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9 TEMPLEWOOD AVENUE NW3

STRUCTURAL STABILITY REVIEW AND BASEMENT IMPACT ASSESSMENT

December 2012

Revision B

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1.0 Introduction

1.1 Proposed Development

This report is submitted in support of a planning application as prepared by Xul Architecture Ltd. pertaining to the property in accordance with the requirements of the London Borough of Camden. These requirements are set out within the Development Policy DP27 and the Camden Planning Guidance CPG4 – Basements and Lightwells

The report is to be read in conjunction with architectural drawings series 12_11, which form part of the planning application, together with structural drawings series 3344 appended to this report. The report should also be read in conjunction with the site specific Hydrogeological Review by GCG Ltd, Flood Risk Assessment by Water Environment Ltd, The Site Investigation Report by HESI Ltd and the Report on the impact on Trees by John Cromar's Arboricultural Company Ltd.

This report deals specifically with the requirement under DP27 to maintain the structural stability of the building and neighbouring properties. In doing so this report reviews the constraints imposed by the existing structure, adjacent structures and surroundings and prevailing ground conditions to ascertain the most appropriate form of construction work to achieve the basement proposals indicated in the architectural drawings. Methods of working are selected on the basis of minimising the impact, both during the works and in the permanent condition, on the following aspects.

- The Existing Building
- Party walls and boundaries
- Adjacent structures

References to left and right are made viewing the property from the front.

1.2 Purpose of work

It is proposed to refurbish an existing basement and ground floor maisonette by remodelling the inside of the ground floor, removing internal load bearing walls and creating new rear bay windows with infill section between them.

In doing so, it is also proposed to enlarge the existing basement, by enlarging the existing footprint and extending slightly lower than the existing basement.

The double storey side extension is proposed to be reconstructed in an amended form.

A small swimming pool is being created in the rear garden which is remote from the buildings and will have no impact in terms of structural issues.

1.3 Qualifications

This report has been prepared by Ian Drummond BSc(Eng) CEng MIStructE. Ian Drummond has been practicing as a consulting engineer in central London for the last 27 years and has extensive experience in subterranean developments. This report has been checked by Peter Lecheta MSc (Eng) who has practiced as a structural engineer involved in subterranean developments for the past 10 years.

1.4 References

Camden Development Policy DP27
Camden Planning Guidance CPG4
Camden Geological, Hydrogeological and Hydrological Study
HESI Ltd - Site Investigation Report
GCG Ltd - Hydrogeological Review
Water Environment Ltd – Flood Risk Assessment
John Cromar's Arboricultural Company Ltd - Report on the impact on trees

1.5 Limitations of Report

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside the stated scope of the research. Any comments made on the basis of information obtained from third parties are given in good faith on the assumption that the information is accurate. No independent validation of third party information has been made by IDCE Ltd

2.0 SCREENING

2.1 Structural Stability Screening Assessment

1. Does the proposed basement involve propping and re-support of the existing building	Yes
2. Does the proposed basement extend lower than the party fence structure to the right	Yes
3. Does the proposed basement extend lower than the building structure to the right	No
4. Does the proposed basement extend lower than the party fence structure to the left	The existing side extension reaches the boundary and this wall is to be demolished and rebuilt
5. Does the proposed basement extend lower than the building structure to the left	Yes
6. Does the proposed basement undermine the public highway?	No
7. Does the proposed basement undermine any structures in the rear garden?	No

2.2 Slope Stability Screening Assessment

1. Does the existing site include slopes, natural or manmade, greater than 7°?	No
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7°?	No
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?	No
4. Is the site within a wider hillside setting in which the general slope is greater than 7°?	No
5. Is the London Clay the shallowest strata at the site?	Yes
6. Is there a history of seasonal shrinkage-swell subsidence in the local area and/or evidence of such effects on the site.	No
7. Is the site within an area of previously worked ground?	No
8. is the site within 5m of a highway or pedestrian right of way?	No
9. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.	No
10. Is the site over (or within the exclusive zone) of and tunnels eg railway lines?	No

3.0 Scoping and Site investigation

3.1 Existing Buildings and Surroundings

The existing building is a detached residential property, originally constructed as a single occupancy residential dwelling, but subdivided into smaller residential units at some point in the past. The subject property occupies the ground floor and partial basement while there are currently two residential units on the first floor and one on the second floor which fall outside the demise of the subject property.

Trees and vegetation exist at the front and rear of the property including mature trees in close proximity. However there are currently no indications of overall structural movement affecting any part of the building as a result of tree root activity in shrinkable clay sub soils.

The left wall of the property is situated on the boundary, forming the side wall of the current side extension which is at existing basement and ground floor level. Consequently the existing side wall is retaining land from the adjacent property to the left. The property to the left, No 7, is approximately 2.5 – 3.0m away from the boundary with the ground sloping slightly down towards the left. As such No 7 is sufficiently remote from the works not to require any special consideration beyond the measures taken to retain the land.

The right wall of the property is set in by approximately 900mm from the right side boundary. Works are currently underway in the formation of a new full size basement in the property on the right, No 11, and from the planning documentation relating to the new basement works at No 11 the foundations of the proposed basement will extend to a very similar level to the foundations of No 11 on the right and therefore no be undermined by the works. Nonetheless, the boundary, side path and adjoining land will need to be retained and re-supported by the new basement wall on the right side of the No 9.

To the rear of the property, the existing garden extends approximately 24m and no trees of particular note exist in close proximity to the redevelopment. The variations in ground level are proposed to be rationalised by levelling across the width of the property and stepping up toward the rear which will involve low garden retaining walls to deal with the general fall of the ground from right to left and from rear to front.

3.2 Site investigation

A visual survey and measured survey have been carried out to the existing property and surroundings. These did not reveal anything prohibitive with respect to the proposals.

An intrusive ground investigation has been carried out by Herts & Essex Site investigation Ltd. in terms of two bore holes at the rear of the property in the vicinity of the basement extension to ascertain the nature of the ground and presence of ground water.

The full report forms part of the Basement Impact Assessment, however in general terms the natural ground was found to be firm sandy CLAY which will provide a typical bearing capacity for London Clay. Slow water seepage was found up to 2.75m BGL which would affect the bottom 250mm of excavations.

This ground will be suitable for re-support of the building on new foundations and for staged excavations. While temporary shoring of excavations is required as a matter of course, clay stands up well in the temporary condition and it will be possible to cut the ground to accurate lines to form the various ground works stages.

Tendency for the clay to heave due to removal of overburden pressure will be compensated by the bearing pressure of the new foundations. The basement slab between the foundation will need to be suspended to combat clay heave.

3.3 Potential Impacts

POTENTIAL IMPACT	POSSIBLE CONSEQUENCES
1. The existing building will need to be temporarily propped and re-supported on a new steel framework as part of the works.	Movement to superstructure during load transfer
2. The existing building will need to be underpinned as part of the works.	Movement to superstructure and upper floors as a result of underpinning works
3. The party fence structure to the right will be undermined as part of the works	Movement and structural damage to party fence structure
4. The adjacent land to the right will be undermined as part of the works	Subsidence of land and possible damage to hard landscaping

4.0 Proposed Construction

4.1 Proposed Structural Form

In view of the traditional ground bearing foundations to the existing basement areas, it is proposed to use ground bearing retaining walls (as opposed to piled) to maintain continuity of structural form and compatibility with the existing foundations with respect to seasonal movement in the bearing strata. Existing foundations, extended foundations, new foundations and new retaining walls are all proposed to be founded on the same bearing strata at very similar founding levels. The existing superstructure is to be re-supported on a new framework of steel beams and columns which can be installed in turn and brought to bear on the new foundation arrangement. The existing timber joisted ground floor structure would be replaced with a new precast floor with in-situ concrete build-up. Underpin retaining walls are proposed to be used to facilitate the ability to excavate and re-support only short sections at a time and limit the movement in the surrounding ground during the operation.

4.2 General Underpinning Method

Underpinning for basement creation below existing buildings is routinely carried out in London and can be successfully achieved by a system of sequenced excavations and construction of short lengths of concrete walls and foundations. These serve to provide new vertical support to the existing building, as well as retain the ground for the formation of the basements. Limited excavations of approximately one metre wide are carried out to ensure that a short length of building only is undermined at any point in the construction sequence. By the nature of the operation, the excavations are carried out in a confined working space and can require temporary shoring if sections of the ground are found to be insufficiently cohesive to be stable in the temporary condition. Once the short section of reinforced concrete has been cast and the building re-supported by pinning up tight off the new construction, the next section of excavation is commenced in a location remote from the first. This method of working ensures the temporary stability of the existing building. As the sequence progresses, more and more of the existing building is re-supported on new foundations, which are usually more rigorous than the original due to the increased founding depth.

No cumulative effects of these construction works have been identified.

4.3 Outline Method Statement

1) Strip out the ground floor ceilings to fully expose the existing structure supporting the first floor above.
2) Remove the ground floor structure to expose the under floor void.
3) Excavate locally in location of new column bases, propping locally as required.
4) Cast new column bases.
5) Chase out existing walls as required and install new steel columns between basement and ground floor level.
6) Install new steel beams at ground floor level.
7) Needle and prop existing walls supporting first floor structure and install new beams and posts supporting first floor above.
8) Demolish existing walls, ground to first.
9) Install new precast beam and block flooring at ground floor level which will also act as a temporary crash deck.
10) Commence with underpinning of existing basement walls to new founding level.
11) Simultaneously commence with non-structural fit out and finishing ground floor.
12) Demolish existing side extension and temporarily shore existing boundary retaining wall.
13) Cut out boundary retaining wall in short sections and cast new deeper retaining walls.
14) Access rear of property with machine and commence earth work at rear.
15) Excavate and cast retaining wall at the rear in short sections and in sequence to ensure stability of ground.
16) Cast the in-situ reinforced concrete bridging slab between the rear of the building and the light well retaining wall.
17) Complete the sequence of perimeter underpinned retailing walls and internall underpinning.
18) Construct the superstructure for the two storey side extension.
19) Continue with damp proofing, finishes and fit out.

4.4 General Method Statement

The fully detailed method of working would be specified in the consulting engineer's General Method Statement following detailed design and forming part of the contract documentation with wich the contractor is obliged to comply.

4.5 Contractor's Method Statement

Actual working practices on site would be subject to the Contractor's Method Statement which the contractor would be obliged to produce prior to start of works on site.

5.0 BASEMENT IMPACT ASSESSMENT

5.1 Impact on the Building

While there is a potential impact on the existing building in terms of differential movement during load transfer the risk is no greater than for any other typical alteration and refurbishment project. Care will need to be taken to sequence the ground works so that excavations are kept to short sections and re-supported immediately during the works. Pre-stressing techniques will be employed during installation of steelwork to minimise deflection during load transfer. Providing such measures are taken the impact on the building is anticipated to be small with category of damage under the Burland Scale being 0 or 1, Negligible or Very Slight.

5.2 Impact on Party Walls and Adjacent Buildings

The sequential nature of underpinning work carried out in short sections protects adjacent structures from undermining and subsequent ground movement, particularly in the case of cohesive clay. The impact on the party fence wall with No 11 is therefore anticipated to be small with category of damage under the Burland Scale being 0 or 1, Negligible or Very Slight.

Due to the similar founding level of the basement at No 11 currently under construction the impact on the works on No 11 are anticipated to be negligible with category of damage under the Burland Scale being 0.

Due distance of No 7 from the works the impact on the works on No 7 are anticipated to be negligible with category of damage under the Burland Scale being 0. In the event of the adjoining owner at No 7 wishing to form a basement adjacent the boundary to the same level in the future, this can be achieved by excavating to the top of the base level and then casting new construction against the wall stem.

5.3 Impact on Land Stability

It is anticipated that the development will have no impact on land stability.

5.4 Impact on Ground Water

A hydro-geological review has been carried out by the Geotechnical Consultancy Group which forms part of the basement impact assessment. The report concludes that the proposed development will have no significant impact on the local groundwater.

5.5 Impact on Surface Water and Flooding

Please refer to the Flood Risk Assessment undertaken by Water Environment Ltd.

5.6 Impact on Trees

A report on the impact on trees of proposed development has been carried out by John Cromar's Arboricultural Company Limited and forms part of the impact assessment. The report concludes that the development will not be injurious to trees to be retained, nor will it require and trees of significant public amenity value to be removed.

6.0 MITIGATION

6.1 Pre-stressing

Pre-stressing of superstructure steelwork by means of flat jacking is recommended to minimise deflection during load transfer.

6.2 Monitoring

To ensure the ongoing temporary and permanent stability of party structures and adjacent buildings, precise level monitoring would be carried out to the neighbouring house side walls on both sides of the building prior to commencement of excavation work and at regular intervals during the course of excavation. A trigger level would be set to allow immediate notification of excessive deflections so that any shortfall in the effectiveness of working methods can be identified and rectified as work proceeds. This will ensure the protection of the adjacent building structures from any unexpected effect of the works.

6.3 Protection and de-watering

While only a small degree of ground water at the base of the excavations is anticipated, protection of excavated areas is recommended together with de-watering facilities to ensure that all excavations and reinstatement works are carried out in the dry.

7.0 Conclusion

The new basement construction as set out in the drawings and method statement gives due consideration to the building structures on and adjacent to the site and allows work to proceed in a way which can be monitored as it progresses, so that any variations in soil conditions or unforeseen anomalies can be dealt with as they arise.

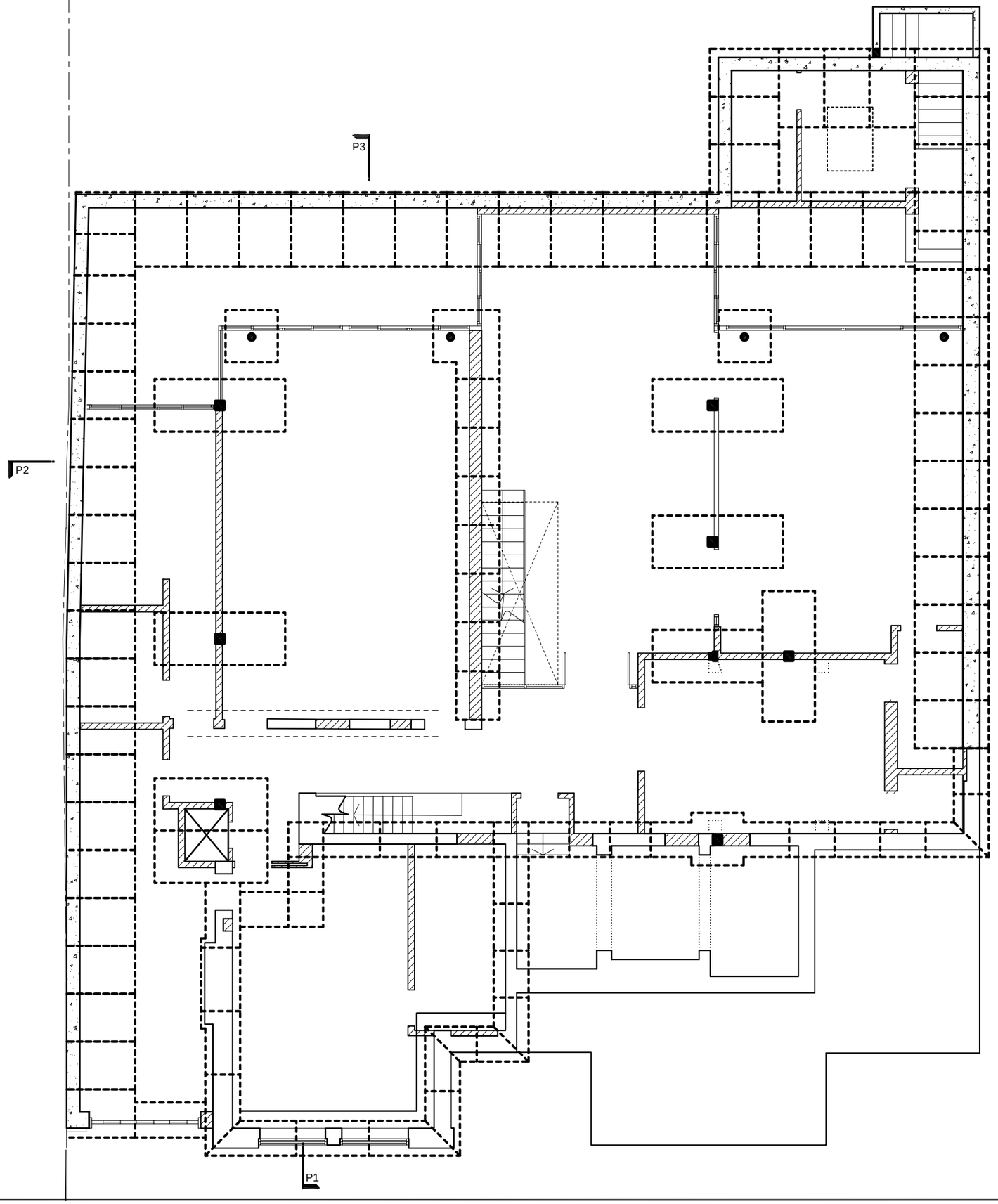
The works can be constructed in such a way as to ensure the temporary and long-term stability of the boundary walls and adjacent structures.

The works do not present a risk to surrounding trees or vegetation, either during the works or after completion.

The methods of working described in the proposals are common methods of construction, regularly employed and do not involve any unusual or experimental techniques.

The foregoing demonstrates that, using methodologies appropriate to the site, the proposed development can be carried out in such a way that maintains the structural stability of the building and neighbouring properties, avoids adversely affecting drainage and run-off or causing damage to the water environment and avoids cumulative impacts on structural stability or the water environment in the local area.

……..
I.G. DRUMMOND BScEng CEng MIStructE



KEY

- New Foundation
- Existing Foundation
- New Load Bearing Walls
- New Reinforced Concrete Walls
- Steel Post
- Steel Post Under
- New Steel Beam
- Existing Beams
- Precast Beam & Block Floor

THESE DRAWINGS ILLUSTRATE STRUCTURAL PRINCIPLES ONLY

Scale 1:50 @ A1 & 1:50 @ A3

ABBREVIATIONS

T	Top
B	Bottom
GMS	galvanised mild steel
TPC	tooth plate connectors
LB	load bearing
c/c	centre to centre
extg	existing

Rev	Date	Detail
	19.12.12	ISSUED FOR PLANNING

BASEMENT PLAN

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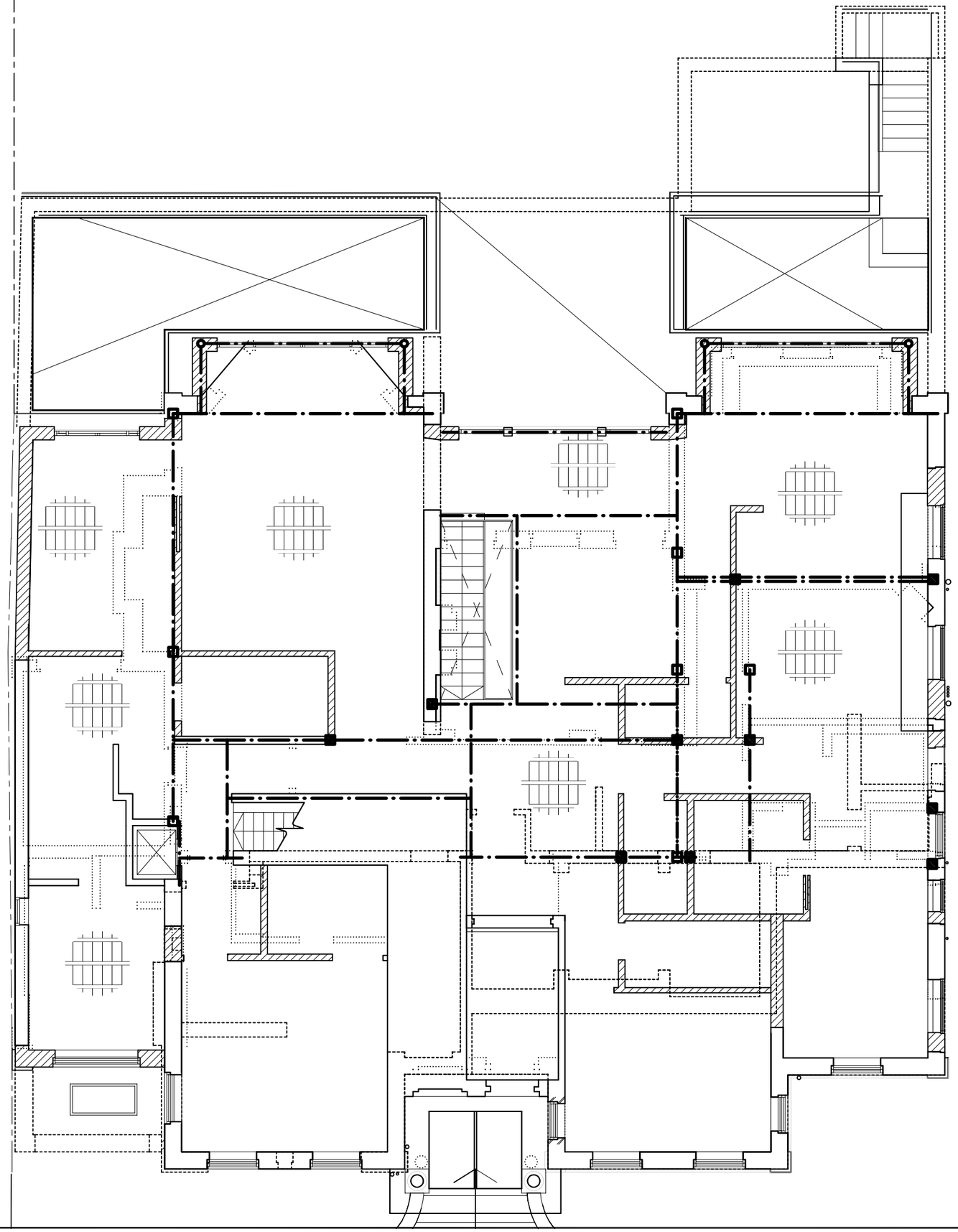
9 TEMPLEWOOD AVE
LONDON NW3

Drawing Number 3344 / 1

Rev



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	19.12.12	ISSUED FOR PLANNING

GROUND FLOOR

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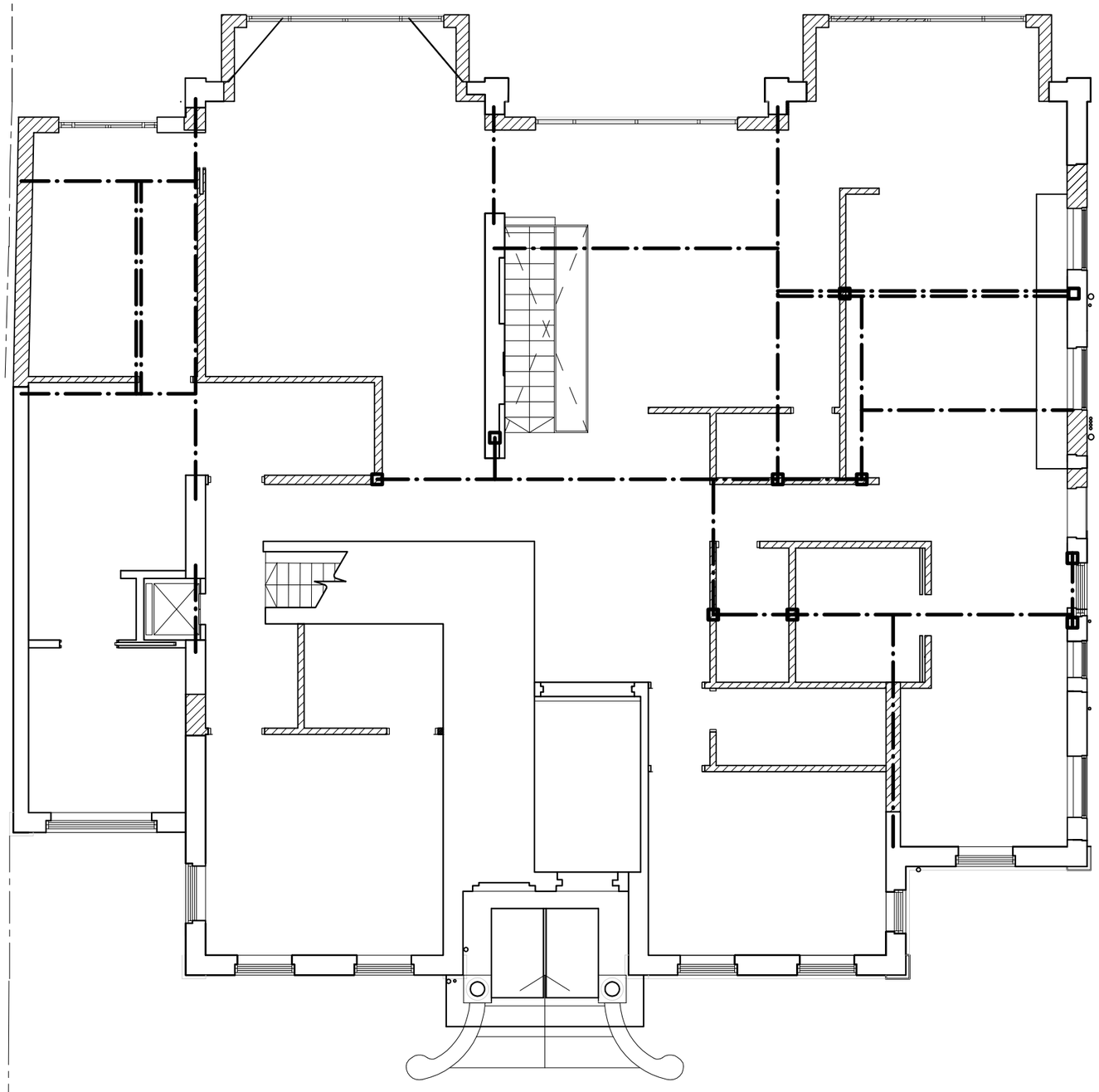
9 TEMPLEWOOD
LONODN NW3

Drawing Number 3344 / 2

Rev



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GROUND FLOOR CEILING

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Drawing Number 3344 / 3

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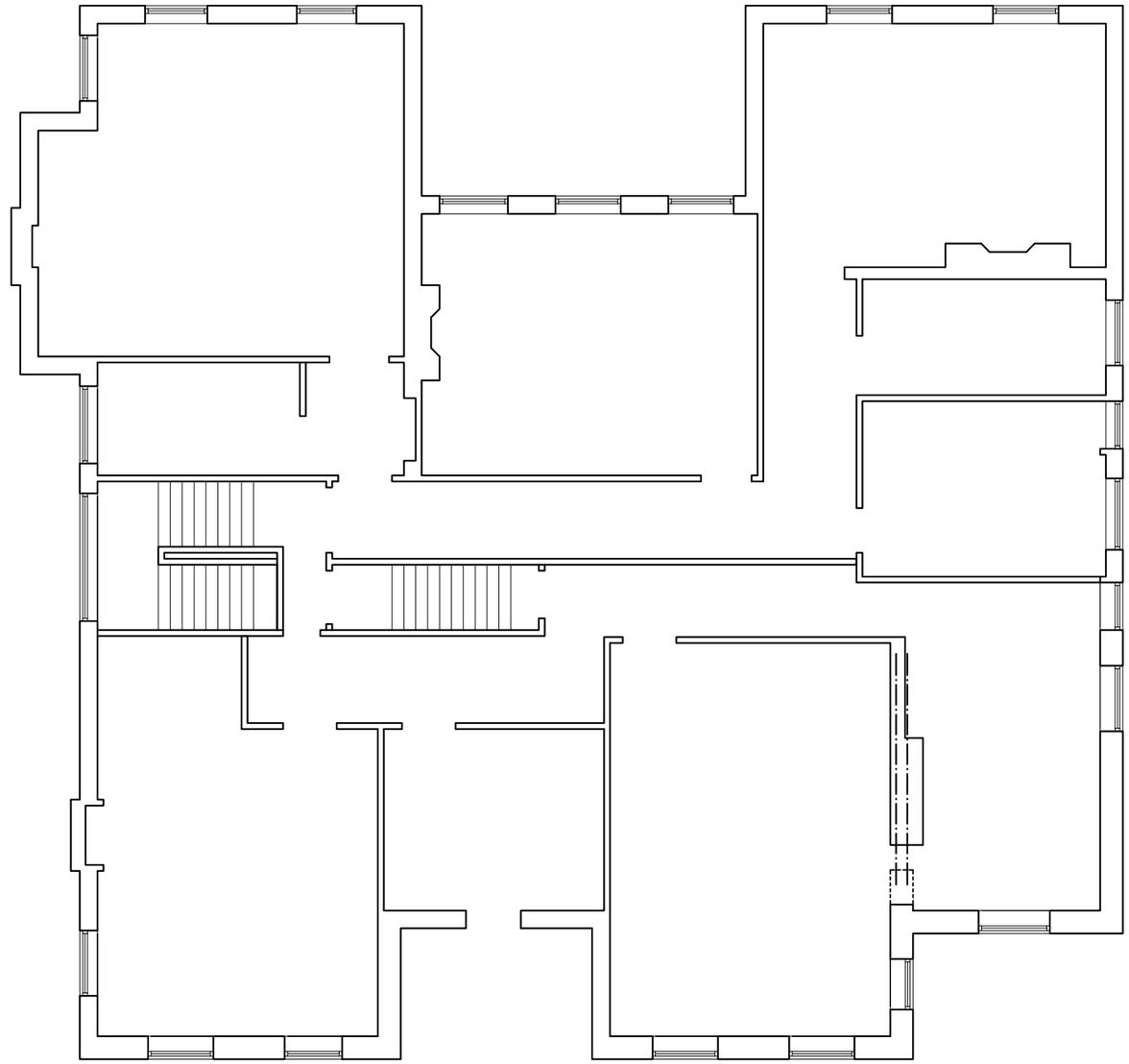
For information only



Scale 1:50 @ A1

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B	Bottom
GMS	galvanised mild steel
TPC	tooth plate connectors
LB	load bearing
c/c	centre to centre
extg	existing

Rev	Date	Detail
		ISSUED FOR PLANNING

FIRST FLOOR

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9 TEMPLEWOOD
LONODN NW3

Drawing Number 3344 / 4

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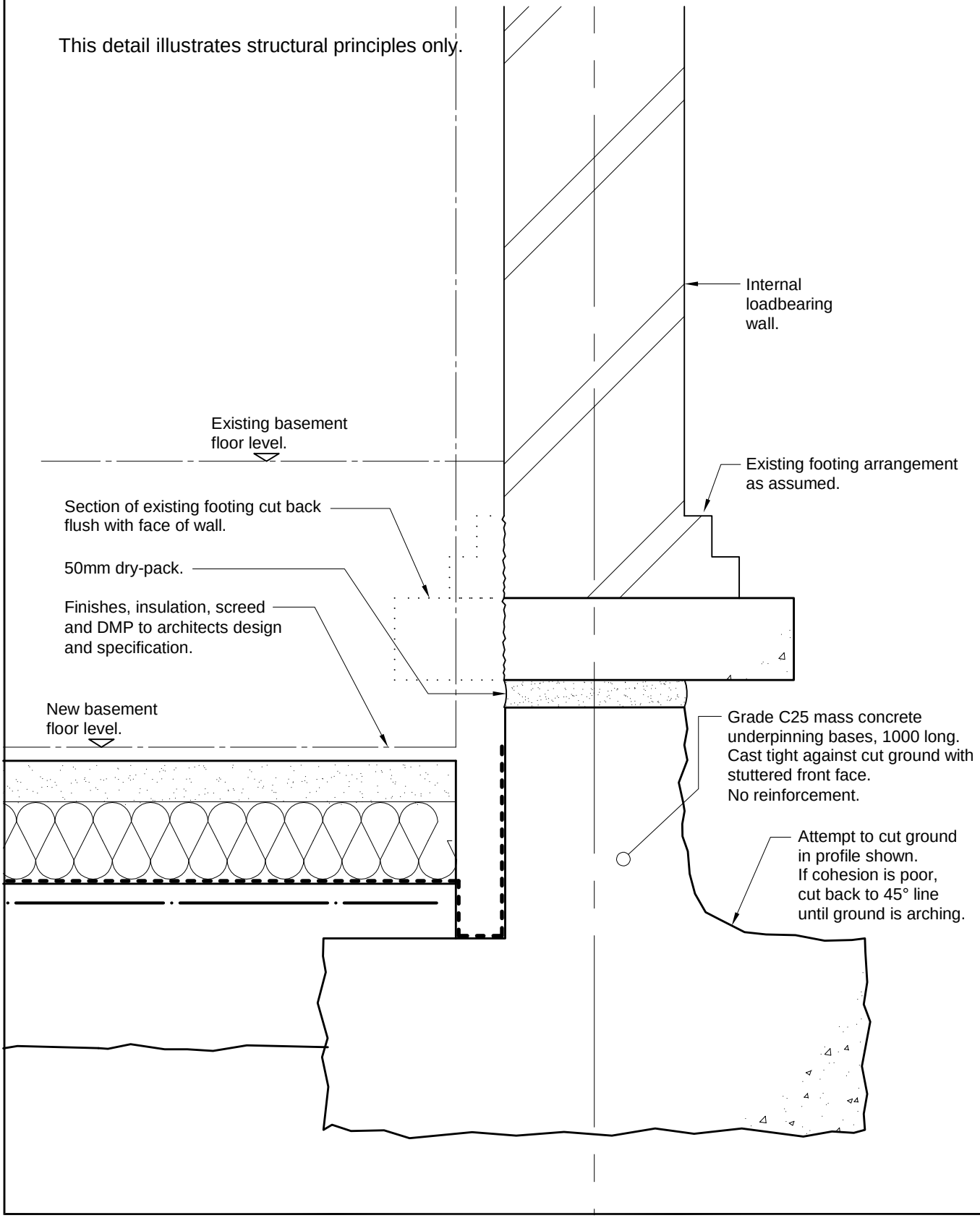
Project

9 TEMPLEWOOD AVENUE
LONDON NW3

Internal Wall Underpinning

This detail illustrates structural principles only.



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9 TEMPLEWOOD AVENUE
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Underpin Retaining Wall

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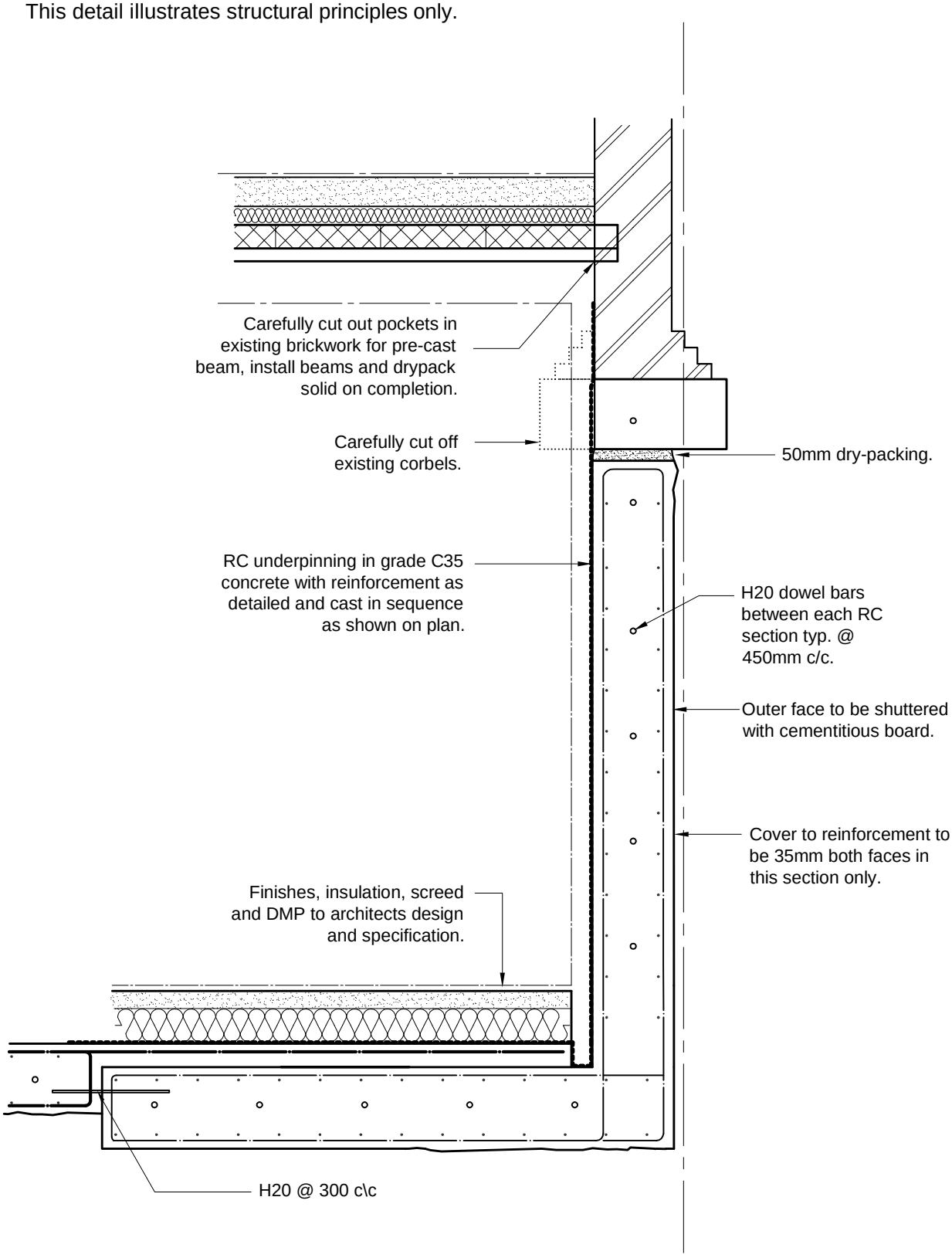

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Lightwell Retaining Wall

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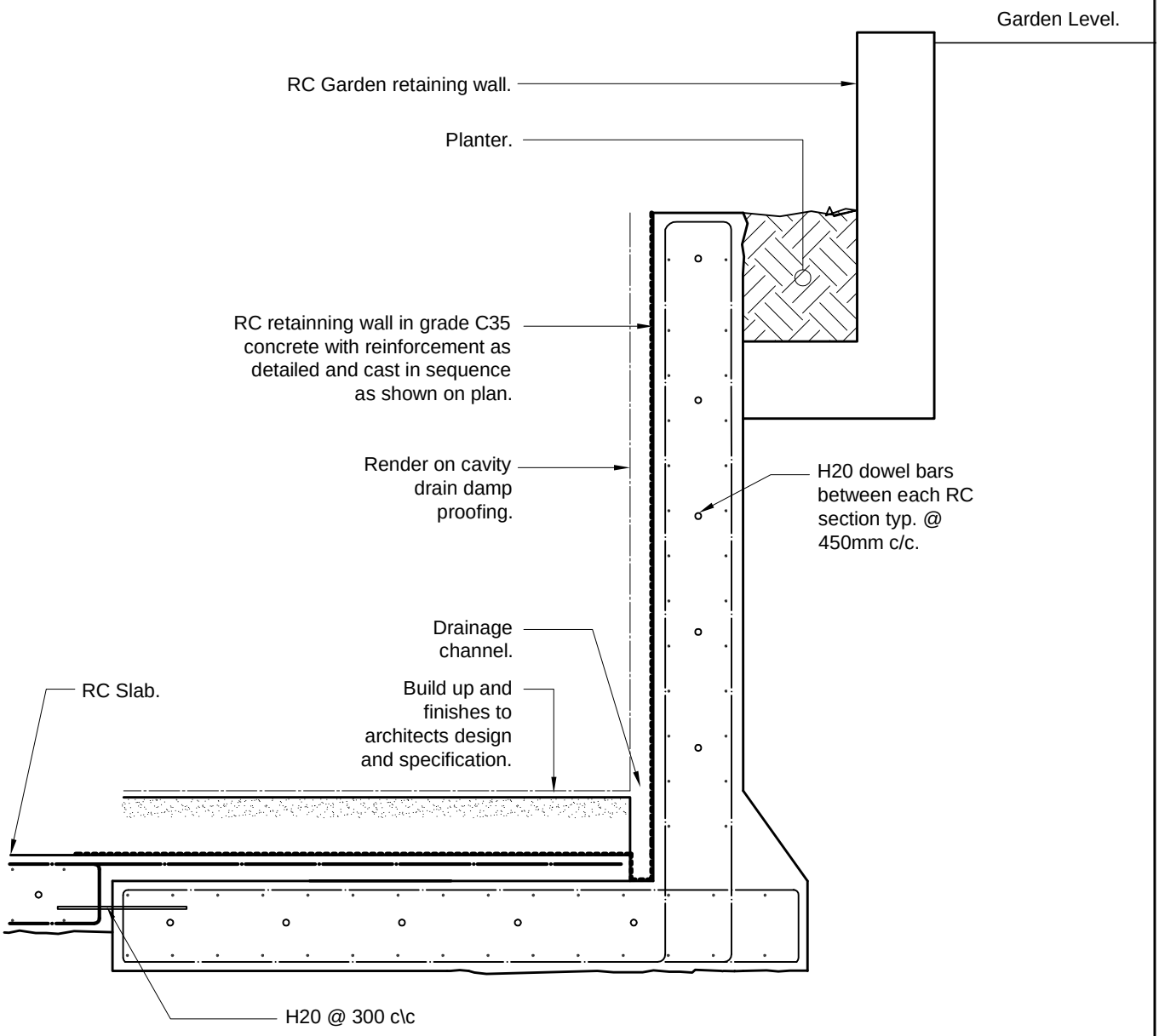

GARDEN FENCE WALL (No. 11)

215 BRICKWORK

1 Brick	22.00 kN/m3	4.73
2 coat plaster 2 sides		0.40
Total DL		5.13
Total LL		0.00
Total DL+LL		5.13 kN/m2

UDL TAKEDOWN

	length (m)	x factor		Load Fac 1.40 DL	Load Fac 1.60 LL	Tot WKG	Tot UTL
215 Wall=	2.50	1.00	m @	5.13	0.00	12.83	17.96
					w1 =	12.83	17.96 kN/m
					DL =	12.83 kN/m	
					LL =	0.00 kN/m	

EXISTING FOOTING ASSESSMENT

Line Load = 12.83 kN/m run

Permissible Ground Bearing Stress taken as 100.00 kN/m2

Minimum strip width reqd = Load / Capacity = 0.13 metres

Assume existing footing width = 0.42 metres
(215mm wall with 2 corbels each side)

Factor of safety on load bearing capacity of existing footing = 3.20

EFFECT OF EXCAVATION OF BEARING CAPACITY

Ultimate bearing capacity = q ult = 0.5 B N + c Nc + DNq

Assume excavation of 3m in clay => q ult = 0 + 315 + 60 = 375 kPa pre-excavation

Assume excavation of 3m in clay => q ult = 0 + 315 + 0 = 315 kPa post excavation

Bearing capacity reduction = 16% post excavation

Therefore permissible ground bearing capacity = 84.00 kN/m2

Minimum strip width reqd = Load / Capacity = 0.15 metres

Assume existing footing width = 0.42 metres
(215mm wall with 2 corbels each side)

Acceptable