underpinning methodology is generally not disruptive. Most of the works would be done by hand without the use of heavy plant. There may be some noise and disruption linked with breaking out and removal of the existing footings or other structures if necessary. The aim should be to perform these works quickly to minimise the disruption caused by these works.

10.4 Vibration – works which involve breaking out or drilling into existing hard structures has the risk of transmitting vibration to adjacent buildings. Again, the aim would be to minimize the duration of these works.

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

10.6 Traffic – construction of a basement normally requires the removal of large quantities of soil. Careful traffic management is required to minimize disruption both to the public road and the pavement. In addition, a small percentage of the excavated material is likely to be made ground, and may be contaminated. Such material must be adequately disposed of. The site is somewhat limited in size and thus the contractor will need to be careful when allocating space for temporary storage of materials/plant as well as refuse. Skips should be placed on the front courtyard for easy removal of large quantities of spoil.

10.7 Archaeology - The site is located within a historic area and the construction of the basement will involve the removal of shallow strata possibly containing archaeological material. Planning conditions may require archaeological assessment of the site. The soil investigation, however, only suggests a thin layer of topsoil is present on-site.

10.8 Energy Use and CO2 Emissions - Great care must be taken in reducing the impact of buildings on the environment. It is considered that 25% of CO2 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, even though the proposed basement is relatively modest in size. 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. The contractor should also consider using recycled materials in the construction of this basement.

10.9 Permanent Impact - No permanent negative impact is to be expected of this development. The proposed basement will provide additional floor area within the developed land in line with current development policies. The proposed development will have very limited effect on the exterior appearance of the building, and as such would not have any negative impact on the street-scene.

11.0 HEALTH AND SAFETY ISSUES

11.1 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.

11.2 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.

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

11.4 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.

11.5 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. Sheeting must be provided to all deep excavations 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.

11.6 A detailed method statement and sequence of works has been prepared in connection with the proposed underpinning 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.

11.7 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 must be performed, and all public utilities must be located and clearly marked on-site. 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 construction.

11.8 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 be guarded, eg gears, chain drives, projecting engine shafts. Adequate over-night storage must be provided to prevent theft and damage.

11.9 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. The contractor should also look at ways of handling refuse removal and deliveries to minimise the traffic impact.

11.10 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.

11.11 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.

11.12 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.

11.13 Site must be properly and secured to prevent injury to general public. 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.

11.14 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 sufficient to cover all reasonable accidents. Nominated and trained first aid person on site at all times. 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.

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

12.0 CONSTRUCTION MANAGEMENT ISSUES

12.1 As discussed in Section 3, Party Wall consent will need to be sought from the owners of the adjoining properties.

12.2 All works must be carried out with full building control approval. A full set of building regulations drawings and calculations to be prepared and submitted to the building control.

12.3 In addition to the standard construction supervision provided by the building control, an additional layer of supervision is normally requested by the council for all subterranean developments. If this is the case for this planning application, the client must appoint a Chartered Civil Engineer (MICE) or Structural Engineer (MI Struct.E) to oversee the works to comply with the planning condition.

12.4 Any construction related equipment, structures or activities on or over the public Highway will require authorisation and/or a licence issued by the Council, acting as the Local Highway Authority. The contractor must coordinate traffic arrangements with other developments in the area, and liaise accordingly with the council transport department. The contractor must also ensure that domestic and commercial waste collections are not disrupted.

12.5 The contractor shall appoint a person in charge of dealing with any complaints from local residents and businesses. His contact number shall be clearly displayed on the site hoarding at all times.

12.6 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. Therefore the client could appoint a single main contractor to handle the entire contract, or he may elect to have two contracts - one for the basement shell and one for the fitting out works.

13.0 DISCUSSION

13.1 This Structural Construction Method Statement forms part of the Basement Impact Assessment in support of the planning application. It should be read in conjunction with the Ground Investigation Report by Ground&Water, the Slope and Land Stability Report by Ground and Project Consultants and the Basement Impact Assessment H Fraser Consulting tackling Groundwater and Hydrogeology, Historical Land Use and Contamination and Hydrology and Flooding.

13.2 The soil investigation, as well as our previous experience in the area indicates deep deposits of London Clay overlaid by a layer of topsoil. Cohesive soils are generally considered to be 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. Nevertheless, some may be required to temporarily support the face of the soil for the concrete to be cast and gain sufficient strength to retain the soil permanently especially given the fact that gravels are present in the topsoil deposits.

13.3 It is our professional opinion that the formation of the basement can best be achieved by using traditional underpinning methods. Perimeter and internal loadbearing basement walls should be formed in segments in a hit&miss underpinning pattern. We would also advise that transition pins be provided to all return walls to provide a transition between the new, deeper, footings and the existing footings of the adjacent attached building.

13.4 Careful planning of the works is required to ensure that all necessary temporary props are in place as required. The permanent and temporary props must provide both adequate lateral restraint to the pins during the underpinning works and also provide temporary support the existing above-ground structure. In addition, excavation must be carefully planned to ensure minimum disturbance. Please refer to STS Planning Drawings 1206-667-005 to 010 and STS Construction Method Statement Drawings 1206-667-CM1 and CM18 for more information.

13.5 If the proposed construction methodology and sequencing of works are carried out adequately, there is minimum risk to the stability of the existing and adjacent properties. The proposed works to 18 Ornan Road are not likely to generate notable movement in the structure of 16 and 20 Ornan Road or other surrounding buildings and roads.

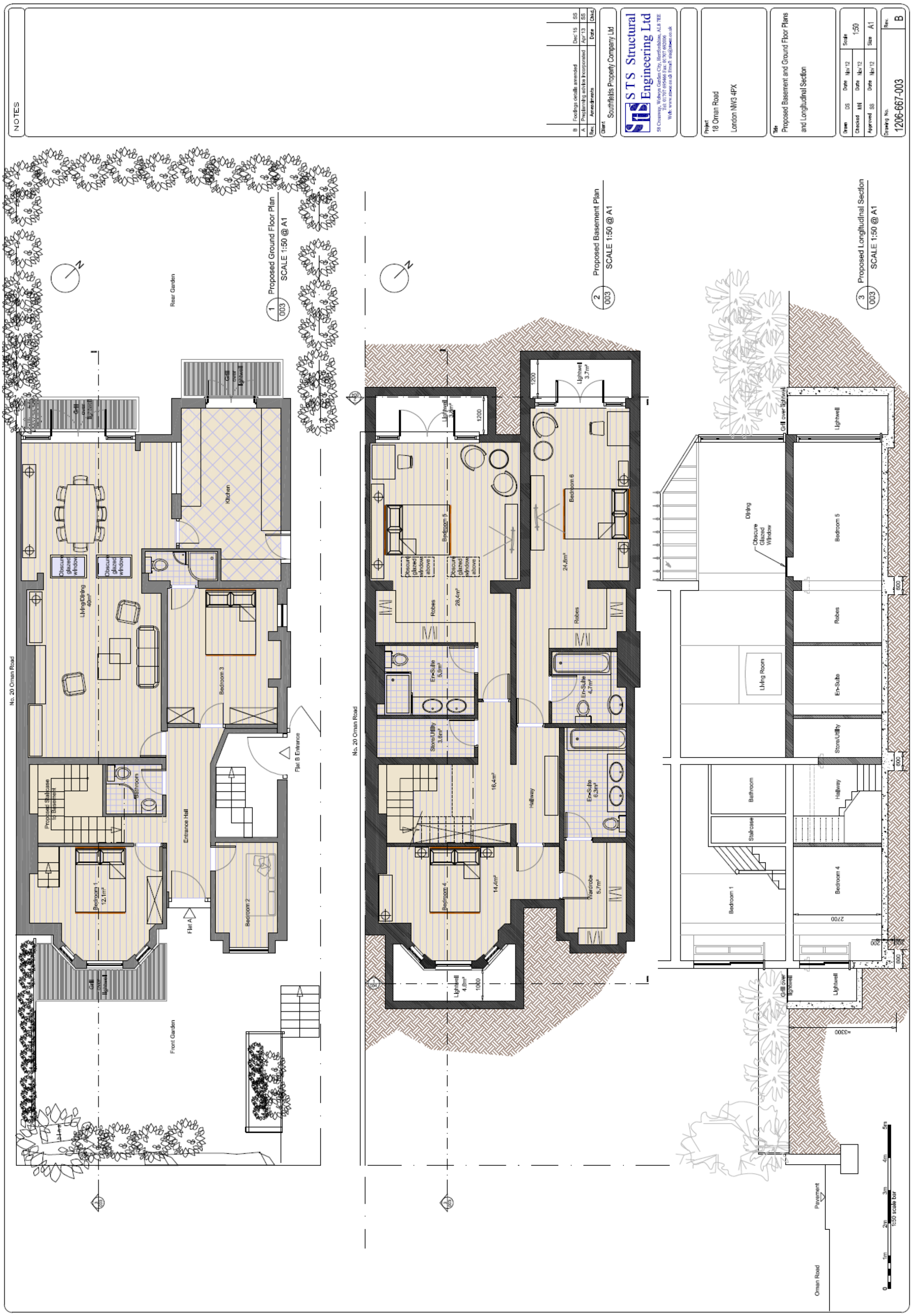
13.6 A full and detailed utilities search is required prior to commencement of any works. In addition, a detailed survey of the existing drainage runs within the site is required and all private services must be carefully identified and accommodated.

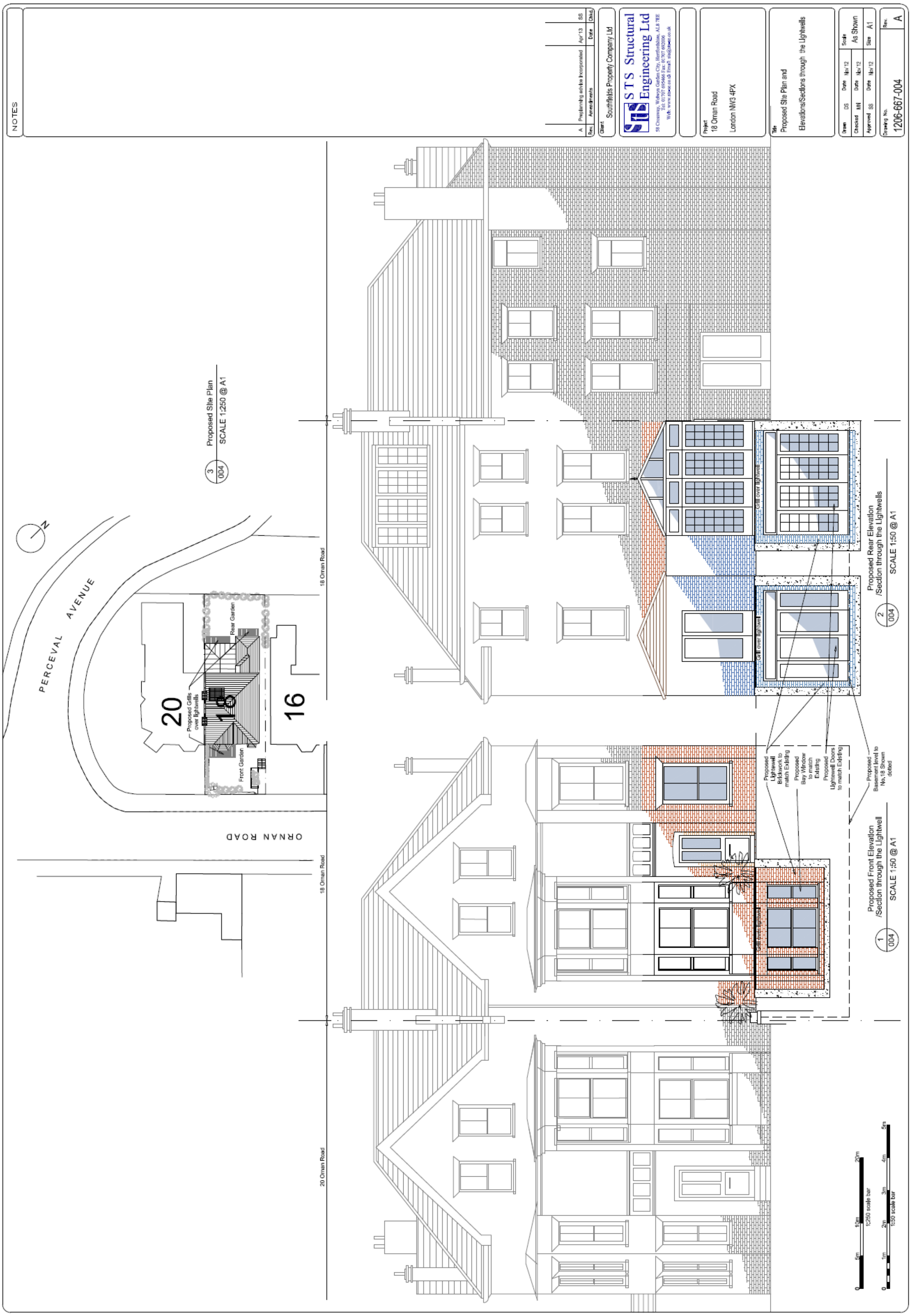
13.7 The property has been inspected and considered in its present state and configuration as of summer 2015.

APPENDICES

APPENDIX 1

A SELECTION OF STS PLANNING DRAWINGS (REDUCED)


NOTES
Proposed Ground Floor Plan
SCALE 1:50 @ A1
Proposed Basement Plan
SCALE 1:50 @ A1
Proposed Longitudinal Section
SCALE 1:50 @ A1
Southfields Property Company Ltd
S T S Structural Engineering Ltd
18 Ornan Road
London NW3 4PX
Proposed Basement and Ground Floor Plans
and Longitudinal Section
1:50
A1
1206-667-003
B
Rear Garden
Front Garden
Kitchen
Entrance Hall
Hallway
No. 20 Ornan Road
Ornan Road
Pavement



NOTES
Proposed Site Plan
SCALE 1:250 @ A1
PERCEVAL AVENUE
ORNAN ROAD
20
18
16
Proposed Rear Elevation
/Section through the Lightwells
SCALE 1:50 @ A1
Proposed Front Elevation
/Section through the Lightwell
SCALE 1:50 @ A1
Southfields Property Company Ltd
STS Structural Engineering Ltd
18 Ornan Road
London NW3 4PX
Proposed Site Plan and
Elevations/Sections through the Lightwells
As Shown
A1
1206-667-004
A

APPENDIX 2

A SELECTION OF PHOTOGRAPHS TAKEN ON-SITE

Rear Elevation

Front Elevation

APPENDIX 3

ON-SITE BOREHOLE AND TRIAL PIT RECORDS SUMMER 2015

(REPRODUCED FROM THE GI REPORT BY GROUND&WATER)

Ground and Water Ltd
Tel: 0333 600 1221
email: enquiries@groundandwater.co.uk
www.groundandwater.co.uk

Project Name: 18 Ornan Road	Project No.: GWPR1313	Co-ords: -	Borehole No: **WS1** Sheet 1 of 1; Hole Type: WS
Location: London NW3 4PX		Level: -	Scale: 1:50
Client: Southfields Property Ltd		Dates: 22/06/2015	Logged By: JD

Sample Depth (m)	Type	Results
0.25	D	
0.50	D	
0.80	D	
1.00	D	
1.50	D	
2.00	D	
2.50	D	
3.00	D	
3.50	D	
4.00	D	
4.50	D	
5.00	D	

Depth (m)	Level (m AOD)	Stratum Description
0.65		MADE GROUND: Dark brown silty clayey gravelly sand. Sand is fine to medium grained. Gravel is abundant, fine to medium, sub-angular to sub-rounded flint, brick, and concrete.
1.25		MADE GROUND: Light brown gravelly sandy silty clay. Sand is fine to medium grained. Gravel is occasional to abundant, fine to medium, sub-angular to sub-rounded flint, brick, concrete, and ceramic waste.
1.75		MADE GROUND: Light brown sandy gravelly silty clay. Sand is fine grained. Gravel is abundant, medium to coarse, sub-angular brick and lignite.
5.00		LONDON CLAY FORMATION: Light brown silty CLAY.

End of Borehole at 5.00 m

Remarks: No groundwater encountered.
Fine roots noted to 2.00m bgl by driller. Roots noted to 1.50m bgl by supervising engineer in samples. Roots traces noted at 4.80m bgl by driller.

AGS

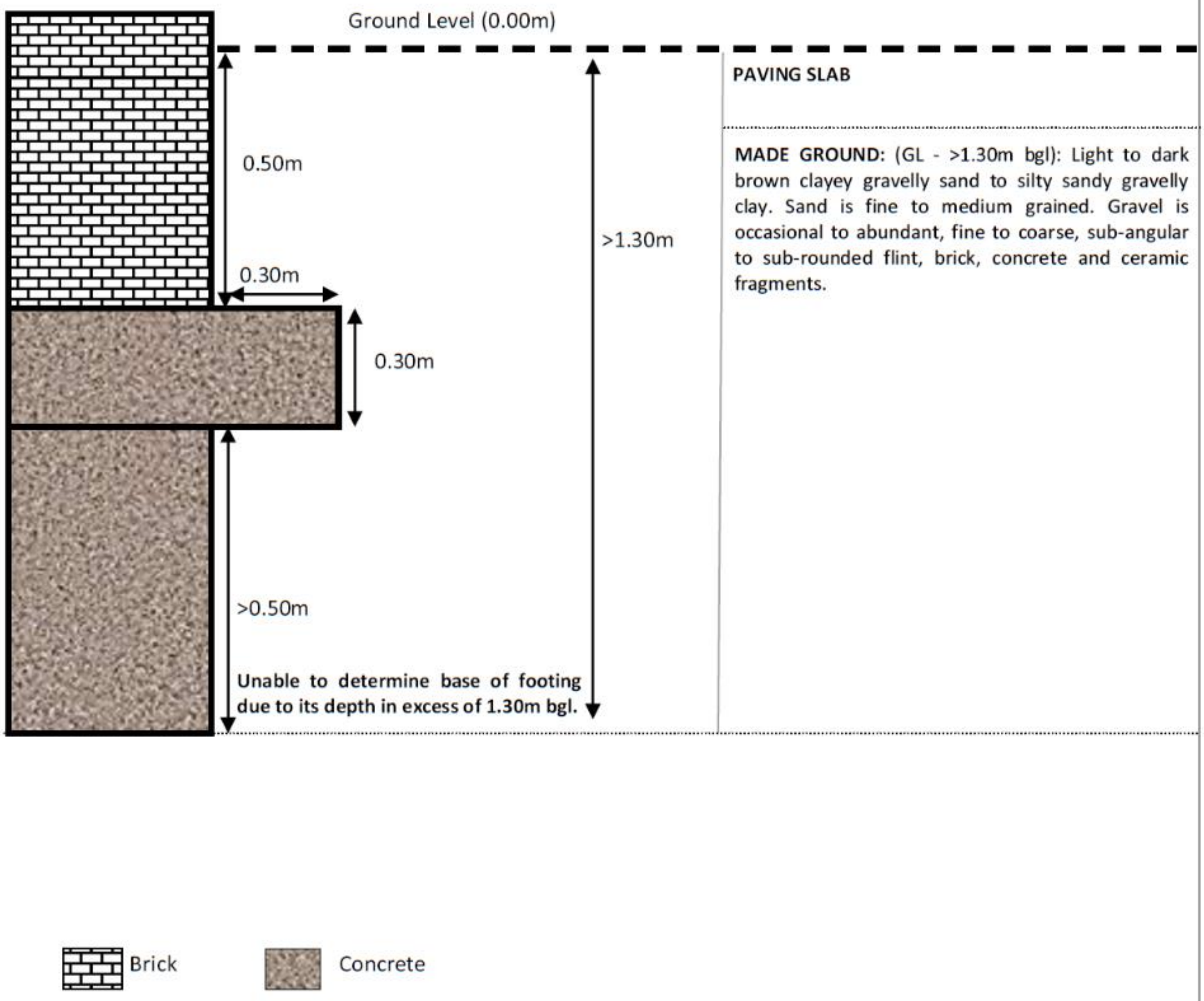
ground & water
Ground and Water Ltd
Tel: 0333 600 1221
email: enquiries@groundandwater.co.uk
www.groundandwater.co.uk

Project Name: 18 Ornan Road	Project No.: GWPR1313	Co-ords: -	Borehole No: **WS2** Sheet 1 of 1
Location: London NW3 4PX		Level: -	Hole Type: WS
			Scale: 1:50
Client: Southfields Property Ltd		Dates: 22/06/2015	Logged By: JD

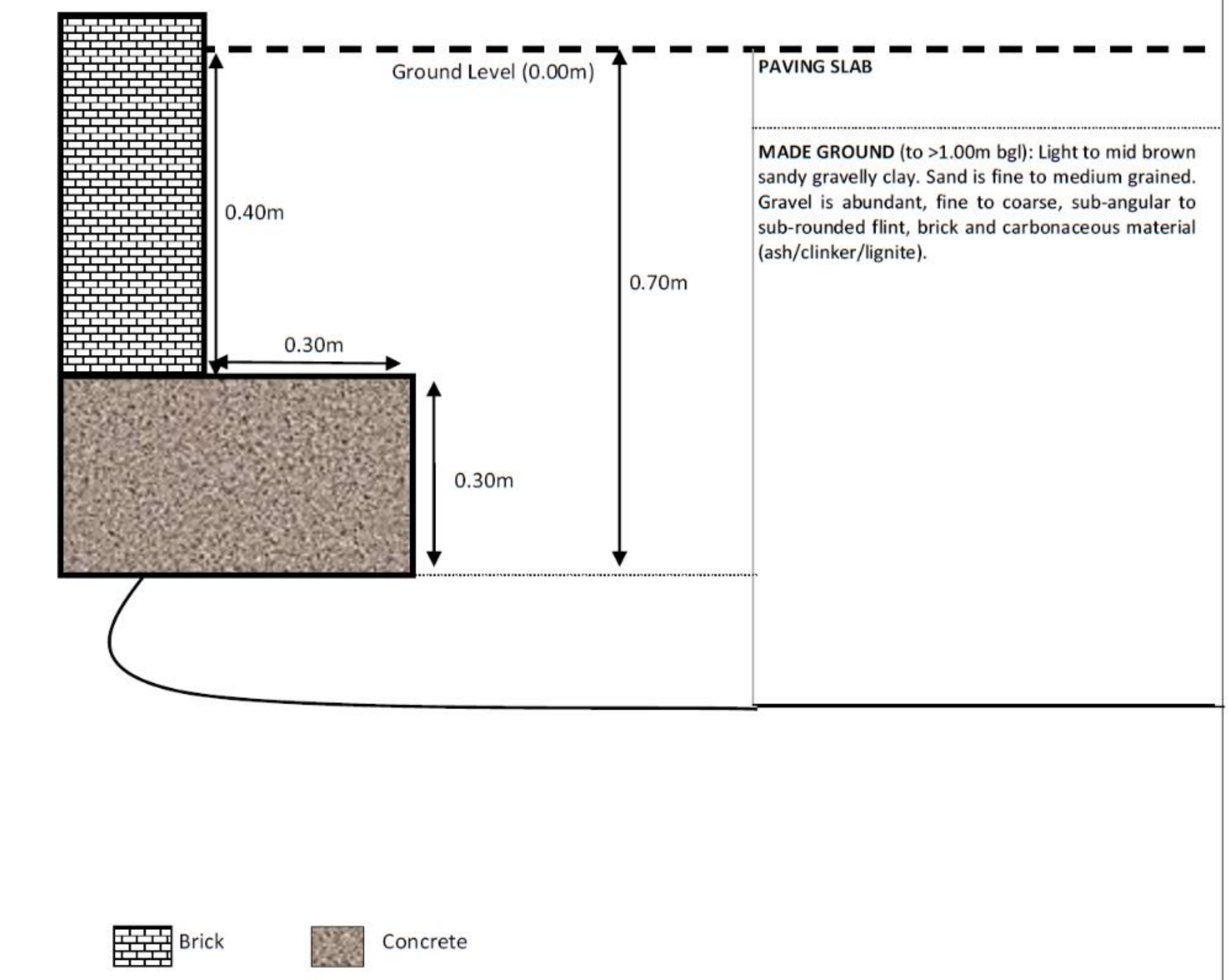
Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.25	D					MADE GROUND: Dark grey brown sandy gravelly silty clay. Sand is fine to medium grained. Gravel is occasional to abundant, fine to medium, sub-angular to sub-rounded flint and brick.
		0.50	D					
		0.80	D					
		1.00	D					
					1.25			LONDON CLAY FORMATION: Light brown, with gry mottling, silty CLAY. Rare lignite inclusions noted.
		1.50	D					
		2.00	D					
		2.50	D					
		3.00	D					
		3.50	D					
		4.00	D					
		4.50	D					
		5.00	D		5.00			End of Borehole at 5.00 m

Remarks: Roots noted to 2.80m bgl.
No groundwater encountered.

AGS



Project: 18 Ornan Road, London NW3 4PX		**Figure 6** ground&water
Client: Southfields Property Ltd	**Date:** August 2015	
Section Drawing: Foundation Exposure TP/FE1	**Ref:** GWPR1313	



Project: 18 Ornan Road, London NW3 4PX		**Figure 7**
Client: Southfields Property Ltd	**Date:** August 2015	ground&water
Section Drawing: Foundation Exposure TP/FE2	**Ref:** GWPR1313	

APPENDIX 4

LITERATURE ON SPECIALIST TECHNIQUES AND TANKING SYSTEMS

4.1 Underpinning general information:

In construction, **underpinning** is the process of strengthening and stabilising the foundation of an existing building or other structure. Underpinning may be necessary for a variety of reasons:

- The original foundation is simply not strong or stable enough, e.g. due to decay of wooden piles under the foundation.
- The usage of the structure has changed.
- The properties of the soil supporting the foundation may have changed (possibly through subsidence) or were mischaracterized during planning.
- The construction of nearby structures necessitates the excavation of soil supporting existing foundations.
- It is more economical, due to land price or otherwise, to work on the present structure's foundation than to build a new one.

Underpinning is accomplished by extending the foundation in depth or in breadth so it either rests on a stronger soil stratum or distributes its load across a greater area. Use of micropiles and jet grouting are common methods in underpinning. An alternative to underpinning is the strengthening of the soil by the introduction of a grout. All of these processes are generally expensive and elaborate.

-Underpinning bays are not to exceed 1.2m in length. Adequate support for at least two thirds of the length of the wall is to be maintained at all times. Sections of the work in progress at any one time are to be separated by a distance of at least 2.4m

-Excavation for underpinning shall be taken down to a level and stratum agreed with the engineer and local authority but in no case less than indicated on the drawings.

-The undersides of the existing footings are to be cleaned and hacked free of any dirt, soil or loose material before final pinning up.

-Mass concrete to underpinning to be 20n/mm mix (20mm maximum aggregate) using sulphate resisting portland cement.

-Drypack to be carried out with semi-dry fine concrete consisting of one part rapid hardening portland cement to one part fine aggregate from 10mm size down to fine sand.It is to be well rammed in, as soon as possible, after the foundation has set hard.

-Excavation to any section of underpinning shall not be commenced until at least 48 hours after completion of any adjacent bays.

-For each set of pins the contractor shall take a set of three test cubes in accordance with BS1881 and arrange to test one at 7 days. The 7 day cube shall attain a minimum crushing strength of 75% of the 28 day characteristic strength of the concrete. If this requirement is not met a second cube shall be crushed and the results compared. If this requirement is not met the contractor and engineer shall agree a course of action.

n.b. extracts taken from Wikipedia.

4.2 Newton drained tanking systems:

Article taken from the manufacturers web-site:

Below Ground Solutions:

Why Should I use Newton Systems in my Below Ground Structure?

When waterproofing structures below the ground, many options are available to clients and specifiers. Traditionally, New Build waterproofing has been performed externally using a water pressure resisting “tanking” membrane. These need to be fitted perfectly without defects for the installation to be effective. The landmark judgement 'Outwing V Thomas Weatherald' found that it is not feasible to expect the workmanship to be 100% defect free, meaning that that these tanking methods should have the water completely removed to be considered safe, which in effect is downgrading the system to just a damp proofing medium.

Those still wishing to use this method of waterproofing should consider the consequences of large scale water removal from what could be a significant area: calculation of the volumes to be removed is difficult, and the potential for surcharges to the storm water drainage should be anticipated. The risk to adjacent structures of removal of soil fines from the ground should also be considered.

If not dissuaded by the above, the reality of working on a building site makes external tanking highly impractical in practice. Many “tanking” systems require the structure to be “dry” for an adequate bond to be achieved and for the site conditions to be clean and the site accessible. Tanking needs to be installed to all external surfaces, including under the new concrete raft. Often installed by low quality site labour, the membrane is laid before the placing of the concrete raft, meaning the membrane is being walked over during this process.

The concrete is then pokered to remove air pockets, and often the poker will pierce the membrane. Laps are left ready for lapping to the wall membrane which cannot be fitted as yet as the walls have not being constructed. This process, often carried out in wet and muddy conditions required form-work to be fabricated and the concrete to be poured with the workers treading on the membrane laps for what maybe a period of weeks.

After all this abuse, the laps are then expected to be adhered neatly and cleanly to the membrane now stuck to the wall. The chances of the laps being dry and undamaged enough to effect the seal is probably zero, and unfortunately, these defective joints are at the point where the water pressure is highest. It is not surprising that we at John Newton put right hundreds of failed systems of this type every year!

Newton System 500

Newton 500 System is the most advanced cavity drainage membrane system available within the UK today. This system comprises a variety of high quality High Density Polyethylene (HDPE) membranes and associated drainage systems giving the specifier the safest method of new build waterproofing design.

“Newton 500 is the waterproofing professionals 'membrane of choice'”

Newton 508 HDPE membrane is the industry standard for all forms of vertical applications. Applied internally and held in place with the unique Newton MultiPlug, Newton 508 membrane creates an 8mm air void within the structure so that water entering the structure is depressurised allowing it to fall to the Basedrain drainage channel sited at the wall/floor junction. The inline profile of the 8mm studded membrane allows for professional water-proofers to install the membrane to “level” and the HDPE material allows the installer to easily and efficiently fold, and form the membrane around columns/footings. This is because the material has a memory and does not spring back into the original form.

Damp Proofing:

When choosing to Damp Proof a property many questions need to be addressed to assess the right solution for your structure.

- What is my structure made from?
- Do I have a damp proof course already present?
- Do I have high ground levels against the property?
- Do I have rising damp?
- Do I have penetrating damp?

The Problem – Why Do I have to damp proof my property?

Rising and penetrating damp, and discolouration caused by oils, salts, acids etc. are problems continually encountered in many buildings. Wind driven rain can enter exposed properties leading to dampness internally. Even slight damp penetration will cause discolouration to surface plaster, decorations and even affect the buildings structural integrity. This is not acceptable in living or storage accommodation, and a permanent solution must be found.

The Solution

NEWLATH 2000 and Newton 503 Mesh provide a firm key and impermeable barrier on any damp or deteriorating surface where direct bonding is not possible. Even poor and random substrates can easily receive these cavity drain membranes when using the COB PLUG that expands to gain a strong fixing.

‘Quick, clean and proven to work.’

NEWLATH 2000 and Newton 503 Mesh presents a physical barrier between the old surface and the new internal finish. It can be punctured when wall fixings are needed. Positive internal air pressure ‘pushes’ vapour, suspended within the air gap created by the studded membrane, through the external wall and out of the property. Quick, clean and proven to work. NEWLATH 2000 and Newton 503 Mesh truly are the modern, cost effective, damp-proofing solution.

Damp Proofing Membrane Applications

Newlath 2000 and Newton 503 Mesh have been extensively used within listed buildings throughout the UK and Ireland. Our membranes have been trusted to deal with damp in buildings since the late 1930’s. Air gap technology allows the structure to “breathe” and as such does not trap moisture within the walls of the property. In addition, the mechanical fixings used to secure our membranes can be removed if required making the system fully reversible. The ability to remove systems is a prerequisite from The National Heritage trust for dealing with listed properties.

Whether a building is listed or not our damp proof membranes offer superior protection against rising damp and water ingress acting a barrier to the penetration of damp spoiling interior finishes with mold, lime and salts. For Above Ground applications such as damp proofing

- a damp wall
- rising damp
- a gable end
- a barn conversion,
- timber frame building
- listed building

Cavity Membrane Vs Chemical Injection and Spray Coatings

Chemical injection and sprayed coatings are commonly used to solve this problem; however they are dependant upon the substrate being suitable. In many older buildings where cracked or varied materials are commonly found, these forms of damp-proofing are just not applicable. Even after injection of a damp-proof course, the old plaster should be removed because of salt contamination and the substrate preparation ready or the new plaster can be damaging and expensive.

4.3 Mabey Props General Information

Props

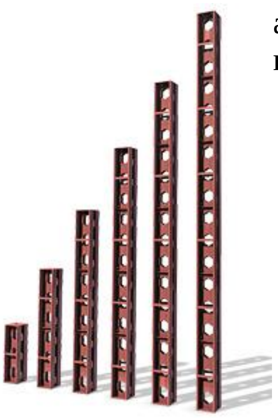
Based on the high-strength System 160 Soldier, or an equivalent tubular section, **Mabey Push-Pull Props** are the ideal solution for high load vertical, horizontal and raking prop applications.

Adjustment is at the end unit, which means that the soldier always remains in the strongest orientation and allows ease of cross-bracing in multiple prop applications Three types of end detail are available to connect to:

• Mabey System 160 Soldiers
• Concrete, Timber etc. - direct bolting
• Mabey MkII Solders

System 160 soldier: The high-strength system for the most demanding formwork jobs. Higher load capacities throughout the system drastically reduce the number of components required, consequently reducing assembly and striking times. This can significantly increase the number of pours possible in a week and reduce overall job time to a minimum.

- A full range of accessories allows greater versatility in applications
- The 8 standard lengths available can closely match your requirements
- **System 160** strength characteristics enable greater spacing of cantilevered members whilst keeping deflection to a minimum



The MkII Soldier is a robust soldier which is available for use on all formwork schemes where the high strength of System 160 is not required.

Bracing Struts

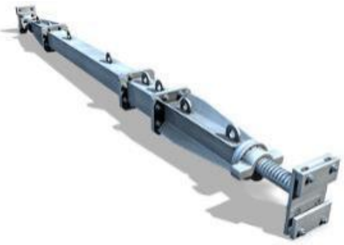
Bracing Struts will be required when the load imposed by the ground exceeds the load capacity of the leg for the full excavation length.

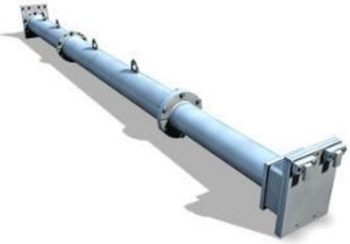
This can occur either for very large excavations or where higher loads are imposed. In all cases, **Mabey Hire** engineering must be consulted for advice and calculations if necessary.

Mabey Hire offers bracing struts of several types ranging in length up to 20m and working compression loads of up to 175 tonnes.

The mechanical struts retain the loads by mechanical methods so that the risk of in-service hydraulic failure is eliminated.

The prop bodies of the heavier mechanical struts are of square cross section to reduce the risks of rolling sideways during transportation, stacking and assembly.





APPENDIX 5

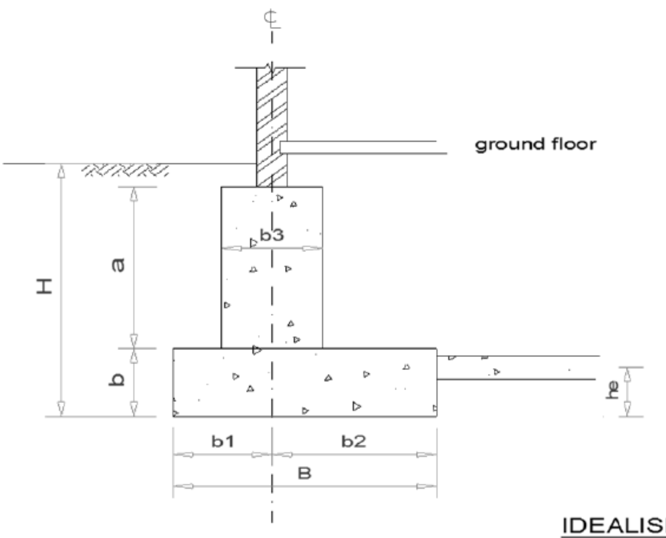
STS PRELIMINARY UNDERPINNING CALCULATIONS

STS Structural Engineering

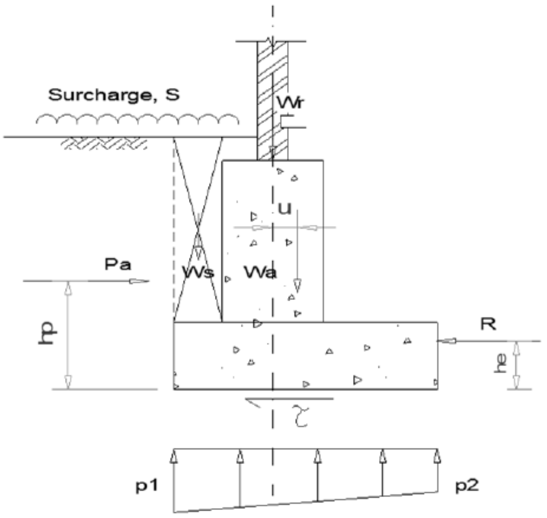
Tel: 01707 695466 Fax: 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site:	18 Ornan Road London NW3 4PX	Made By: MN
Job:	Basement	Checked: SS
Job No.	1206-667	Page:

Underpinning Stability Calculations



IDEALISED DIMENSIONS



IDEALISED FORCES

  Status: Initial Issue

STS Structural Engineering

Tel: 01707 695466 Fax: 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site:	18 Ornan Road London NW3 4PX	Made By: MN
Job:	Basement	Checked: SS
Job No.	1206-667	Page:

Underpinning Stability Calculations

Section A - General Information

A1: Soils information and coefficients

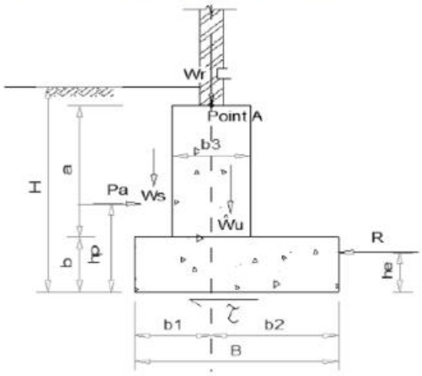
S	nominal surcharge	=	10.0 kN/m/m

Soils present on site: London Clay per SI Report
angle of friction, φ = = 24 degrees

thus:

sin f =	0.407	tan f =	0.445
τ	=(Wv+Wu+Ws)tan f	=	
	(38.42+28.44+3.04)*0.45 =		31.1 kN/m/m
Ka	=(1-sin f)/(1+sin f)		
	(1-0.41)/(1+0.41) =	=	0.422
Ko	=(1-sin f)		
	(1-0.41) =	=	0.593

A2: Basic Geometry and Retained Height



Height of Retained Soil H = 3.10 m
Height to restraint He = 0.20 m

a+b-Hr =	3.35 m	a+b-Hp =	2.517 m	Hp=H/3=	1.03 m
a =	3.20 m	b =	0.35 m	b1 =	0.18 m
b2 =	0.93 m	b3 =	0.25 m		

Page 2/9

STS Structural Engineering

Tel: 01707 695466 Fax: 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site:	18 Ornan Road London NW3 4PX	Made By: MN
Job:	Basement	Checked: SS
Job No.	1206-667	Page:

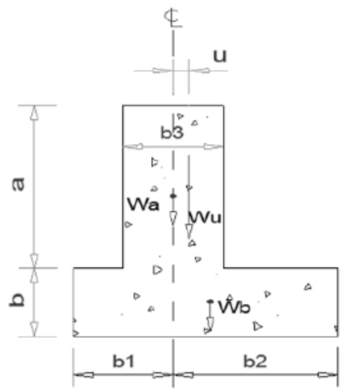
Underpinning Stability Calculations

A3: Vertical Loading onto pins:

Reaction from the wall over:

Roof:	1*(0.75+1) =	1.8	kN/m
Loft Floor	1*(1.5+0.4) =	1.9	kN/m
1st Floor:	1*(1.5+0.4) =	1.9	kN/m
Wall s.w.	8.3*0.22*18 =	32.9	kN/m
Wv	=	**38.4**	kN/m/m

A4: Calculate Selfweight of the Pin & Eccentricity



concrete density	g1 =	24	kN/m3
soil density	g2 =	19	kN/m3

a =	3.20 m	b =	0.35 m	b1 =	0.18 m
b2 =	0.93 m	b3 =	0.25 m		
B=b1+b2=	1.10 m	B/2=	0.55 m	a+b=	3.55 m
b3 + 2b1 =	0.60 m	B/2 - b1 =	0.375 m	B/2-b1-u =	0.253 m
2B-2b1+b3 =	2.10 m				

Wa = g1*a*b3	= 24*3.2*0.25 =	19.200	kN/m
Wb = g1*b*B	= 24*0.35*(0.18+0.92) =	9.240	kN/m
Wu =Wa + Wb	= 19.2+9.24 =	28.440	kN/m
Ws =g2*a(b1-b3/2)	= 19*3.2*(0.18-0.25/2) =	3.040	kN/m/m

Find vertical load eccentricity (due to pin sw only) u:

*Moments about centreline: wu*u = wb(B/2-b1)+wa*0, hence*

u = Bb(B/2 - b1)/(ab3 + bB) =

u = (1.1*0.35*0.38)/((3.2*0.25)+(0.35*1.1)) = 0.122 m

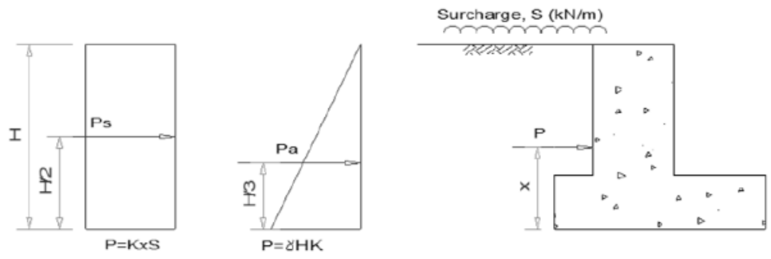
STS Structural Engineering

Tel: 01707 695466 Fax: 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site:	18 Ornan Road London NW3 4PX	Made By: MN
Job:	Basement	Checked: SS
Job No.	1206-667	Page:
	Underpinning Stability Calculations	

A5: Evaluate Lateral Earth Pressures (assumed water table below footing)

Coefficients:
Ka=active
Ko=at rest



Moments about base:

Px=PsH/2+PaH/3 but P=Ps+Pa, hence

x =(H/6)(3*Ps+2*Pa)/(Pa+Ps) =

(3.1/6)*(3*13.07+2*38.5)/(13.07+38.5) =	1.164 m	active case
(3.1/6)*(3*18.39+2*54.16)/(18.39+54.16) =	1.164 m	at-rest case

Ps=SKH and Pa=γH²K/2, hence:

Ps=S*K*H =	10*0.42*3.1 =	13.1 kN/m	active case
	10*0.59*3.1 =	18.4 kN/m	at-rest case
Pa=g2*H*H*K/2 =	19*3.1*3.1*0.42/2 =	38.5 kN/m	active case
	19*3.1*3.1*0.59/2 =	54.2 kN/m	at-rest case
P=Ps+Pa =	13.07+38.5 =	51.6 kN/m	active case
	18.39+54.16 =	72.6 kN/m	at-rest case

STS Structural Engineering

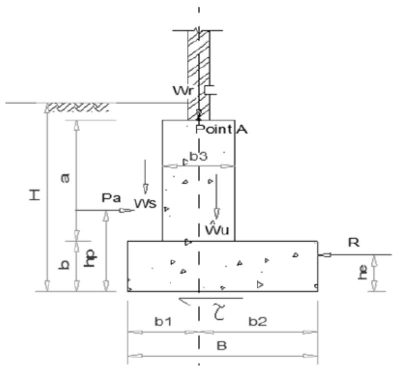
Tel: 01707 695466 Fax: 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site:	18 Ornan Road London NW3 4PX	Made By: MN
Job:	Basement	Checked: SS
Job No.	1206-667	Page:

Underpinning Stability Calculations

Section B - Stability Analysis

Stability Analysis based on:
(i) Sliding FoS≥1.5 (temporary)
≥2.0 (permanent)
(ii) Rotation about top of underpin, A
(iii) Max. allowable bearing pressure



B1: Sliding Stability

Required FoS ≥ (R+τ)/P

B1.1 Construction Case

During Construction, R = 0 (no horizontal restraint), and P based on active pressure (Ka). For stability FoS ≥ 1.5

hence, FoS = (0+t)/P = 31.12/51.58 = **0.60**

FoS < 1.5 temporary propping REQUIRED prior to permanent strutting

B1.2 Permanent Case

R provided by base slab propping force
P based on earth pressure at rest (Ko)
FoS required to be: FoS ≥ 2.0 ≤ (R+τ)/P
hence, R ≥ 2P/τ (2*72.55)/31.12 =
or, Rmin= **4.7** kN for FoS=2 & at-rest pressures

i.e. Floor Slab or ground beams need to provide a minimum resistance to in-plane copression of 4.7kN/m run for a FoS against sliding of 2.0

B2: Rotation about Top of Pin

Check Rotation around Point A at the top of the pin

clockwise: R(a+b-hR) + Wu*u+τ(a+b)
anti-clockwise: P(a+b-hp) + Ws/4(b3+2b1)

B2.1 Construction Case

During Construction, R = 0 (no horizontal restraint), and P based on active pressure (Ka). For stability FoS ≥ 1.5

(τ(a+b)+Wu*u)/(P(a+b-Hp)+(Ws/4(b3+2b1))), hence

(31.12*(3.55)+28.44*0.12)/(51.58*2.52+(3.04/4)*0.6) FoS= **0.87**

FoS NOT ACCEPTIBLE - It will be necessary to provide temporary prop to prevent rotation for the construction case

STS Structural Engineering
Tel: 01707 695466 Fax: 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site:	18 Ornan Road London NW3 4PX	Made By: MN
Job:	Basement	Checked: SS
Job No.	1206-667	Page:
	Underpinning Stability Calculations	

B2.2 Permanent Case

R provided by base slab propping force

P based on earth pressure at rest (Ko)

FoS required to be:

FoS ≥ 2.0 ≤ [2P(a+b-Hp)+(Ws/2(b3+2b1))-t(a+b)-(u*Wu)]/(a+b-Hr)

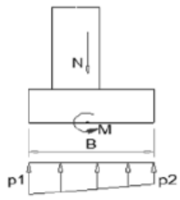
Hence, R ≥ (2P(a+b-hp)+(ws/2(b3+2b1))-(wuu)-τ(a+b))/(a+b-he) =

(2*72.55*2.52+(3.04/(2*(0.6)))-31.12*3.55-0.12*28.44)/3.35 =

Rreqd = **75.8** kN for FoS=2 & at-rest pressures

i.e. Floor Slab or ground beams need to provide a minimum resistance to in-plane copression of 75.8kN/m run for a FoS against sliding of 2.0

B3: Check Bearing Pressures



p1/2 = N/B ± 6M/B2 if M/N≤B/6

Total Reaction from the Pin,	Wsum = Wv+Wu+Ws =	69.9 kN/m
Weight of Soil Removed,	We =	10.0 kN/m
Hence, Vert. Force N =	=Wsum - We =	59.9 kN/m

Net Moments about the centreline of base

M = Wv(B/2-b1) + Wu(B/2-b1-u) + (Ws/4)(2B-2b1+b3) + R*Hr-P*Hp =

B3.1 Construction Case

R=10kN/m - amount of temporary restraint required at a height of Hr=1m

P based on active pressure (Ka). FoS ≥ 1.5

M =	Wv(B/2-b1) =	(38.42*0.38) =	14.41
	Wu(B/2-b1-u) =	+(28.44*0.25) =	7.20
	(Ws/4)(2B-2b1+b3) =	(3.04/4)*(2.1) =	1.60
	R*Hr =	35*1 =	35.00
	- P*Hp =	-(51.58*1.03) =	-53.29
			4.9 kNm/m

Page 6/9

STS Structural Engineering

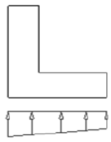
Tel: 01707 695466 Fax: 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site:	18 Ornan Road London NW3 4PX	Made By: MN
Job:	Basement	Checked: SS
Job No.	1206-667	Page:

Underpinning Stability Calculations

Total Eccentricity e = M/N =	0.082	m
And thus eccentricity =	B / 13.4	
As e<B/6 - low eccentricity		
Z = 1.0*B²/6 =	0.202	m3
Average bearing pressure	54	kN/m2
Maximum bearing preassure σmax = σav + M/Z =	79	kN/m2
Minimum bearing preassure σmax = σav - M/Z =	30	kN/m2

This is an acceptable bearing pressure for most soils at that depth



B3.2 Permanent Case

Thus total Vert reaction from the wall Wv =	38.4	kN/m'
with s.w. of the wall Wu =	28.4	kN/m'

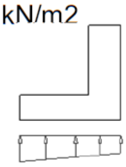
R provided by base slab propping force,P based on earth pressure at rest (Ko)

Assume min. horizontal restraint force R = 300.00

which is adequate for a 200mm thick RC slab (σ=300x1000/200/1000=1.5N/mm2)

M =	Wv(B/2-b1) =	(38.42)*0.38 =	14.41
	Wu(B/2-b1-u) =	(28.44*0.25) =	7.20
	(Ws/4)(2B-2b1+b3) =	(3.04/4)*(2.1) =	1.60
	R*Hr =	(300*0.2) =	60.00
	- P*Hp =	-(72.55*1.03) =	-74.97
			8.23 kNm

Total Eccentricity e = M/N =	0.084	m
And thus eccentricity =	B / 13.1	
As e<B/6 - low eccentricity		
	0.202	m3
Hence, the average bearing preassure σav = N / B =	61	kN/m2
Maximum bearing preassure σmax = σav + M/Z =	102	kN/m2
Minimum bearing preassure σmax = σav - M/Z =	20	kN/m2



This is acceptible for soils at that depth
Prop to be provided by the basement concrete slab which is capable of providing the required propping force for the permanent case

Page 7/9

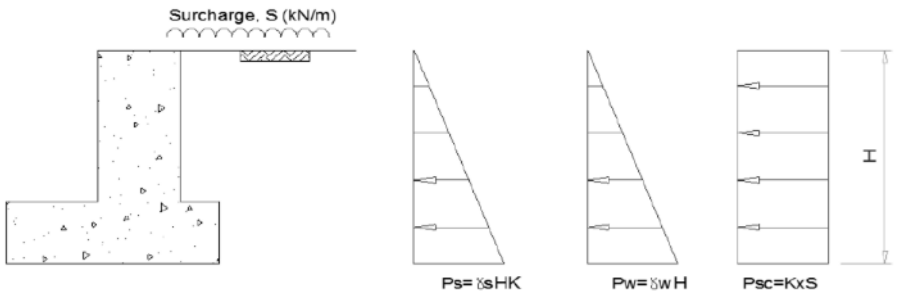
STS Structural Engineering

Tel: 01707 695466 Fax 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site: Job: Job No.	18 Ornan Road London NW3 4PX Basement 1206-667 **Underpinning Sizing Calcs**	Made By: MN Checked: SS Page:

Calculate Earth and Water Pressures on Basement Wall Permanent Loadcase

Coefficients:
Ka=active
Ko=at rest



Geohydrology report indicates that water table lies below the level of the proposed basement, and thus no water pressures have been allowed for for the construction-case stability checks of the underpinning, water pressures shall be considered for the permanent load case and combined with active pressures to allow for any incidental or long term increase in ground water table

S	nominal surcharge	=	10.0 kN/m/m
angle of friction, φ = (London Clay)		=	24 degrees
sin ϕ =	0.407	tan ϕ =	0.445
Ka	=(1-sin ϕ)/(1+sin ϕ)	=	0.422
Ko	=(1-sin ϕ)	=	0.593

Thus the minimum retained pressure at H = 0m = Psc =
0.59*10 = 5.9 kN/m'

and, maximum retained pressure at H = 2.8m = Ps + Pw + Psc
0.59*19*3+10*3+0.59*10 = 69.7 kN/m'

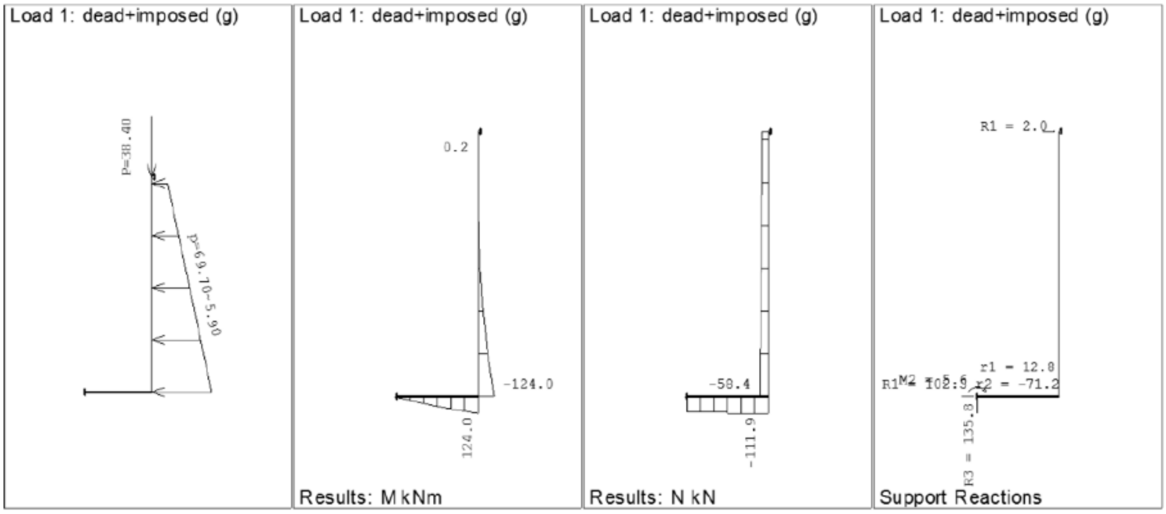
Page 8/9

STS Structural Engineering

Tel: 01707 695466 Fax: 01707 692006, www.sts-se.co.uk, 58 Crossway, Welwyn Garden City, Herts AL8 7EE

Site:	18 Ornan Road London NW3 4PX	Made By: MN
Job:	Basement	Checked: SS
Job No.	1206-667	Page:
	Underpinning Sizing Calcs	

Retaining Wall Structural Analysis – Loading and Results – Permanent loadcase (unfactored)



Retaining wall sizing to BS8110

1) Base and bottom of the Retaining Wall

From Analysis	Maximum factored moment: Mux = 1.6*124 =			198.4 kNm/m
	Member properties:			
	d =	270 mm	d' =	50 mm
	fy =	460 N/mm2		
	fcu =	30 N/mm2	K' =	0.156
3.4.4.4	$K = M/bd^2fcu$ =			0.0907
	z = d {0.5+√(0.25-K/0.9)} (and <=0.95d)			239 mm
	x = (d-z)/0.45 =			68 mm
	As = M/0.95fyz =			1897 mm2/m
	Compression reinforcement not required			
Table 25	Min. reinforc. For slabs 0.1%Ac =			270 mm2/m

Use T16/100mm bars (As = 2010mm2/m) main vertical reinforcement to the outer face of the wall and to the bottom zone of the base coupled with A393 mesh reinforcement to both inner and outer face of the retaining wall and the base

Page 9/9

APPENDIX 6

STS CONSTRUCTION METHOD STATEMENT DRAWINGS