Symmetrys Ltd
Structural Engineers

Basement Impact Assessment
In Support of Planning Application

35 Pilgrim's Lane
London
NW3 1SS

A: Unit 6, The Courtyard, Lynton Road, London. N8 8SL, T: 020 8340 4041, E: info@symmetrys.com, W: symmetrys.com
Symmetrys Limited Consulting Engineers, Registered In England And Wales, Company No. 5873122

February 2018
17363 Rev. A

Contents

Appendices

1.0 INTRODUCTION

1.1 Symmetrys has been engaged by alma-nac to carry out a structural report relating to the proposed construction of a basement extension below a three storey outrigger extension at 35 Pilgrims Lane, London.

1.2 Our drawings and this report will be included within our client's planning application. Our documents are not intended for, and should not be relied upon by, any third party for any other purpose. Proposed and existing general arrangement drawings were passed to us from alma-nac.

1.3 This report will only detail the basement construction.

Photo 1: Bird's eye view of rear and side elevation

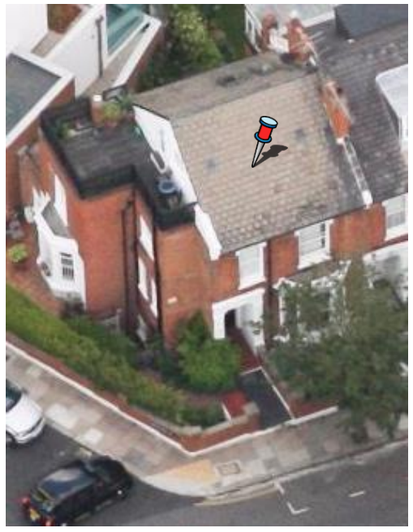


Photo 2: Bird's eye view of front elevation

1.4 Reference documents

The following documents have been used as guidance to complete this Structural Report:

1, Camden Planning Guidance 4: Basements and Lightwells – July 2015
2, Camden's Core Strategy CS14
3, Camden Development Policy DP25
4, National Planning Policy Framework: Section 12.
5, The Lost Rivers of London, Nicholas Barton

2.0 EXISTING CONDITION

2.1. The existing dwelling is located in the London Borough of Camden.

2.2 The existing structure is 4 storeys high with a two storey outrigger to the rear stepping down to single storey. The structure is load bearing masonry with timber floor joists spanning front to back and a duopitch roof. The property exhibits no signs of excessive deformation or cracking other than would be expected of a property of this type and age.

2.3 Symmetrys envisage opening up works will be undertaken to further establish the condition of the existing building prior to undertaking detailed design to enable existing defects to be considered.

3.0 DESIGN PROPOSALS

3.1 The proposal is to extend the existing lower ground floor below the front and side as well as lowering the floor level at the rear of the property, see structural drawings in Appendix A. The extended areas will be constructed using sequential reinforced concrete underpinning – a well-known and frequently used technique to form basements. The use of temporary propping will ensure that the basement does not cause any local ground movements whilst construction is taking place.

3.2 Side Lightwell

The lower ground floor extension will occupy a majority of the zone containing the side lightwell to the property. Due to alignment differences with the proposed extension there will be a small region of existing retaining wall which shall remain and be treated as a sacrificial wall to be backfilled upon completion of the basement. The new retaining walls will tie into the existing wall and formed in an underpinning sequence using reinforced concrete L-shaped pins. This will ensure that the basement slab resists any potential soil pressure due to heave of hydrostatic loads from localised perched water, leaking pipes, etc.

3.3 Side Vault

Utilisation of the lower ground floor side vault is envisaged within the proposed extension. Due to the vault comprising of a reduced ceiling height it shall be closed off and used a storage space. Underpinning sequencing shall be constructed to meet up with both flank walls of the vault and provide buttressing to the existing structure.

3.4 Rear Extension

The rear extension at lower ground floor will be formed using two reinforced concrete L-shaped pins excavated below the existing footings. Careful attention will be paid when excavating as obtained drawings show the neighbouring property's underpinning will also be at this founding level. The existing floor construction within the Store and Boiler Room will also be removed and replaced with new 350mm thick RC slab to provide a level threshold and allowance for underfloor heating.

3.5 Waterproofing

BS8102 sets out guidance for the waterproofing of basement structures according to their use. With this in mind the use of tanked, integral and/or drained methods of waterproofing will have to be considered. These items will be considered once a tanking specialist has been employed.

4.0 STAGE 1: SCREENING

A screening process has been undertaken based on the flow screening charts of the Camden Planning Guidance CPG4.
The tables below identify any matters that are relevant in the proposed scheme. Each question is answered by "Yes" or "No". "No" answers are justified in the last column of the screening charts. "Yes" answers are discussed further in "Stage 2: Scoping".

Subterranean ground water flow screening chart

1a: Is the site located directly above an aquifer?	No	Groundwater was recorded within the London Clay Formation during monitoring. However, the groundwater encountered was within discrete micro fissures and not representative of a laterally continuous ground water unit (aquifer).
1b: Will the proposed basement extend beneath the water table surface?	No	Isolated recorded groundwater determines that the water table was not reached during site investigation.
2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No	The Lost Rivers of London extract in Figure 3 shows the Hampstead No 1 Pond is 300m away from the site. Refer to the local mapping and desk information study within LMB Geosolutions Ltd's report (Appendix C).
3: Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is located near to Hampstead Heath but not within the catchment area.
4: Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	**Yes**	Please refer to Scoping stage.
5: As part of the site drainage, will more surface water than at present be discharged to the ground?	**Yes**	Please refer to Scoping stage.
6: Is the lowest point of the proposed excavation close to, or lower than, the mean water level in any local pond or spring line?	No	The nearest pond 300m away is 1.2m lower than the lowest point of the proposed excavation.
Slope stability screening flowchart		
1: Does the existing site include slopes, natural or manmade, greater than 7 degrees?	No	The site has a slight slope but is far less than 7 degrees.
2: Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7 degrees?	No	There is no proposed change in the slope of the site.
3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees?	No	There is a railway track 315m from the site, see Figure 2. This is considered to be reasonable distance, the basement development will not affect the railway line.
4: Is the site within a wider hillside setting in which the general slope is greater than 7 degrees?	No	The site is located on a wider hillside but not on a slope greater than 7 degrees. Please refer to Figure 16 of the Camden Guidance.
5: Is the London Clay the shallowest strata at the site?	**Yes**	Please refer to scoping stage.
6: Will any tree(s) be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?	No	No trees are to be removed as part of the proposed basement extension and the proposed scheme will not impact any tree protection zones.
7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	No	There have been no cracks reported during a walkover survey other than normal signs of façade degeneration expected from a property of this age.
8: Is the site within 100m of a watercourse or a potential spring line?	No	The site is more than 300m away from Hampstead No 1 Pond. Refer to Appendix C for further review.
9: Is the site within an area of previously worked ground?	No	The existing house at 35 Pilgrims Lane has occupied the land since late-19th century.

10: Is the site within an aquifer? Is so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	The site investigation confirms that the site is not within an aquifer.
11: Is the site within 50m of the Hampstead Heath ponds?	No	The site is located 300m from the nearest pond.
12: Is the site within 5m of a highway or pedestrian right of way?	**Yes**	Please refer to Scoping stage.
13: Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	The proposal involves extending the Lower Ground Floor's footprint. This level is existing for all neighbouring dwellings along Pilgrims Lane.
14: Is the site over any tunnels, railway lines?	No	The closest line is the Overground, 90 metres away from the site.
Surface flow and flooding screening flowchart		
1: Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is located 300m from the nearest pond on Hampstead Heath and is outside of the catchment boundary.
2: As part of the proposed site drainage, will surface water flows be materially changed from the existing route?	No	There will be minor changes in the surface water pipe configuration as the side return building footprint will increase and require slight alterations to RWP locations. However, these adjustments will be minimal with a mindfulness for the most efficient drainage routes.
3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**Yes**	Please refer to Scoping stage.
4: Will the proposed basement result in changes to the profile of the inflows of surface water being received by adjacent properties or downstream watercourses?	No	There will be no material change in the requirements of the local drainage infrastructure.
5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	There is no change in the surface water quality received by the neighbouring properties.
6: Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature ?	No	No ground water was encountered during the site investigation and the site is not located in a flood risk zone, as shown on figure 4. It is also an area considered to have a very low to low risk from surface water flooding.

5.0 STAGE 2: SCOPING

From the screening process, six relevant matters have been identified and require definition of the scope of investigation to be undertaken.

5.1 Subterranean ground water flow screening chart

4: Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?

Answer: There will be a small increase of hard landscaping by way of introducing new steps from the garden up to the Ground Floor. However, this area is negligible as runoff onto the soft landscaping below is envisaged.

Scoping: Permeable paving at the base of the steps shall provide direct infiltration for the runoff.

5: As part of the site drainage, will more surface water than at present be discharged to the ground?

Answer: The introduction of steps within the rear garden will create a small rise in surface water discharging to a reduced area of soft landscaping; although, this is deemed to be insignificant.

Scoping: As discussed above, planters are proposed which will collect the water runoff from the new steps up to Ground Floor.

5.2 Slope stability screening flowchart

5: Is the London Clay the shallowest strata at the site?

Answer: Yes. The local geological survey maps indicate that the underlying strata is London Clay.

Scoping: London Clay is deemed to be highly shrinkable. A Ground Movement Assessment has been undertaken, to predict the potential heave and settlement actions on the proposed structure. No mature trees were observed in close proximity to the basement and the depth of new foundations are likely to be below the influence of any roots and seasonal volume change effects.

12: Is the site within 5m of a highway or pedestrian right of way?

Answer: Yes. The site is located on Pilgrims Lane, the proposed development will be within 5 metres of the public highway.

Scoping: A Ground Movement Assessment has been undertaken, to predict the damage category.

5.3 Surface flow and flooding screening flowchart

3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

Answer: Minimal changes of overall hard landscaping and impermeable roof areas will result in a similar drained runoff rate compared to existing.

Scoping: This is considered to be negligible as storm water runoff from the new steps and balcony at the rear will be directed immediately to soft landscaping/permeable paving at lower level.

5.4 Summary of the assessments required

The screening and scoping process raises six issues all relative to the land stability of the site and the potential ground movements. These issues have been assessed in the ground movement report, see Appendix C.

6.0 STAGE 3: SITE INVESTIGATION AND STUDY

6.1 Desktop Study

The first stage of a site investigation is to develop an understanding of the site and immediate surroundings. LMB carried out a desktop study including a site walkover in their site investigation report, see Appendix C.

6.2 Ground Conditions

The local geological survey maps, accessible via the British Geological Society website http://mapapps.bgs.ac.uk/geologyofbritain/home.html?mode=boreholes, indicated that the underlying soil strata is London Clay. Having reviewed boreholes cut in the vicinity of the property on Downshire Hill, the street parallel to the East, with the BGS reference TQ28NE5 (see Figure 1), stiff clay was confirmed down to 88m.

Figure 1: Historical bore hole log map taken from the British Geological Surveys

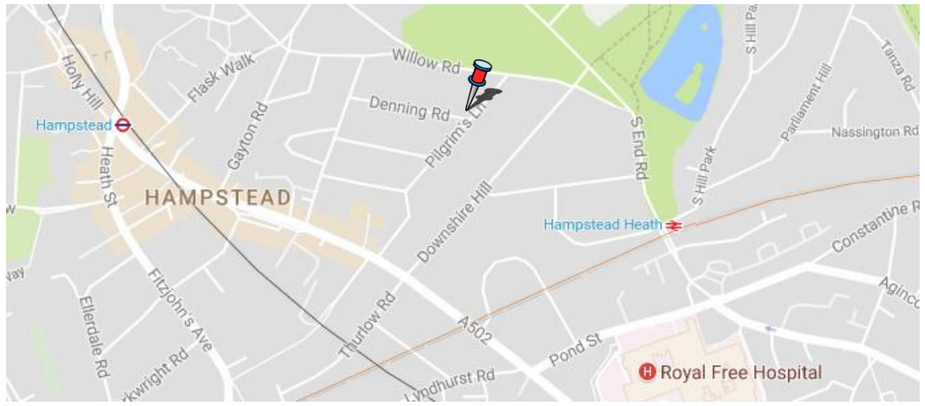


Figure 2: Map showing local transport tunnels

6.3 Ground Investigation / Opening-Up Works Undertaken:

6.3.1 One heavy duty windowless sampler borehole was cut in the front garden at ground floor level to determine safe bearing loads; cohesion values; extent of any ground contamination and ground water levels. Should planning be granted then additional trial pits will be completed.

6.3.2 Two trial pits were excavated at the rear of the dwelling – one within the existing store and one along the exterior wall of the house at the rear to reveal the existing foundations and to take samples of soil for laboratory testing.

6.4 Existing foundations

Trial pits were dug by LMB Geosolutions Ltd on 29th November 2017 to reveal the full profile of the existing foundations. Sections representing the results of the trial pits can be found in the factual report of the basement impact assessment in Appendix C.

6.5 Ground Investigation and Geology

6.5.1 The interpretative report of the site specific investigation has been undertaken by LMB Geosolutions Ltd. The findings and recommendations are described in their report dated January 2018.

6.5.2 The ground conditions are summarised as follows:

Borehole Log	
G.L to 3.25m	Made Ground
3.25m to 4.50m	Firm Brown Clay – London Clay
4.50m to 6.00m	Firm Brown / Grey Slightly Silty Clay – London Clay
6.00m to 7.30m	Stiff Dark Grey / Brown Clay – London Clay

6.5.3 Ground Water Monitoring:

No groundwater strikes were recorded during the ground investigation works but upon the return monitoring visits groundwater was recorded in small quantities. This is likely to be perched water.

6.5.4 The report confirms that the proposed lower ground flood extension can be founded on London Clay which would allow a safe bearing pressure of 110kN/m^2.

6.6 Hydrology

Referring to the "The Lost Rivers of London" by Nicholas Barton the closest known watercourse is described to be on the east of the site approximately 300m away which is known as the Fleet which runs from Hampstead Heath heading southwards. This is a significant distance away and will not have any impact on the local hydrology, see Figure 3.

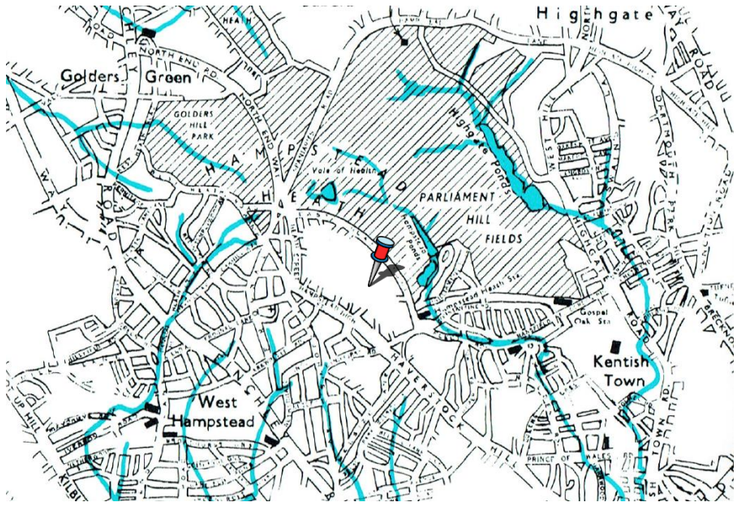


Figure 3: Extract from the Lost River of London by Nicholas Barton

6.7 Flooding

Referring to the Camden strategic flood risk assessment, the proposed basement does not lie in a Local Flood Risk Zone and therefore having a less than 1 in 1000 annual probability of river or sea flooding any year. Therefore, no further assessment is required.

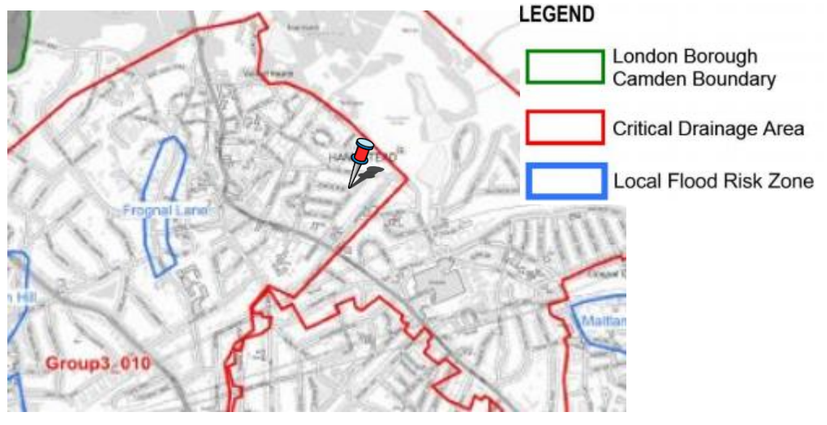


Figure 4: Extract from Camden Strategic Flood Risk Assessment

7.0 PROPOSED SEQUENCE OF WORKS

7.1 The structural method statement provided (see Appendix A) is for the purpose of the design team's design development and for the purpose of the client's planning application. The appointed contractor will be responsible for all temporary supports and for the stability of the structure during the works. The method of construction adopted minimises the need for temporary works. However, propping during the underpinning sequencing will be required to minimise the risk of ground movement occurring.

To ensure that the retained engineer's intent is correctly interpreted by the contactor, they will be required to submit all temporary works proposals to review a minimum of 7 working days prior to commencing excavation. The contractor should also submit a dewatering strategy to ensure a strategy is agreed should water be encountered.

7.2 Below Existing Building

Temporary propping to the newly formed retaining walls forming the extensions will be required until the lower ground floor has been formed. For further details please see Appendix A for construction sequence and method statements.

7.3 Dewatering Strategy

As minimal ground water was recorded during the site investigation, LMB Geosolutions Ltd have advised that a dewatering strategy is not necessary for this planning application.

8.0 CONSTRUCTION METHOD STATEMENTS

Please see Appendix A for construction sequence and method statements.

9.0 CONSTRUCTION MANAGEMENT PLAN

A Construction Traffic Management plan will be undertaken may planning be granted. The works are expected to be completed over an 8-9 month program split in the three phases below:

- 2 months excavation
- 3 months construction
- 3/4 months fit out.

Once appointed, the contractor will be responsible for providing a program with anticipated starting date.

10.0 STAGE 4: IMPACT ASSESSMENT

10.1 Due to the robust engineering principles and construction method applied, the extent of movement is limited in accordance with British and European codes. We can confirm that the proposed structural design and method of construction of the basement has been developed with a view to ensuring structural safety, and that if constructed in accordance with this document the works will be able to be completed without any adverse impact on the structural stability of the neighbouring properties, other adjacent structures, adjoining land and gardens or the adjoining Public Highway.

10.2 The reinforced concrete structure will be designed to accommodate surcharges from the neighbouring property, public highway and ground pressures. The structure will have adequate stiffness to ensure that the lateral deflections do not exceed the appropriate limits recommended by British Standards Codes of Practice in order to ensure that potential ground movements be kept to acceptable limits.

10.3 The structures will be designed to transfer vertical loads into the ground safely. As the basement extension will involve very limited excavation works and will be carried out in an underpinned sequence, it is unlikely to cause any critical damages to the neighbouring structures.

10.4 Ground Movement Assessment

10.4.1 Ground movement assessment report has been undertaken by LMB Geosolutions Ltd and can be found in Appendix C.

10.4.2 LMB's report confirms that the ground movement model predicts movement to fall between Category 0 (negligible) and Category 1 (very slight), which is described in the table on the following page.

Category of damage	Description of typical damage (Nature of repair in italic type)
0	Hairline cracking which is normally indistinguishable from other causes such as shrinkage and thermal movement. Typical crack widths 0.1mm. *No action required*
1	Fine cracks which can *easily be treated using normal decoration*. Damage generally restricted to internal wall finishes: cracks rarely visible in external brickwork. Typical crack widths up to 1mm.
2	*Cracks easily filled. Recurrent cracks can be masked by suitable linings.* Cracks not necessarily visible externally: *some external repointing may be required to ensure weather tightness.* Doors and windows may stick slightly and *require easing and adjusting*. Typical crack widths up to 5mm.
3	Cracks which *require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.* Doors and windows sticking, service pipes may fracture. Weather-tightness often impaired. Typical crack widths are 5 to 15mm, or several of, say 3mm.
4	Extensive damage which *requires breaking-out and replacing sections of walls,* especially over doors and windows. Windows and door frames distorted, floor sloping noticeably*. Walls leaning or bulging noticeably; some loss of bearing in beams. Service pipes disrupted. Typical cracks widths are 15 to 25mm, but also depends on number of cracks.
5	Structural damage which *requires a major repair job, involving partial or complete rebuilding.* Beams loose bearing walls lean badly and require shoring. Windows broken with distortion. Danger of instability. Typical crack widths are greater than 25mm, but depends on the number of cracks.

Important Note. Crack width is one factor in assessing category of damage and should not be used on its own as a direct measure of it. * Local deviation of slope, from the horizontal or vertical, of more than 1/100 will normally be clearly visible. Overall deviations in excess of 1/150 are undesirable.

Figure 5: Building damage categories used by the IStructE and ICE

10.5 Figure 2, shows the position of the Northern Line and Overground relative to the proposed basement. Due to the tunnels being 280m away, which is considered a significant distance, no further consultation with the London Underground Asset Protection team will be undertaken.

10.6 Cumulative effects are considered unlikely on this project as described in LMB Geosolutions Ltd attached ground investigation & assessment report.

11.0 PARTY WALL MATTERS

11.1 The scope of works falls within the Party Wall Act 1996. Procedures under the Act will be dealt with by the client's Party Wall Surveyor. The Party Wall Surveyor will prepare and serve necessary Notices under the provision of the Acts and agree Party Wall Awards in event of disputes. The Contractor will be required to provide the Party Wall Surveyor with the appropriate drawings, method statements and all other relevant information covering the works notifiable under the Act.

The resolution of the matters under the Act and provision of Party Wall Awards will protect the interests of all owners.

11.2 Monitoring

It is proposed that the structural stability of the surrounding/adjacent properties is safeguarded by a system of movement monitoring.

The Contractor shall monitor the position and movements of the elevations of the adjacent properties around the perimeter of the proposed excavation. The monitoring shall be undertaken by a specialist survey company. The monitoring system will have at least the following characteristics:

1) The existing facades of the neighbouring properties as well as the flank wall of the neighbouring building will be monitored near ground level and at roof level, at intervals not exceeding 3m centres.

2) Monitoring points (targets) shall be firmly attached, to allow 3D position measurement, for the duration of the work, to a continuous and uninterrupted accuracy of -/+ 1mm. A suitable remote reference base/datum unaffected by the works will be adopted, one located at least 50m from the site.

3) Points/targets shall be measured for 3D positioning on, at not less than the following intervals:

- Before any works commence (base reading)
- Every two weeks during the period of basement excavation/construction.
- Upon completion of all construction works.

5) All measurements shall be plotted graphically, to clearly indicate the fluctuation of movement with time. The survey company shall submit the monitoring results to the Engineer (Symmetrys Ltd) and to the Adjoining Owners Party Wall Surveyors/Engineer within 24 hour of measurement, graphically and numerically.

6) The following trigger levels for movement are proposed for agreement. In the event of a trigger value being reached the Contractor will immediately stop any work that might cause further movement, assess the situation and propose alternative methods for proceeding, with definitive further movement limits for those later steps.

7) Trigger movement limits are proposed as follows:

A) **Existing Buildings Horizontal/Vertical movement**

Amber	+/-7mm	All parties notified.
Red	+/-10mm	Works reviewed

B) **The garden walls and excavation**

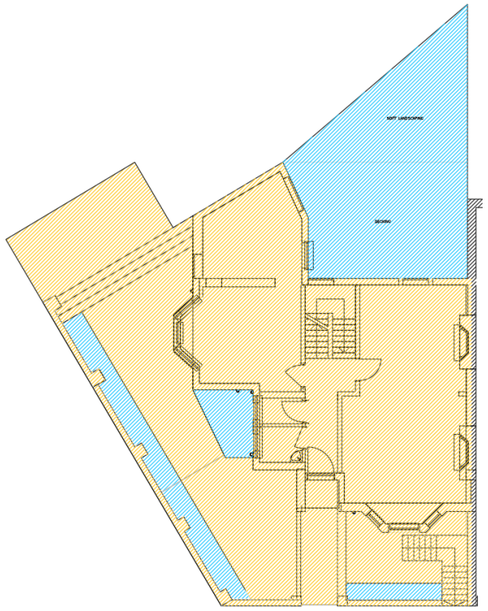
Amber	+/-7mm	All parties notified.
Red	+/-10mm	Works reviewed

12.0 DRAINAGE

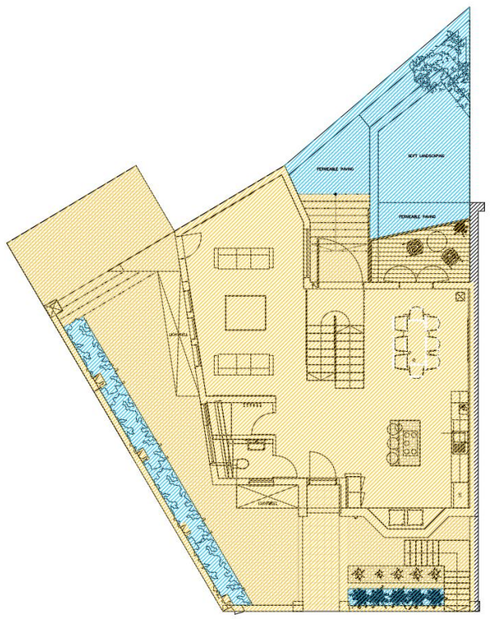
12.1 The development is a subterranean extension of a single family dwelling house. Additional utilities comprising of a sauna (Lower Ground Floor), kitchenette and bathroom (Second Floor) are to be created which will marginally impact flow rates but not considerably enough to necessitate a change of the local drainage infrastructure. Thames Water will however be involved in this process and advise accordingly.

12.2 The above ground drainage will be subject to invert levels, drained by gravity to the existing combined sewage system. The existing below ground drainage will be reviewed and if necessary drained to a submersible pump chamber which will connect to a rising drain directed to the nearest available inspection chamber. Gravity flow will be utilised into the existing combined sewage system. To mitigate the risk of back flow suitable measures such as non-return valves will be incorporated into the drainage specification.

DRAINAGE CATEGORISATION	EXISTING	PROPOSED	DIFFERENCE
OUTSIDE PROPERTY			
HARD SURFACING RAINFALL IS NOT ATTENUATED AND ENTERS THE SURFACE WATER DRAINAGE SYSTEM	161.4m²	178.4m²	+17m²
LANDSCAPE / GARDEN AREAS RAINFALL DOES NOT ENTER THE SURFACE WATER DRAINAGE SYSTEM	52.9m²	35.9m²	−17m²



EXISTING DRAINAGE CATEGORISATION



PROPOSED DRAINAGE CATEGORISATION

12.3 The increase in the areas of hardstanding have been considered and all surface water runoff from the new steps and balcony will be guided to the permeable paving/soft landscaping zones within the rear garden.

13.0 SUSTAINABILITY

As the proposed extension at lower ground floor will involve significant amounts of concrete, cement replacement alternatives should be considered. Cement replacements can used to replace up to 40% of the cement in concrete mix. These replacements are typically waste products from the energy production industry such as PFA (pulverised fuel ash) and GBFS (granulated blast furnace slag) are recycled and not sent to landfill sites. Furthermore, this also reduces the amount of cement that needs to be mined. Concrete should be bought from a local supplier to further reduce the carbon footprint of transport.

There is a significant amount of reinforced concrete on the project for which steel reinforcement bars will be required. By specifying reinforcement from a UK supplier it ensures that the rebar is made from 100% recycled steel. Any structural steelwork should be sourced from a British manufacturer to ensure that rolled sections are made from at least 60% recycled steel. Sourcing the steel from a local supplier will further reduce the transport carbon footprint.

The use of timber as a structural element is to be maximised as timber production actively negates greenhouse gas production. Furthermore, all timber is to be FSC certified insuring that the timber is produced from a sustainable source.

14.0 STAGE 5: REVIEW AND MITIGATION MEASURES

The table below summarises the potential impact of the lower ground floor extension on the natural environment and local amenity.

Potential Impact	Mitigation Measures
Land Stability: Impact on neighbouring structures	Monitoring of neighbouring buildings will be undertaken.
	The lower ground floor extension will be constructed following the construction method statement
	The contractor will adopt the practices outlines within the Demolition Protocol and the Considerate Constructors Scheme
Ground Water Flow: Impact on aquifer	The lower ground floor extension will have no impact on any aquifer units.
Surface Flow and Flooding: Increase of surface water run off to drainage system	The proposed development will includes green roofs which will provide some attenuation of the surface water run-off to the local drainage system.

15.0 NON-TECHNICAL SUMMARY

15.1 It is essential that a thorough review of all temporary works, contractors' method statements and calculations for these works is undertaken by a suitable qualified structural engineer prior to works starting. The permanent works will also be submitted to Building Control and the necessary Party Wall Surveyors for approval prior to the works commencing on site.

15.2 The findings of this Basement Impact Assessment can be summarised as per below:

- The lower ground floor extension will be predominantly within London Clay.
- Groundwater is not expected to be encountered.
- The development is expected to have negligible impact on surface water flow and flooding.
- *From the results of the Ground Movement Assessment, the predicted damage category is between Category 0 and Category 1. This is below the limit imposed by Camden Council and will only be a risk of aesthetic damages.*
- Monitoring of adjacent properties will be undertaken.
- The proposed development is not expected to provoke any cumulative effect as the founding level will remain the same as existing.

15.3 The proposed works at 35 Pilgrims Lane have been designed with robust structural principles and methods of construction that are widely used and known. This will ensure the integrity of neighbouring structures and roadways are not compromised during its construction.
This assumed Method Statement and Structural report has been completed by Symmetrys Limited.

Report Prepared by:	Report Reviewed by:		
Mark Barnikel BEng Structural Engineer	John Strawson MICE	Christopher Atkins CEng MIStructE Managing Director of Symmetrys Limited	Philip Lewis FGS, CGeol Managing Director of LMB Geosolutions Ltd

APPENDIX A

PROPOSED DRAWINGS & STRUCTURAL METHODOLOGY STATEMENT

QD A1

REFER TO ARCHITECTS DRAWINGS FOR ALL SETTING OUT DETAILS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY SUPPORTS AND RESPONSIBLE FOR STABILITY OF THE STRUCTURE DURING WORKS

LEGEND

- DENOTES EXISTING MASONRY OR TIMBER WALLS
- DENOTES NEW MASONRY WALLS BUILT IN 15N/mm² COMPRESSIVE STRENGTH BRICKWORK AND GRADE iii MORTAR
- DENOTES NEW MASONRY WALLS BUILT IN 7N/mm² COMPRESSIVE STRENGTH BLOCKWORK AND GRADE iii MORTAR
- DENOTES NEW NON LOAD BEARING STUD WALL BY ARCHITECT
- SEE DETAIL FOR TYPICAL RESTRAINT
- DENOTES WALL TO BE DEMOLISHED
- DENOTES SPAN OF NEW FLOOR JOISTS C24 TIMBER
- DENOTES NEW RC SLAB
- DENOTES TEMPORARY PROPS

CONTRACTOR/SPECIALIST DESIGN ELEMENTS

1. ALL TEMPORARY WORKS
2. ALL TANKING DETAILS
3. ALL REINFORCEMENT DRAWINGS AND BAR BENDING SCHEDULES
4. DESIGN OF ALL STEELWORK CONNECTIONS. THE FABRICATOR WILL HAVE TO SUBMIT THEIR CALCULATIONS TO BUILDING CONTROL FOR APPROVAL
5. STEEL FABRICATION DRAWINGS

NOTES

– ALL STEELWORK IN THE EXTERNAL WALLS ARE TO BE GALVANISED (80 MICRONS)

– LOCATION OF EXISTING AND PROPOSED DRAIN RUNS ARE TO BE CONFIRMED BY THE SERVICE ENGINEER

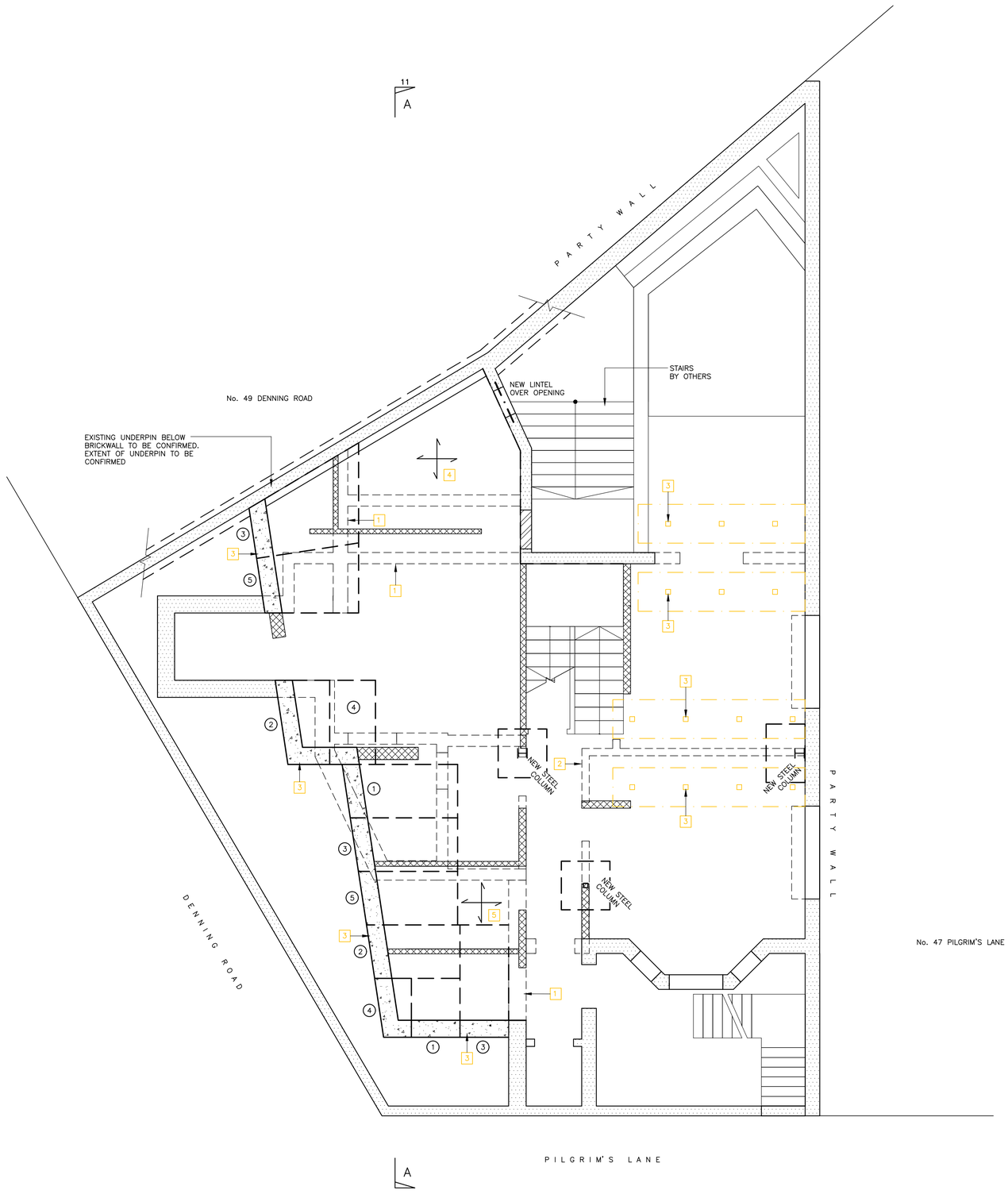
– PLEASE REFER TO ARCHITECTS DRAWINGS FOR ALL SETTING OUT DETAILS, INSULATION AND VENTILATION DETAILS, DAMP PROOF COURSES AND ALL TANKING DETAILS

– FOR ALL FIRE WORK PROTECTION TO STEELWORK REFER TO THE ARCHITECTS DRAWINGS

– CONTRACTOR SHOULD ALSO REVIEW MECHANICAL ENGINEERS DRAWINGS FOR EXACT LOCATION OF SERVICE PENETRATION PRIOR TO CUTTING

PROPOSED METHOD STATEMENT/ SUGGESTED SEQUENCE OF WORKS

1. DEMOLISH EXISTING SIDE EXTENSION AND PROP EXISTING BRICKWORK TO REMAIN ALONG DENNING ROAD AND REAR GARDEN
2. DEMOLISH NON LOAD BEARING WALLS IN LOWER GROUND FLOOR AND INSTALL FIRST FLOOR PROPOSED STEELWORK
3. INSTALL ALL TEMPORARY PROPS AND FORM THE NEW CONCRETE UNDERPINS AND PERIMETER FOUNDATIONS IN AN UNDERPINNED SEQUENCE.
4. EXISTING FLOOR TO BE BROKEN OUT IN PREPARATION FOR ANY NEW DRAINAGE AND NEW SLAB CAST. LEVEL TO BE DETERMINED BY ARCHITECT
5. INSTALL ALL DRAINAGE AND THEN FORM LOWER GROUND FLOOR SLAB
6. KEEPING IN POSITION ALL TEMPORARY WORKS INSTALL ALL BASEMENT STEEL WORK AND THEN INSTALL FLOOR JOISTS WITH PLY SHEETING
7. FORM NEW REINFORCED CONCRETE SLAB OVER LOWER GROUND FLOOR EXTENSION
8. REMOVE TEMPORARY WORKS IN REVERSE ORDER OF INSTALLATION
9. INSTALL WATERPROOFING



Notes

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS & ENGINEERS DRAWINGS AND SPECIFICATIONS
2. DO NOT SCALE FROM THIS DRAWING

Rev	Date	Chkd	Amendments
P1	21.02.18	AH	ISSUED FOR PLANNING

Drawing Status: PLANNING

Symmetrys Limited
Consulting Structural Engineers
6 The Courtyard, Lynton Road
London, N8 8SL
T: 020 8340 4041
W: www.symmetrys.com
E: info@symmetrys.com

Job Title

35 PILGRIMS LANE LONDON, NW3

Drawing Title

LOWER GROUND FLOOR PLAN

Job No.	Drawing No.	Revision
17363	01	P1

Scales 1:50 AT A1 — Original Size A1

Drawn By JNS — Date NOV 2017

Company No. 5873122
VAT Registration No. 894 2993 61
Registered In England And Wales

QD A1

REFER TO ARCHITECTS DRAWINGS FOR ALL SETTING OUT DETAILS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY SUPPORTS AND RESPONSIBLE FOR STABILITY OF THE STRUCTURE DURING WORKS

LEGEND

- DENOTES EXISTING MASONRY OR TIMBER WALLS
- DENOTES NEW MASONRY WALLS BUILT IN 15N/mm² COMPRESSIVE STRENGTH BRICKWORK AND GRADE iii MORTAR
- DENOTES NEW MASONRY WALLS BUILT IN 7N/mm² COMPRESSIVE STRENGTH BLOCKWORK AND GRADE iii MORTAR
- DENOTES NEW NON LOAD BEARING STUD WALL BY ARCHITECT
- SEE DETAIL FOR TYPICAL RESTRAINT
- DENOTES WALL TO BE DEMOLISHED
- * DENOTES SPAN OF NEW FLOOR JOISTS C24 TIMBER
- DENOTES ASSUMED SPAN OF EXISTING FLOOR JOISTS
- PS DENOTES NEW MASS CONCRETE C30 PADSTONE U.N.O
- DENOTES TEMPORARY PROPS

CONTRACTOR/SPECIALIST DESIGN ELEMENTS

1. ALL TEMPORARY WORKS
2. ALL TANKING DETAILS
3. ALL REINFORCEMENT DRAWINGS AND BAR BENDING SCHEDULES
4. DESIGN OF ALL STEELWORK CONNECTIONS. THE FABRICATOR WILL HAVE TO SUBMIT THEIR CALCULATIONS TO BUILDING CONTROL FOR APPROVAL
5. STEEL FABRICATION DRAWINGS

NOTES

– ALL STEELWORK IN THE EXTERNAL WALLS ARE TO BE GALVANISED (80 MICRONS)

– LOCATION OF EXISTING AND PROPOSED DRAIN RUNS ARE TO BE CONFIRMED BY THE SERVICE ENGINEER

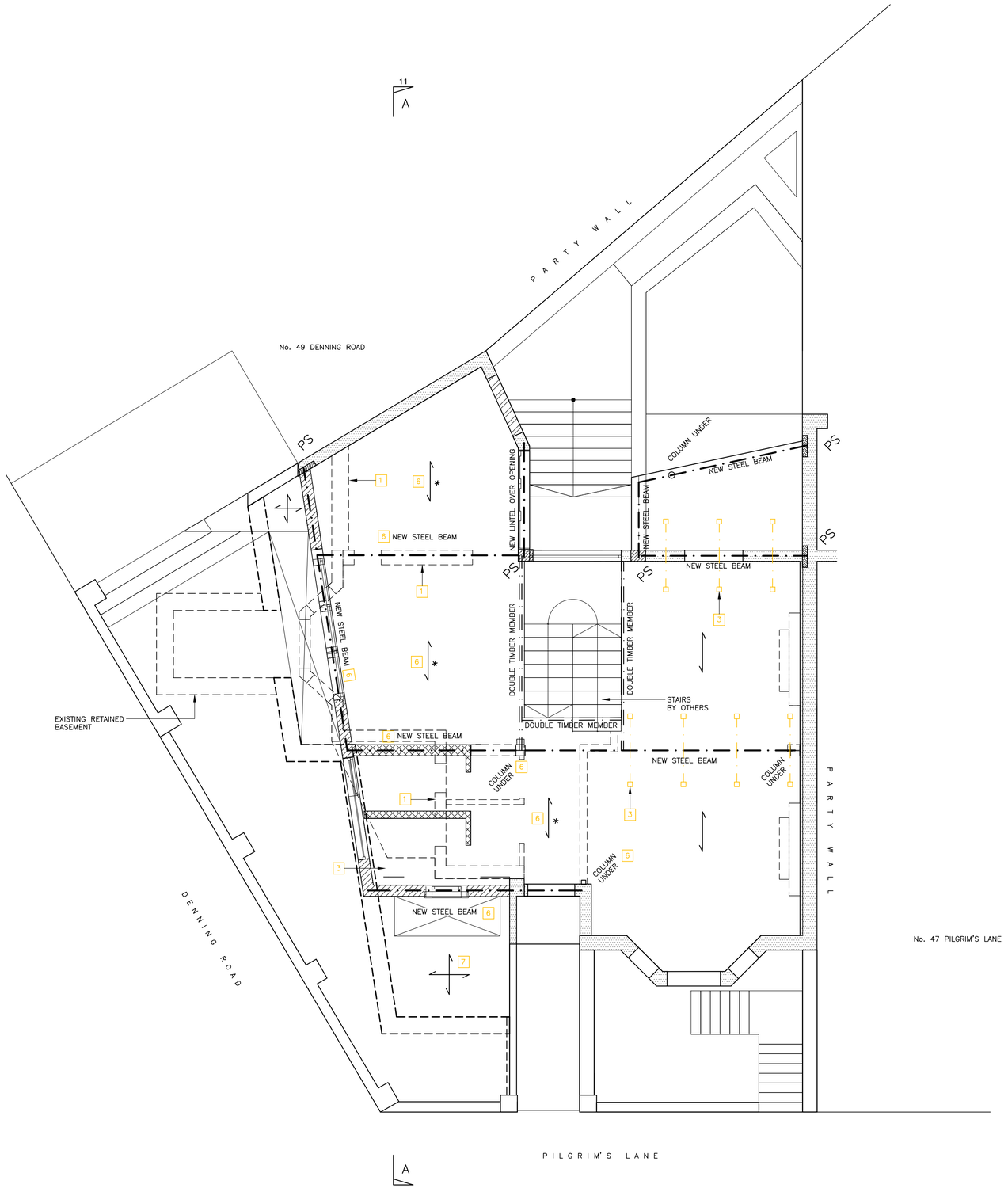
– PLEASE REFER TO ARCHITECTS DRAWINGS FOR ALL SETTING OUT DETAILS, INSULATION AND VENTILATION DETAILS, DAMP PROOF COURSES AND ALL TANKING DETAILS

– FOR ALL FIRE WORK PROTECTION TO STEELWORK REFER TO THE ARCHITECTS DRAWINGS

– CONTRACTOR SHOULD ALSO REVIEW MECHANICAL ENGINEERS DRAWINGS FOR EXACT LOCATION OF SERVICE PENETRATION PRIOR TO CUTTING

PROPOSED METHOD STATEMENT/ SUGGESTED SEQUENCE OF WORKS

1. DEMOLISH EXISTING SIDE EXTENSION AND PROP EXISTING BRICKWORK TO REMAIN ALONG DENNING ROAD AND REAR GARDEN
2. DEMOLISH NON LOAD BEARING WALLS IN LOWER GROUND FLOOR AND INSTALL FIRST FLOOR PROPOSED STEELWORK
3. INSTALL ALL TEMPORARY PROPS AND FORM THE NEW CONCRETE UNDERPINS AND PERIMETER FOUNDATIONS IN AN UNDERPINNED SEQUENCE.
4. EXISTING FLOOR TO BE BROKEN OUT IN PREPARATION FOR ANY NEW DRAINAGE AND NEW SLAB CAST. LEVEL TO BE DETERMINED BY ARCHITECT
5. INSTALL ALL DRAINAGE AND THEN FORM LOWER GROUND FLOOR SLAB
6. KEEPING IN POSITION ALL TEMPORARY WORKS INSTALL ALL BASEMENT STEEL WORK AND THEN INSTALL FLOOR JOISTS WITH PLY SHEETING
7. FORM NEW REINFORCED CONCRETE SLAB OVER LOWER GROUND FLOOR EXTENSION
8. REMOVE TEMPORARY WORKS IN REVERSE ORDER OF INSTALLATION
9. INSTALL WATERPROOFING



Notes

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS & ENGINEERS DRAWINGS AND SPECIFICATIONS
2. DO NOT SCALE FROM THIS DRAWING

Rev	Date	Chkd	Amendments
P1	21.02.18	AH	ISSUED FOR PLANNING

Drawing Status: PLANNING

Symmetrys Limited
Consulting Structural Engineers
6 The Courtyard, Lynton Road
London, N8 8SL
T: 020 8340 4041
W: www.symmetrys.com
E: info@symmetrys.com

Job Title

35 PILGRIMS LANE LONDON, NW3

Drawing Title

GROUND FLOOR PLAN

Job No.	Drawing No.	Revision
17363	02	P1

Scales 1:50 AT A1 — Original Size A1

Drawn By JNS Date NOV 2017

Company No. 5873122
VAT Registration No. 894 2993 61
Registered In England And Wales

QD A1

REFER TO ARCHITECTS DRAWINGS FOR ALL SETTING OUT DETAILS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY SUPPORTS AND RESPONSIBLE FOR STABILITY OF THE STRUCTURE DURING WORKS

LEGEND

- DENOTES EXISTING MASONRY OR TIMBER WALLS
- DENOTES NEW MASONRY WALLS BUILT IN 15N/mm² COMPRESSIVE STRENGTH BRICKWORK AND GRADE iii MORTAR
- DENOTES NEW MASONRY WALLS BUILT IN 7N/mm² COMPRESSIVE STRENGTH BLOCKWORK AND GRADE iii MORTAR
- DENOTES NEW NON LOAD BEARING STUD WALL BY ARCHITECT
- SEE DETAIL FOR TYPICAL RESTRAINT
- DENOTES WALL TO BE DEMOLISHED
- 85kN / 25kNm — DENOTES TOTAL FACTORED REACTIONS. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE DESIGN OF ALL STEEL TO STEEL CONNECTIONS AND SHOULD FORWARD HIS CONNECTION DETAILS AND CALCULATIONS TO BUILDING CONTROL FOR APPROVAL
- DENOTES NEW FLOOR JOISTS 200x50mm C24 TIMBER AT 300mm CENTRES
- PS — DENOTES 440 LONG x 100 WIDE x 225mm HIGH MASS CONCRETE C30 PADSTONE U.N.O
- MC 200knm 150kN — MOMENT CONNECTION

CONTRACTOR/SPECIALIST DESIGN ELEMENTS

1. ALL TEMPORARY WORKS
2. ALL TANKING DETAILS
3. ALL REINFORCEMENT DRAWINGS AND BAR BENDING SCHEDULES
4. DESIGN OF ALL STEELWORK CONNECTIONS. THE FABRICATOR WILL HAVE TO SUBMIT THEIR CALCULATIONS TO BUILDING CONTROL FOR APPROVAL
5. STEEL FABRICATION DRAWINGS

NOTES

– ALL STEELWORK IN THE EXTERNAL WALLS ARE TO BE GALVANISED (80 MICRONS)

– LOCATION OF EXISTING AND PROPOSED DRAIN RUNS ARE TO BE CONFIRMED BY THE SERVICE ENGINEER

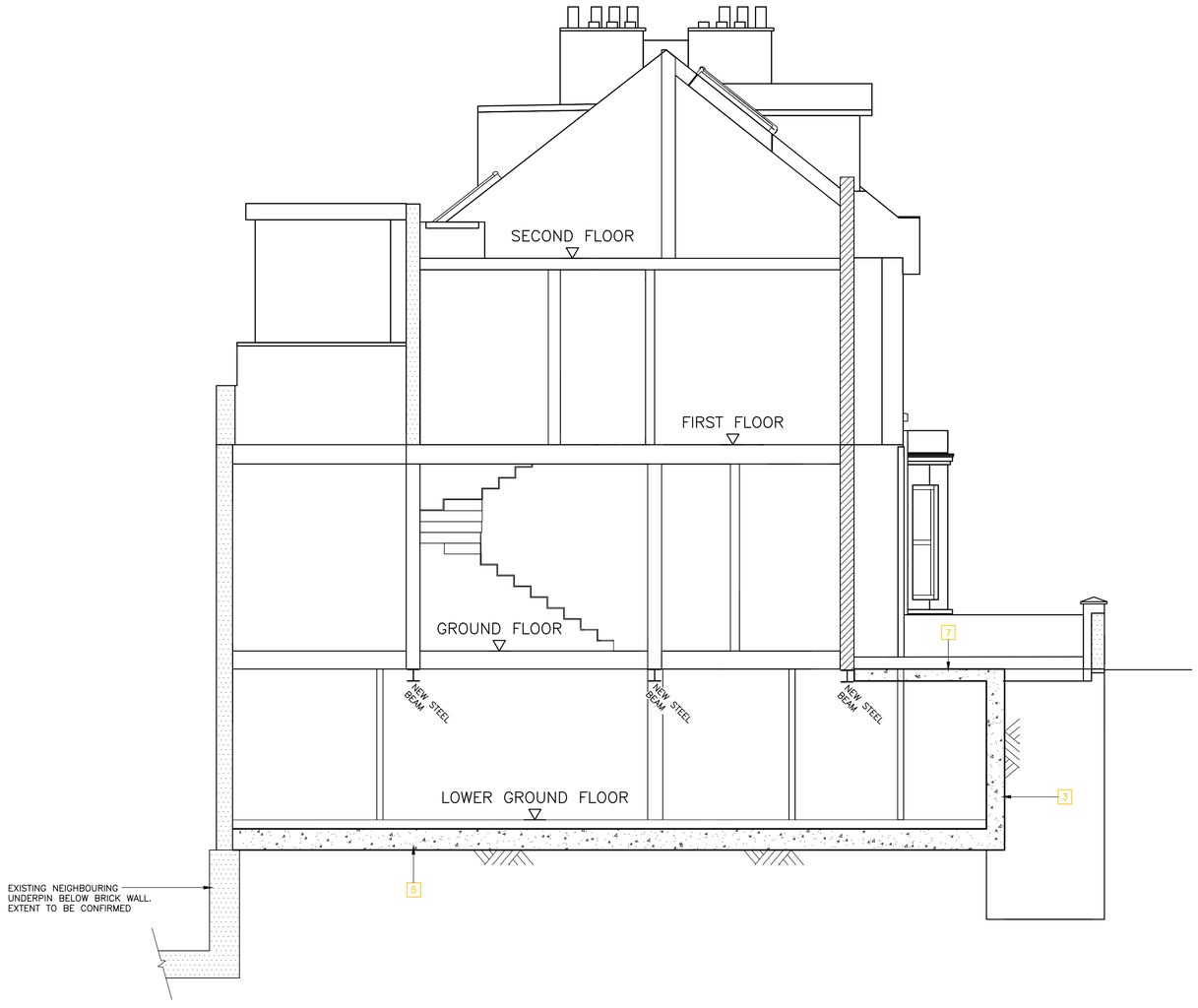
– PLEASE REFER TO ARCHITECTS DRAWINGS FOR ALL SETTING OUT DETAILS, INSULATION AND VENTILATION DETAILS, DAMP PROOF COURSES AND ALL TANKING DETAILS

– FOR ALL FIRE WORK PROTECTION TO STEELWORK REFER TO THE ARCHITECTS DRAWINGS

– CONTRACTOR SHOULD ALSO REVIEW MECHANICAL ENGINEERS DRAWINGS FOR EXACT LOCATION OF SERVICE PENETRATION PRIOR TO CUTTING

PROPOSED METHOD STATEMENT/ SUGGESTED SEQUENCE OF WORKS

1. DEMOLISH EXISTING SIDE EXTENSION AND PROP EXISTING BRICKWORK TO REMAIN ALONG DENNING ROAD AND REAR GARDEN
2. DEMOLISH NON LOAD BEARING WALLS IN LOWER GROUND FLOOR AND INSTALL FIRST FLOOR PROPOSED STEELWORK
3. INSTALL ALL TEMPORARY PROPS AND FORM THE NEW CONCRETE UNDERPINS AND PERIMETER FOUNDATIONS IN AN UNDERPINNED SEQUENCE. SEE DRAWING SK05 FOR PROPOSED PROPPING TO UNDERPINS
4. EXISTING FLOOR TO BE BROKEN OUT IN PREPARATION FOR ANY NEW DRAINAGE AND NEW SLAB CAST. LEVEL TO BE DETERMINED BY ARCHITECT
5. INSTALL ALL DRAINAGE AND THEN FORM LOWER GROUND FLOOR SLAB
6. KEEPING IN POSITION ALL TEMPORARY WORKS INSTALL ALL BASEMENT STEEL WORK AND THEN INSTALL FLOOR JOISTS WITH PLY SHEETING
7. FORM NEW REINFORCED CONCRETE SLAB OVER LOWER GROUND FLOOR EXTENSION
8. REMOVE TEMPORARY WORKS IN REVERSE ORDER OF INSTALLATION
9. INSTALL WATERPROOFING



Notes

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS & ENGINEERS DRAWINGS AND SPECIFICATIONS
2. DO NOT SCALE FROM THIS DRAWING

Rev	Date	Chkd	Amendments
P1	21.02.18	AH	ISSUED FOR PLANNING

Drawing Status: PLANNING

Symmetrys Limited
Consulting Structural Engineers
6 The Courtyard, Lynton Road
London, N8 8SL
T: 020 8340 4041
W: www.symmetrys.com
E: info@symmetrys.com

Job Title: 35 PILGRIMS LANE LONDON, NW3

Drawing Title: SECTION A – A

Job No.	Drawing No.	Revision
17363	11	P1

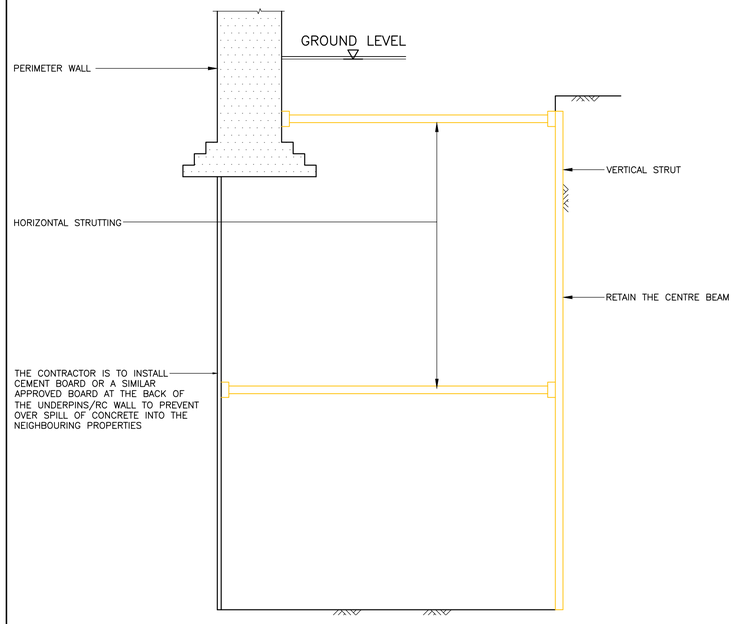
Scales 1:50 AT A1 — Original Size A1

Drawn By JNS Date NOV 2017

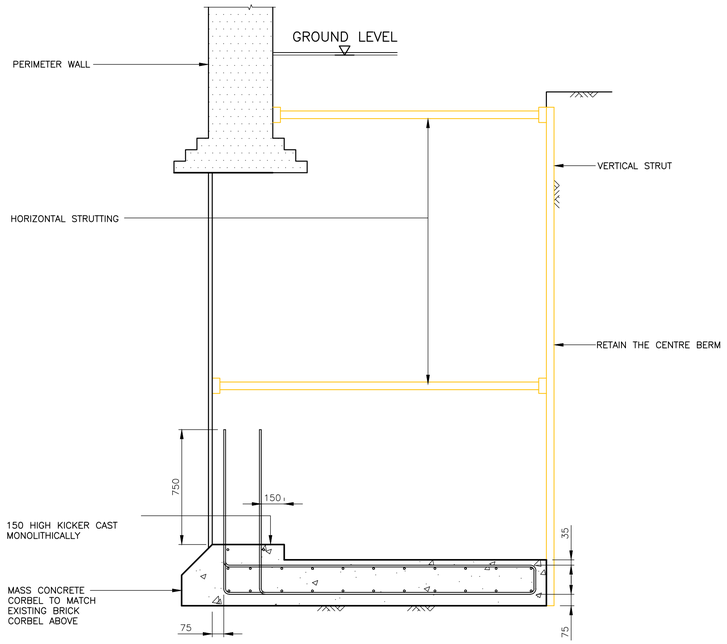
Company No. 5873122
VAT Registration No. 894 2993 61
Registered In England And Wales

QD A1

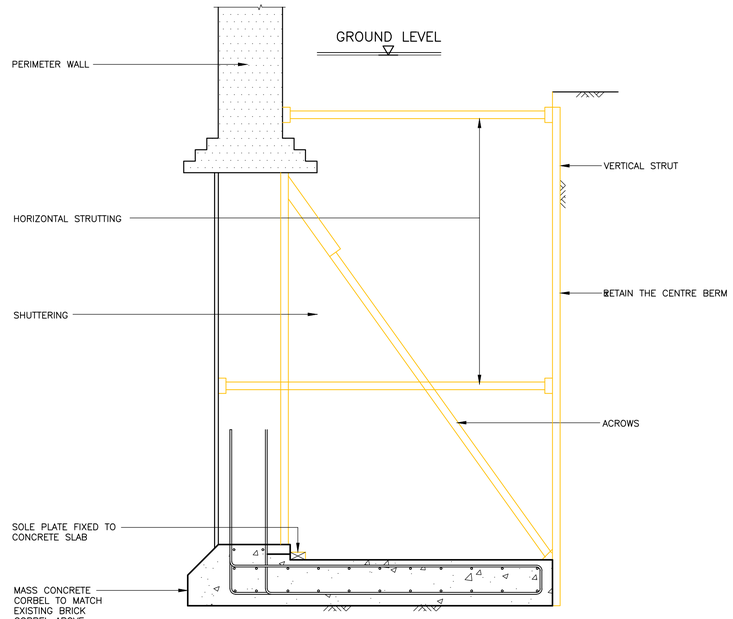
NOTE:
UNDERPINS TO BE DOWELLED INTO EACH OTHER WITH 6No. MIN H20 DOWELS WITH 400mm MIN. EMBEDMENT



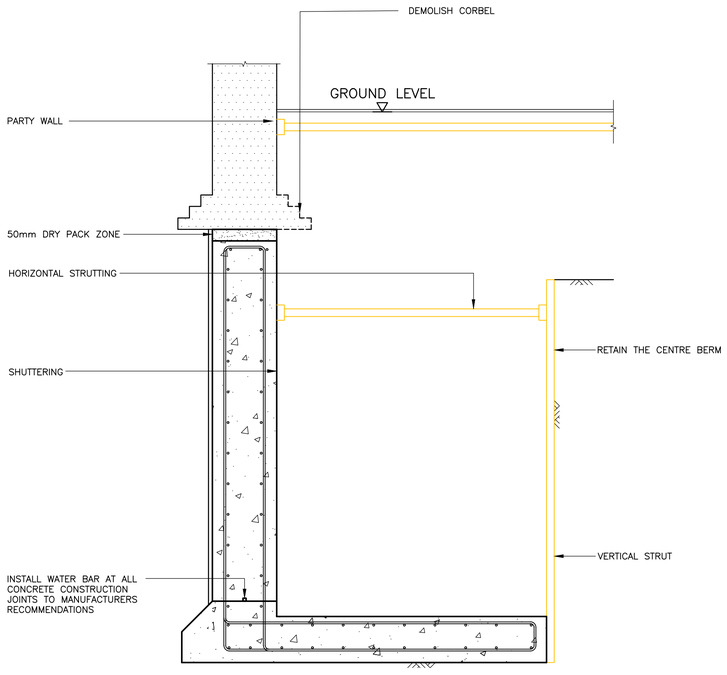
SEQUENCE 1
1:20



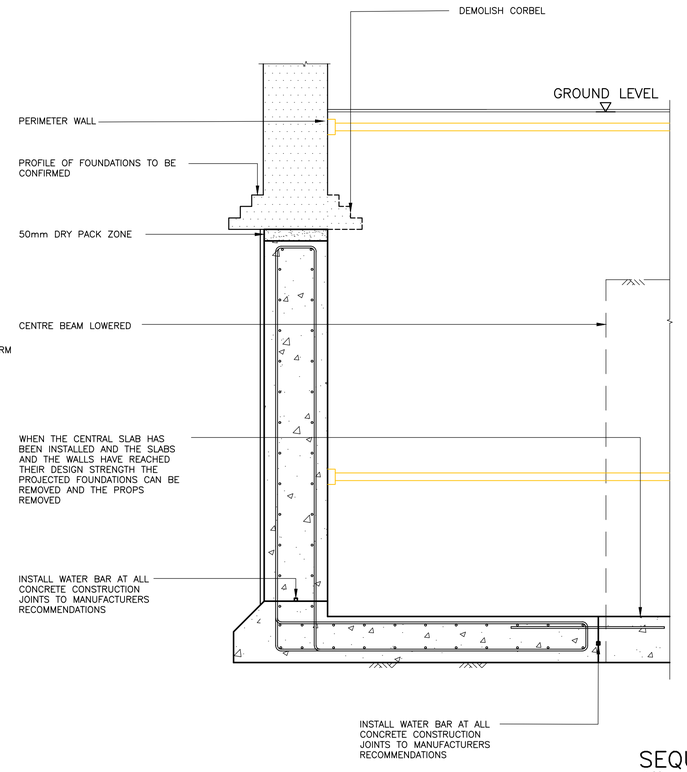
SEQUENCE 2
1:20



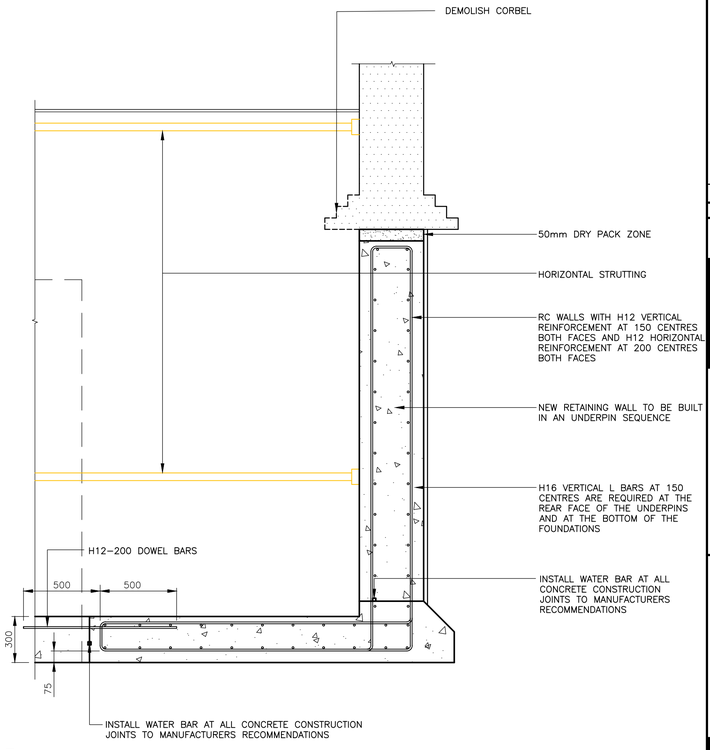
SEQUENCE 3
1:20



SEQUENCE 4
1:20



SEQUENCE 5
1:20



Notes

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS & ENGINEERS DRAWINGS AND SPECIFICATIONS
2. DO NOT SCALE FROM THIS DRAWING

Rev	Date	Chkd	Amendments
P1	21.02.18	AH	ISSUED FOR PLANNING

Drawing Status
PLANNING

Symmetrys Limited
Consulting Structural Engineers
6 The Courtyard, Lynton Road
London, N8 8SL
T: 020 8340 4041
W: www.symmetrys.com
E: info@symmetrys.com

Job Title
35 PILGRIMS LANE
LONDON, NW3

Drawing Title
TYPICAL UNDERPINNING SEQUENCE

Job No.	Drawing No.	Revision
17363	12	P1

Scales 1:50 AT A1 | Original Size A1
Drawn By JNS Date NOV 2017

Company No. 5873122
VAT Registration No. 894 2993 61
Registered In England And Wales

APPENDIX B
STRUCTURAL CALCULATIONS

Symmetrys Ltd
Structural Engineers

Structural Calculations

35 Pilgrims Lane
London
NW3 1SS

17363
February 2018
Rev. A

A: Unit 6, The Courtyard, Lynton Road, London. N8 8SL, T: 020 8340 4041, E: info@symmetrys.com, W: symmetrys.com

1.0 Architect – alma-nac

2.0 Design Codes

2.1 The following design codes/guidance were used to carry out the design:

- BS 648: 1964 – Weights of Building Materials
- BS 5268: Pt 2: 1991 – Structural Timber
- BS 6399: Pt 1: 1984 – Design Loads
- BS 8110: Pt 1: 1997 – Structural Use of Concrete

3.0 Ground Conditions

3.1 Design assumes London Clay with an allowable bearing pressure of 110kPa based on the findings of the soil investigation provided to LMB Geosolutions Ltd.

4.0 Imposed Loads

4.1 Domestic Floors 1.50kN/m^2

5.0 Loading

5.1 The loadings used throughout the design are shown in the table below:

Item	DL (kPa)	LL (kPa)
Timber Floor		
Ceiling and services	0.15	
Joists	0.20	
Plyboard and finishes	0.25	
	0.60	**1.50**
Solid Masonry		
100mm thick	1.9	
15mm plaster	0.3	
	2.2	
215mm thick	4.0	
15mm plaster	0.3	
	4.3	
330mm thick	6.14	
15mm plaster	0.3	
	6.44	
Public Highway		**10.0**
Garden		**2.50**

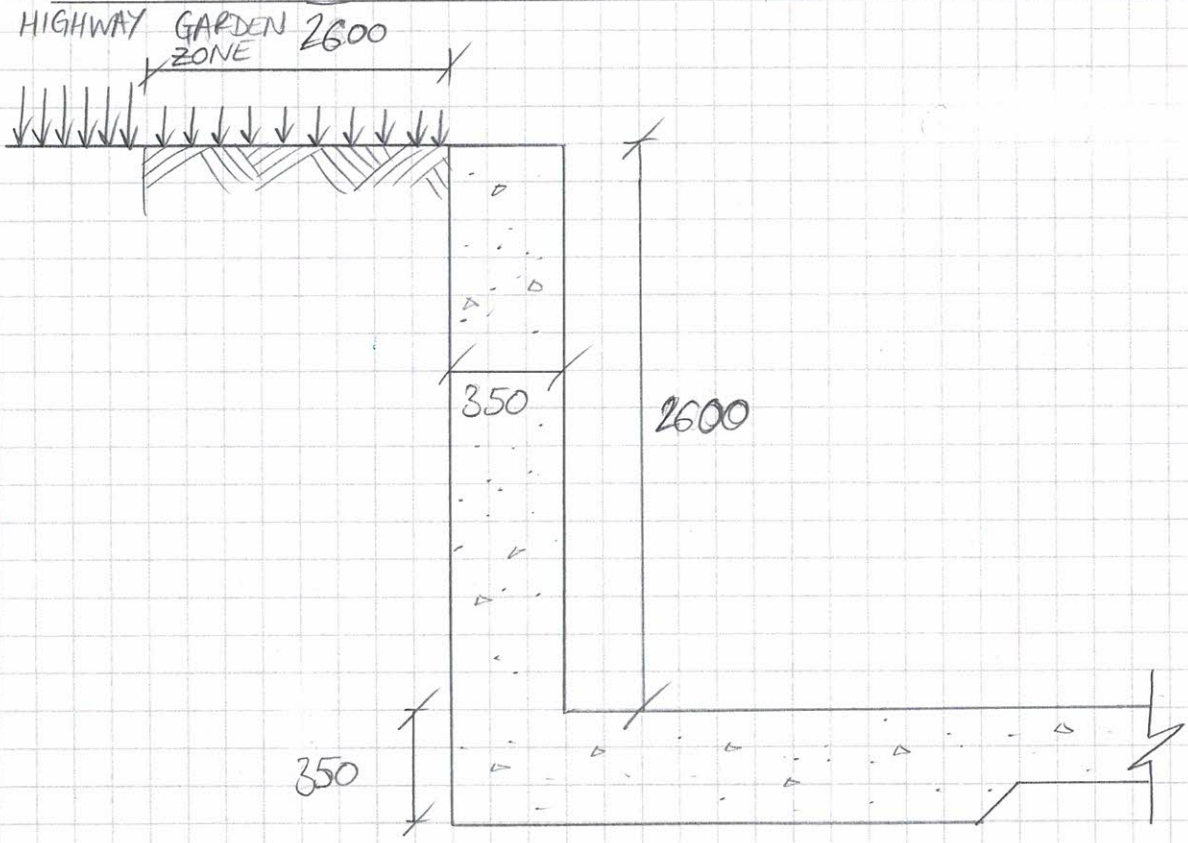
Symmetrys
Structural Engineers

W: www.symmetrys.com
E: info@symmetrys.com

Job No.	Sheet No.	Revision
17363		

Job Title	Date	Made By	Checked By
53 PILGRIMS LANE			
Section PLANNING APP - STRUCTURAL CALCULATIONS	02/2018	MB	

DESIGN OF RETAINING WALL ALONG BOUNDARY OF HIGHWAY



DEAD LOAD

ROOFLIGHT $0.5 kN/m^2 \times 0.4 m = 0.21 kN/m$

LIVE LOAD

ROOFLIGHT $0.75 kN/m^2 \times 0.4 m = 0.31 kN/m$

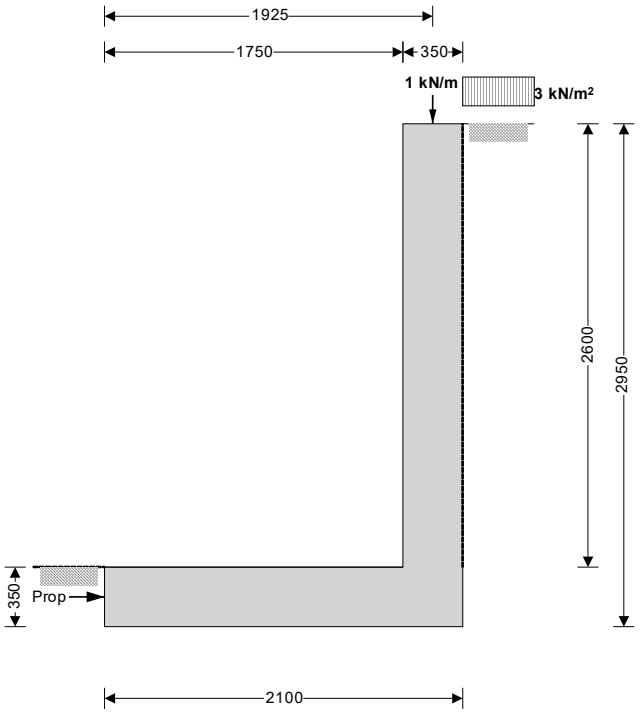
GARDEN $= 2.50 kN/m^2$

REFER TO TEDDS CALCULATION

Symmetrys Structural Engineers	Project: 35 Pilgrims Lane				Job no.: 17363	
	Calcs for: Retaining Wall (Rooflight)				Start page no./Revision	
	Calcs by: MB	Calcs date: 15/02/2018	Checked by: AH	Checked date: 15/02/2018	Approved by	Approved date

RETAINING WALL ANALYSIS (BS 8002:1994)

TEDDS calculation version 1.2.01.06



Wall details

Retaining wall type	**Cantilever**		
Height of wall stem	h_{stem} = **2600** mm	Wall stem thickness	t_{wall} = **350** mm
Length of toe	l_{toe} = **1750** mm	Length of heel	l_{heel} = **0** mm
Overall length of base	l_{base} = **2100** mm	Base thickness	t_{base} = **350** mm
Height of retaining wall	h_{wall} = **2950** mm		
Depth of downstand	d_{ds} = **0** mm	Thickness of downstand	t_{ds} = **350** mm
Position of downstand	l_{ds} = **250** mm		
Depth of cover in front of wall	d_{cover} = **0** mm	Unplanned excavation depth	d_{exc} = **0** mm
Height of ground water	h_{water} = **0** mm	Density of water	γ_{water} = 9.81 kN/m^3
Density of wall construction	γ_{wall} = **23.6** kN/m^3	Density of base construction	γ_{base} = **23.6** kN/m^3
Angle of soil surface	β = **0.0** deg	Effective height at back of wall	h_{eff} = **2950** mm
Mobilisation factor	M = **1.5**		
Moist density	γ_m = **18.0** kN/m^3	Saturated density	γ_s = **21.0** kN/m^3
Design shear strength	ϕ' = **27.0** deg	Angle of wall friction	δ = **0.0** deg
Design shear strength	ϕ'_b = **27.0** deg	Design base friction	δ_b = **18.6** deg
Moist density	γ_{mb} = **18.0** kN/m^3	Allowable bearing	$P_{bearing}$ = **110** kN/m^2

Using Coulomb theory

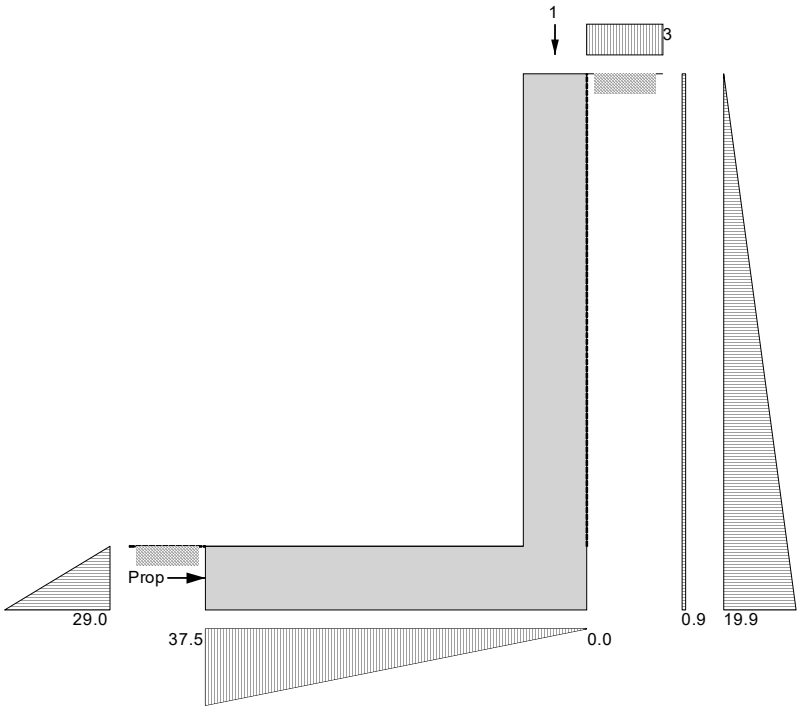
Active pressure	K_a =**0.376**	Passive pressure	K_p = **4.864**
At-rest pressure	K_0 = **0.546**		

Loading details

Surcharge load	Surcharge = **2.5** kN/m^2		
Vertical dead load	W_{dead} = **0.2** kN/m	Vertical live load	W_{live} = **0.3** kN/m
Horizontal dead load	F_{dead} = **0.0** kN/m	Horizontal live load	F_{live} = **0.0** kN/m

Symmetrys Structural Engineers	Project: 35 Pilgrims Lane				Job no.: 17363	
	Calcs for: Retaining Wall (Rooflight)				Start page no./Revision	
	Calcs by: MB	Calcs date: 15/02/2018	Checked by: AH	Checked date: 15/02/2018	Approved by	Approved date

Position of vertical load l_{load} = **1925** mm Height of horizontal load h_{load} = **0** mm



Loads shown in kN/m, pressures shown in kN/m²

Calculate propping force

Propping force F_{prop} = **14.0** kN/m

Check bearing pressure

Total vertical reaction R = **39.3** kN/m Distance to reaction x_{bar} = **700** mm

Eccentricity of reaction e = **350** mm

Reaction acts within middle third of base

Bearing pressure at toe p_{toe} = **37.5** kN/m² Bearing pressure at heel p_{heel} = **0.0** kN/m²

PASS - Maximum bearing pressure is less than allowable bearing pressure

Symmetrys Structural Engineers	Project: 35 Pilgrims Lane				Job no.: 17363	
	Calcs for: Retaining Wall (Rooflight)				Start page no./Revision	
	Calcs by: MB	Calcs date: 15/02/2018	Checked by: AH	Checked date: 15/02/2018	Approved by	Approved date

RETAINING WALL DESIGN (BS 8002:1994)

TEDDS calculation version 1.2.01.06

Ultimate limit state load factors

Dead load factor γ_{f_d} = **1.4** Live load factor γ_{f_l} = **1.6**

Earth pressure factor γ_{f_e} = **1.4**

Calculate propping force

Propping force F_{prop} = **14.0** kN/m

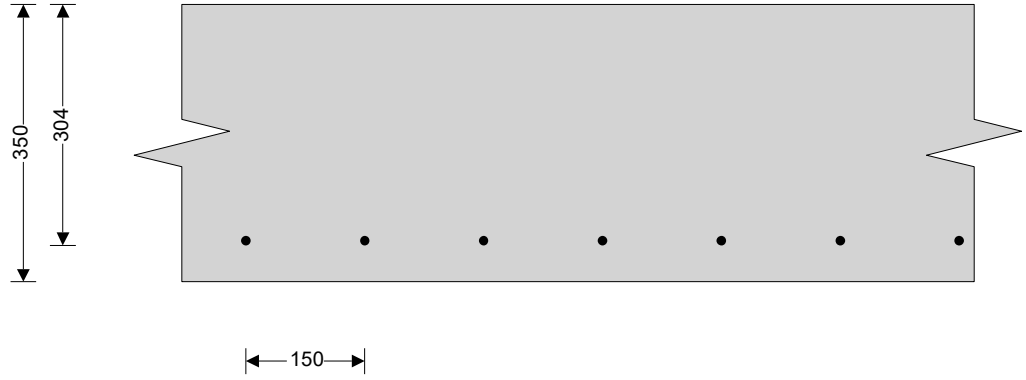
Design of reinforced concrete retaining wall toe (BS 8002:1994)

Material properties

Strength of concrete f_{cu} = **40** N/mm^2 Strength of reinforcement f_y = **500** N/mm^2

Base details

Minimum reinforcement k = **0.13** % Cover in toe c_{toe} = **40** mm



Design of retaining wall toe

Shear at heel V_{toe} = **34.9** kN/m Moment at heel M_{toe} = **68.2** kNm/m

Compression reinforcement is not required

Check toe in bending

Reinforcement provided **12 mm dia.bars @ 150 mm centres**

Area required $A_{s\_toe\_req}$ = **542.9** mm^2/m Area provided $A_{s\_toe\_prov}$ = **754** mm^2/m

PASS - Reinforcement provided at the retaining wall toe is adequate

Check shear resistance at toe

Design shear stress v_{toe} = **0.115** N/mm^2 Allowable shear stress v_{adm} = **5.000** N/mm^2

PASS - Design shear stress is less than maximum shear stress

Concrete shear stress v_{c_toe} = **0.497** N/mm^2

v_{toe} < v_{c_toe} - No shear reinforcement required

Design of reinforced concrete retaining wall stem (BS 8002:1994)

Material properties

Strength of concrete f_{cu} = **40** N/mm^2 Strength of reinforcement f_y = **500** N/mm^2

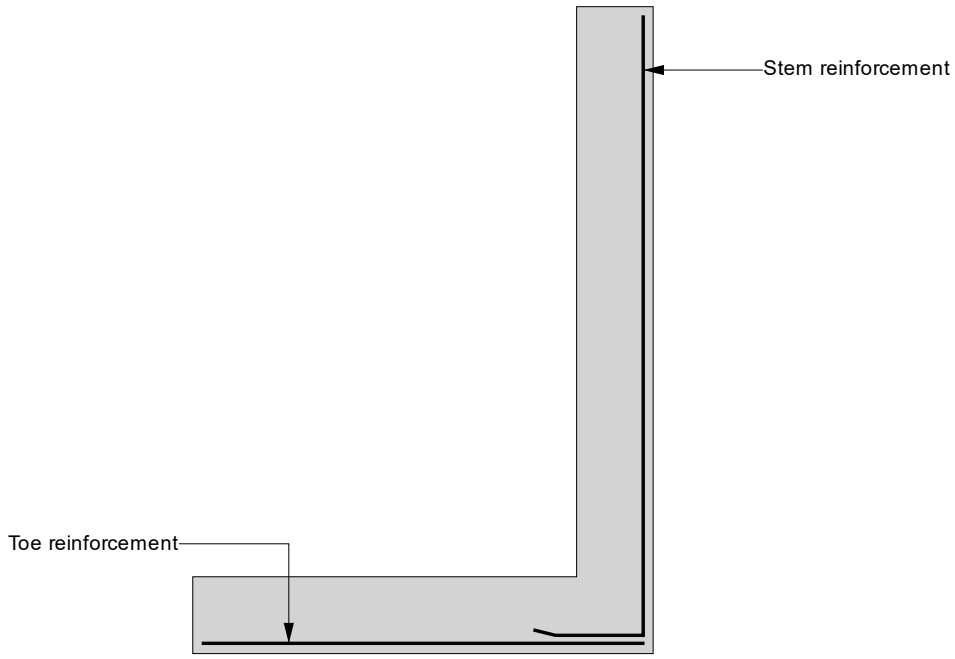
Wall details

Minimum reinforcement k = **0.13** %

Cover in stem c_{stem} = **40** mm Cover in wall c_{wall} = **40** mm

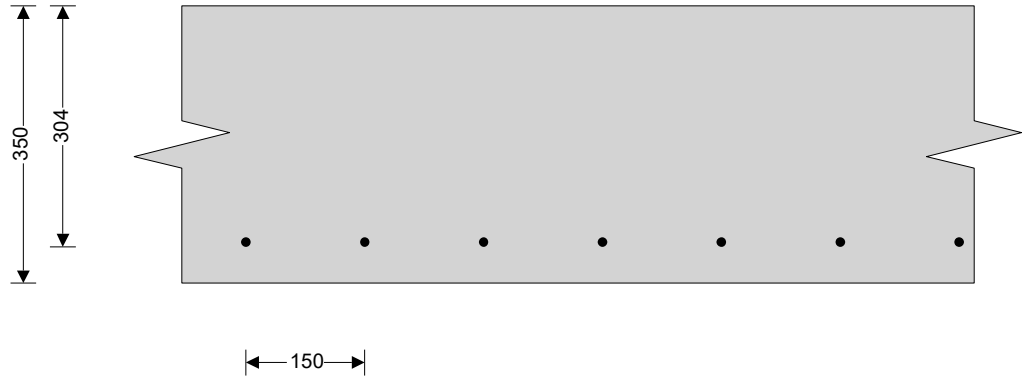
Symmetrys Structural Engineers	Project: 35 Pilgrims Lane				Job no.: 17363	
	Calcs for: Retaining Wall (Rooflight)				Start page no./Revision	
	Calcs by: MB	Calcs date: 15/02/2018	Checked by: AH	Checked date: 15/02/2018	Approved by	Approved date

Indicative retaining wall reinforcement diagram



Toe bars - 12 mm dia.@ 150 mm centres - (754 mm^2/m)
Stem bars - 12 mm dia.@ 150 mm centres - (754 mm^2/m)

Symmetrys Structural Engineers	Project: 35 Pilgrims Lane				Job no.: 17363	
	Calcs for: Retaining Wall (Rooflight)				Start page no./Revision: 4	
	Calcs by: MB	Calcs date: 15/02/2018	Checked by: AH	Checked date: 15/02/2018	Approved by:	Approved date:



Design of retaining wall stem

Shear at base of stem V_{stem} = **11.4** kN/m Moment at base of stem M_{stem} = **56.8** kNm/m

Compression reinforcement is not required

Check wall stem in bending

Reinforcement provided **12 mm dia.bars @ 150 mm centres**

Area required $A_{s\_stem\_req}$ = **455.0** mm²/m Area provided $A_{s\_stem\_prov}$ = **754** mm²/m

PASS - Reinforcement provided at the retaining wall stem is adequate

Check shear resistance at wall stem

Design shear stress v_{stem} = **0.037** N/mm² Allowable shear stress v_{adm} = **5.000** N/mm²

PASS - Design shear stress is less than maximum shear stress

Concrete shear stress v_{c_stem} = **0.497** N/mm²

v_{stem} < v_{c_stem} - No shear reinforcement required

Check retaining wall deflection

Max span/depth ratio $ratio_{max}$ = **14.00** Actual span/depth ratio $ratio_{act}$ = **8.55**

PASS - Span to depth ratio is acceptable

Symmetrys
Structural Engineers

W: www.symmetrys.com
E: info@symmetrys.com

Job No.	Sheet No.	Revision
17363		

Job Title	35 PILGRIMS LANE	Date	Made By	Checked By
Section	PLANNING APP - STRUCTURAL CALCULATIONS	01/18	MB	AH

TEMPORARY WORKS

Prop Force (From TEDDS Calculation) = 14.0 kN/m

ULTIMATE 14 kN/m x 1.6 = 23 kN/m

PROVIDE 'SUPERSLIM SOLDIER' BY RMD QUICKFORM

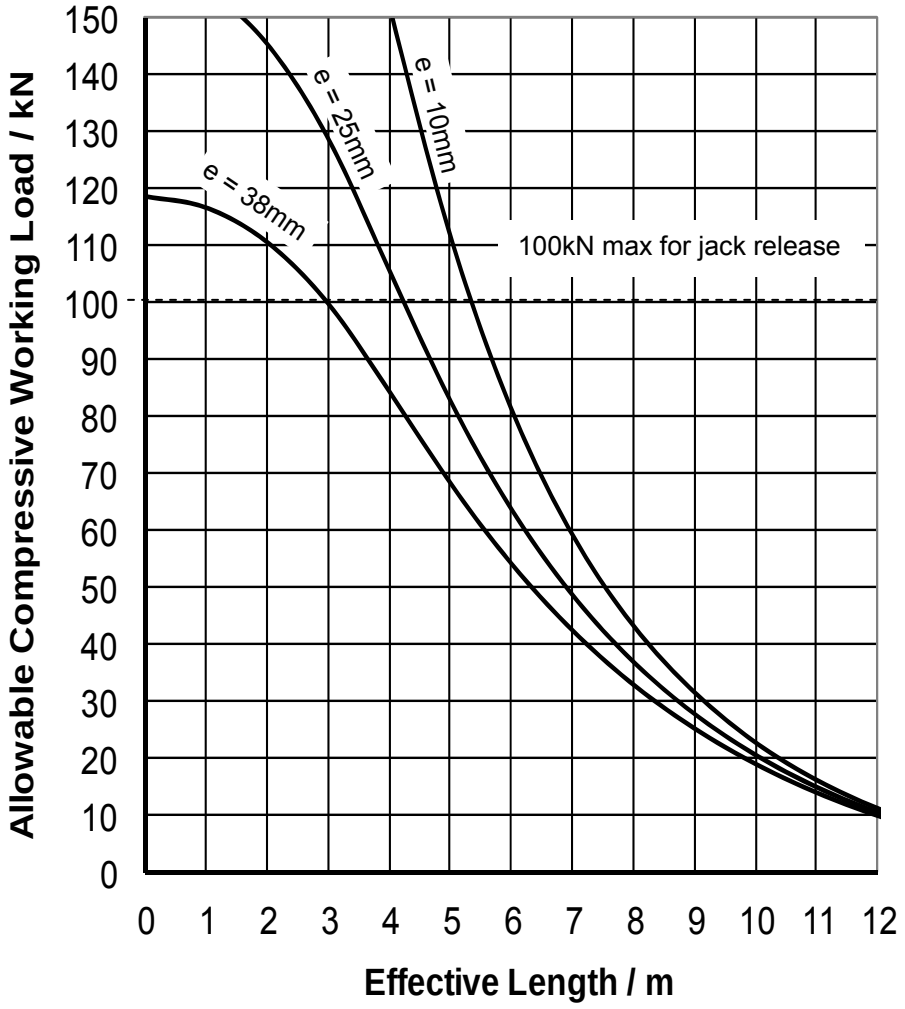
ALLOWABLE COMPRESSIVE WORKING LOAD, FOR SAY 4m = 85kN

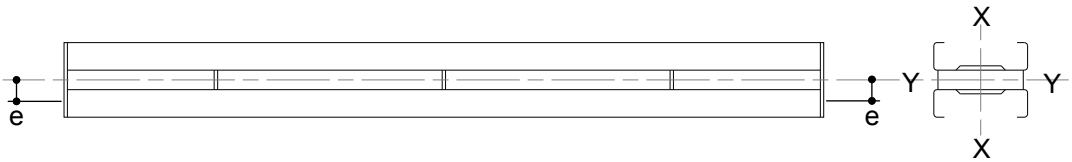
85kN / 1.5m CENTRES = 56.7 kN/m > 23kN/m → OK

∴ PROVIDE PROPS AT 1.5m CENTRES

1.1.8. Horizontal Shores – Buckling About the Y Axis

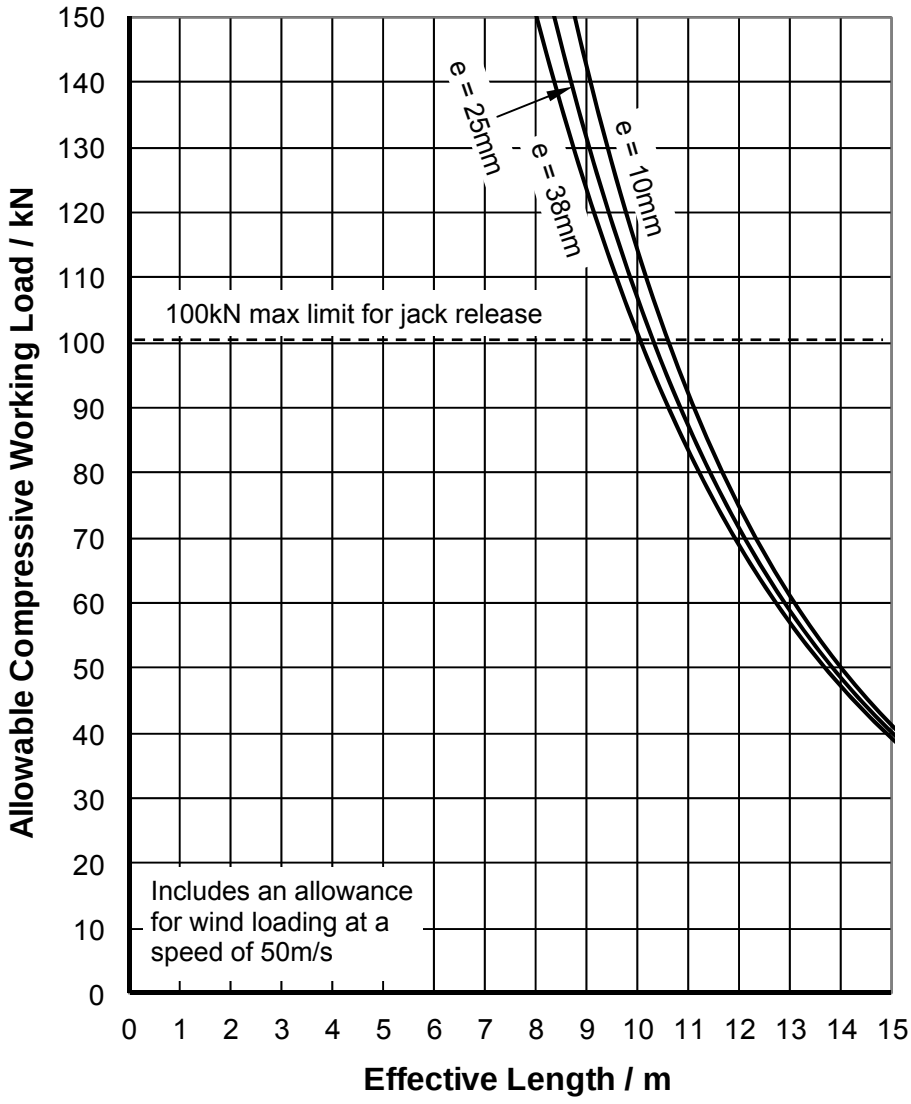
The notes relating to vertical members in compression also apply to horizontal members in compression. An additional allowance for the self weight of the horizontal shore has been included. Wind load has been excluded for the orientation shown. When shores have intermediate vertical restraints, buckling about the x axis may be the limiting factor.

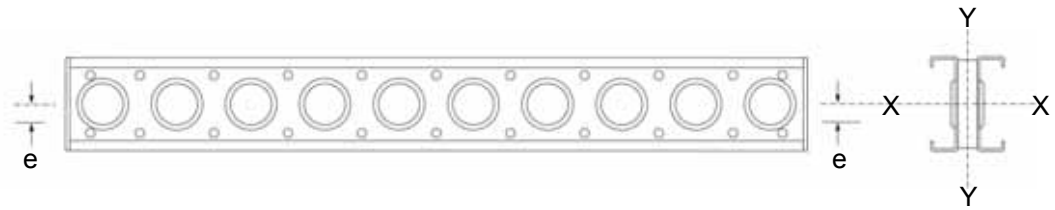




Note! The allowable working load for horizontal applications is shown as greater than for vertical applications due to the inclusion of wind loads in the vertical application graph (the effects of which exceed the effect of self weight in the horizontal orientation graph). If vertical plane wind loads are expected when designing struts with this orientation refer to RMD Kwikform for revised data.

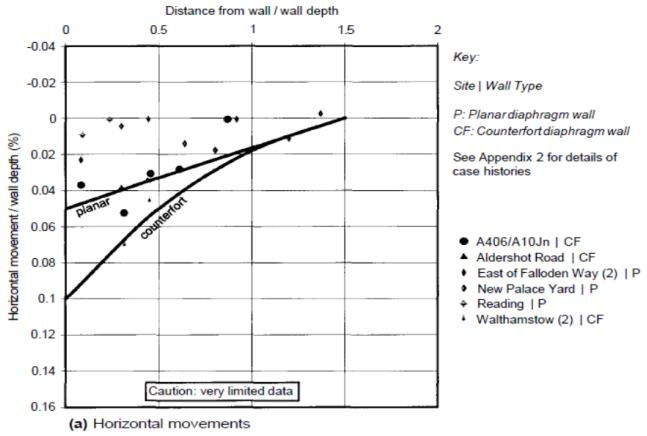
1.1.9. Horizontal Shores – Buckling About the X Axis





This graph assumes that the strut is effectively restrained against buckling in the Y axis by adequate intermediate lateral restraint.

APPENDIX C
GROUND INVESTIGATION & ASSESSMENT



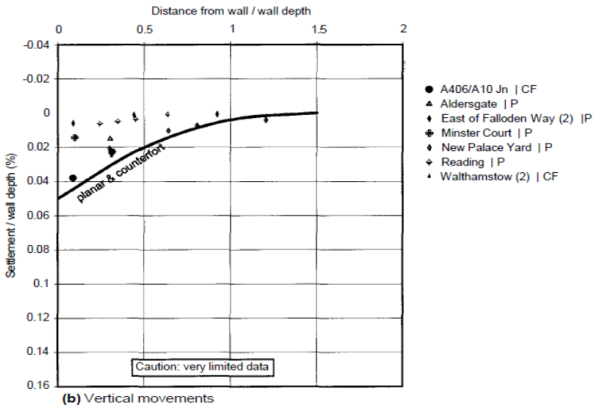
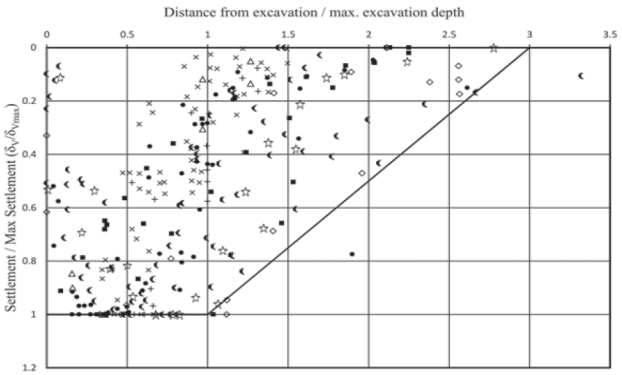


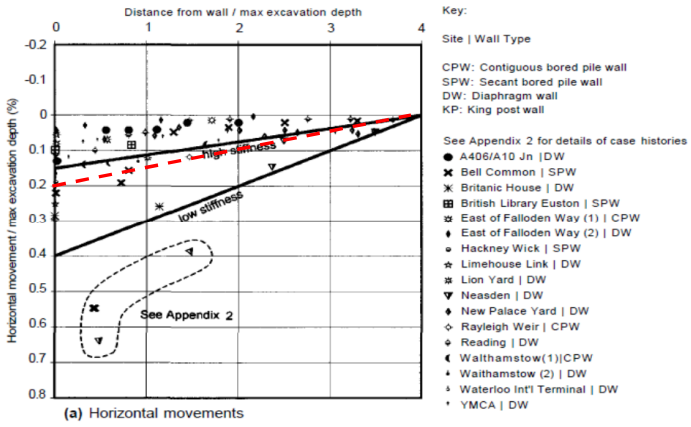
Fig. 6.9 *Ground surface movements due to diaphragm wall installation in stiff clay*



b Normalised ground settlements in soft to firm clay

Figure 6.11 Normalised ground surface settlements due to excavation in soft and firm clay and settlements behind the wall based on the same data

Soft to Firm Clay



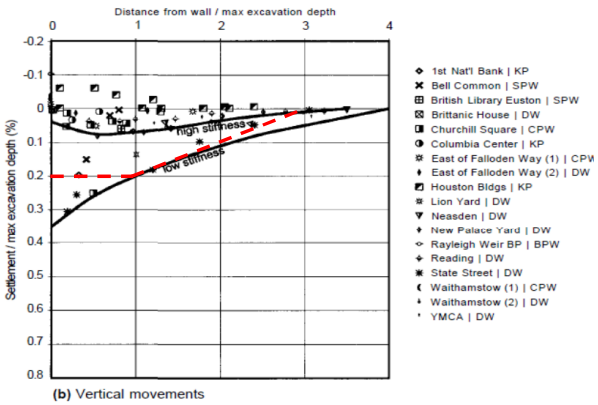


Fig. 6.15 *Ground surface movements due to excavation in front of wall in stiff clay*