Structural Feasibility Report

36-52 & 20 Fortess Grove, London NW5 2HB

blyth+blyth

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THIS DOCUMENT HAS BEEN REVIEWED FOR COMPLIANCE WITH PROJECT REQUIREMENTS IN ACCORDANCE WITH BLYTH + BLYTH QUALITY ASSURANCE OPERATIONAL PROCEDURES.

CONTENTS

1. INTRODUCTION

Plan view of the site. Copyright Google Maps.

Blyth and Blyth have been appointed by Cooley Architects on behalf of The Estate Charity of Eleanor Palmer to provide structural feasibility advice on the partial demolition and redevelopment of site at 36-52 & 20 Fortess Grove, London NW5 2HB.

At present the site houses two warehouses used for prestige car repair by M&A Coachworks Ltd. The proposal is to partially demolish these and construct new three storey residential and commercial units within the existing perimeter walls.

We were requested to advise on the structural implications of the proposed works with the main focus on:

- Feasibility and effects of the partial demolition;
- Means of structural support to retained building elements;
- Proposal for works where new works will affect the existing neighbouring buildings;
- Provide preliminary structural proposals for the new development.

This report is based on the following information:

- Site visit and visual inspection of the existing warehouses and surrounding buildings (there was no access to the external areas outside the warehouse at the north end of the site);
- A check of the British Geological Survey to determine the likely ground conditions beneath the site.

It was not possible to inspect all the areas therefore this report is based on the following limitations:

- Only internal of the main warehouse was accessible;

- Only part of the west and part of the south elevations of the small warehouse were visible from the outside;
- The neighbouring terrace houses were not inspected.

This feasibility report and preliminary design is based on a visual site inspection carried out by Damian Janicki of Blyth and Blyth and preliminary drawings by Cooley Architects.

2. DESCRIPTION OF EXISTING STRUCTURES

The site is located in the London Borough of Camden. It currently houses two warehouses used for prestige car repair by M&A Coachworks Ltd. These two buildings occupy nearly the whole of the site, with most of the perimeter walls either running along the boundary line or astride it. These are Party Walls in the view of Party Wall Act and any work to these walls will have to be notified to the neighbours.

No information was available on when the warehouses were built but based on the construction type and condition it is assumed that the larger warehouse is approximately 80 years old, and the smaller warehouse is either of similar age or built later. The roofs are assumed to have been replaced around 1970-1980.

View from Fortess Grove. On the left is the main warehouse, in the middle is the small warehouse while on the right is the residential building to remain.


West elevation of the main warehouse.

Entrance to the main (left) and the small (right) warehouse.


Residential building to remain.


South elevation of the small warehouse (left) and the rear entrance at the east elevation (right). This is the only visible section of east elevation.

2.1. Main Warehouse

The main warehouse is a single storey building with an approx. 900m2 floor area. The construction is loadbearing masonry with steel trusses spanning between perimeter walls and supporting lightweight metal deck roof. The ground floor is ground bearing concrete slab.

The roof decking includes skylights which are most likely plastic and span between secondary steelwork.

The warehouse has a single access through the van-size roller shutter door in the south elevation wall. There are two bricked up van-size openings in the north elevation which now would exit onto neighbouring properties' back gardens.

There are four large industrial type windows in the west elevation. The window and door openings have concrete lintels. Cracks were visible in the lintel above the rear entrance van-size door.

Chords and diagonals of the roof trusses are steel angle sections with bolted connections. The member arrangement indicates a combination of Fink (also called French) truss type with a central vertical hanger to support the bottom chord of the truss.

The trusses sit on 440mm by 900mm long masonry piers. Each pier has 315mm square nibs either side of it. At high level there is a recess and the external wall reduces to 215mm thick. This allows for 215mm deep bearing for the roof trusses.


Internal of the main warehouse. Looking west on the large windows (left) and north-west (right).


Internal of the main warehouse. Looking north (left) and south (right).


Internal of the main warehouse. Circular windows in the north wall (left) and blocked up entrances in the same wall (right).

2.2. Small Warehouse

The small warehouse is a single storey building with an approx. 500m2 floor area. The construction is loadbearing masonry with steel trusses spanning between perimeter

walls and supporting lightweight metal deck roof. The ground floor is ground bearing concrete slab.

The roof decking includes skylights which are most likely plastic and span between secondary steelwork.

The warehouse has two van-size access doors, one in the west elevation onto Fortess Grove and one in the east elevation onto Railey Mews.

There are three large industrial type windows in the south elevation. These have concrete lintels and span between 330mm by 900mm long masonry piers. These also support the secondary steel rafters.

Chords and diagonals of the roof trusses are steel angle sections with bolted connections. The member arrangement indicates a combination of Fink (also called French) truss type with a central vertical rod acting as a hanger to support the bottom chord of the truss.

The trusses sit on 330mm by 900mm long masonry piers.

In the east section of the warehouse there is a small single storey office unit. In the north side of the warehouse there is an additional area at raised level accessible through a concrete ramp. It is assumed that the area is raised to match the rear road level. Intrusive trial pits are required to confirm this.

Depending on the ground level of the neighbouring building, it is possible that this is a 1.5m high retaining wall. This should to be established during prior to design work as it will have an effect on the proposed foundations.

Internal of the small warehouse. Looking north-west at masonry piers (left) and south at large windows (right).

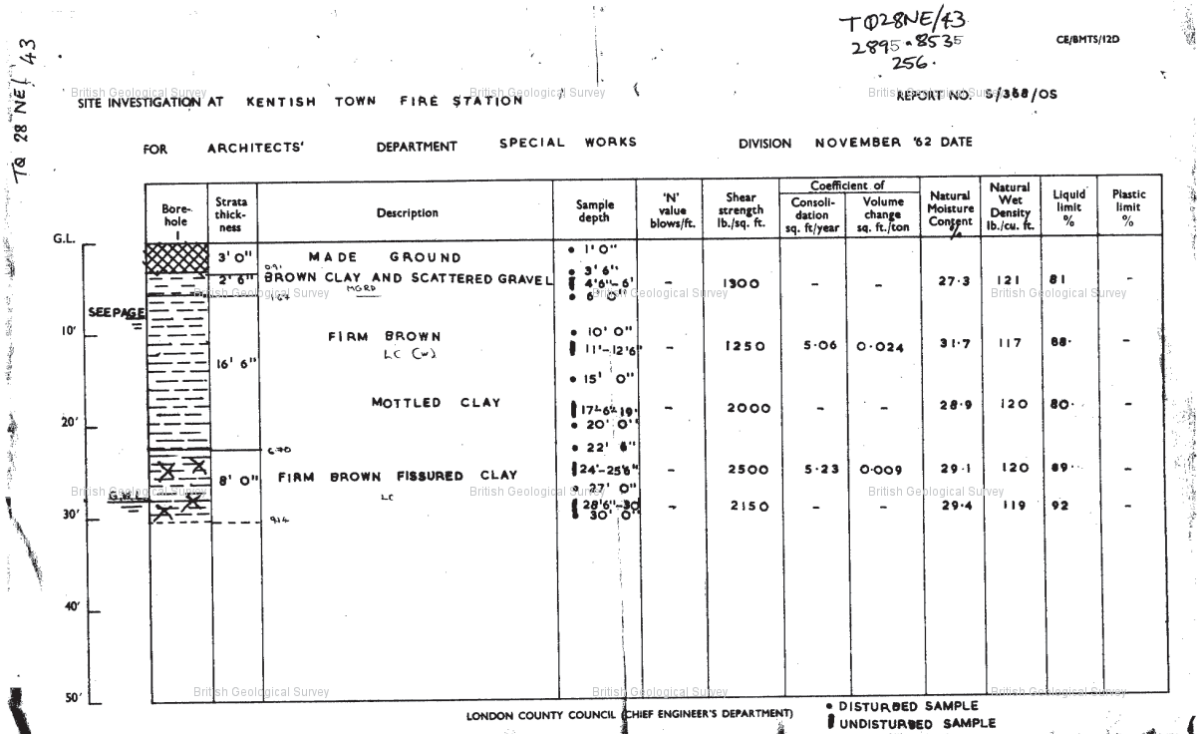
Internal of the small warehouse. Steel beam supporting roof rafters above large opening (left) and roof trusses (right).

3. GEOTECHNICAL AND ENVIRONMENTAL CONDITIONS

3.1. Ground Conditions

The British Geological Survey shows the site to be underlain by London Clay Formation – clay, silt and sand. There are no known superficial deposits at this location.

There are no existing borehole logs for the site, however there is a log for 9.14m deep borehole at TQ28NE43, which is 50m away from site.



TQ28NE/43
2895 - 8535
256.

CE/BMTS/12D

SITE INVESTIGATION AT KENTISH TOWN FIRE STATION REPORT NO. S/388/OS

FOR ARCHITECTS' DEPARTMENT SPECIAL WORKS DIVISION NOVEMBER '62 DATE

Bore-hole	Strata thick-ness	Description	Sample depth	'N' value blows/ft.	Shear strength lb./sq. ft.	Coefficient of Consoli-dation sq. ft/year	Coefficient of Volume change sq. ft./ton	Natural Moisture Content %	Natural Wet Density lb./cu. ft.	Liquid limit %	Plastic limit %
G.L.	3' 0"	MADE GROUND	• 1' 0"								
	2' 6"	BROWN CLAY AND SCATTERED GRAVEL	• 3' 6" ▮ 4'6"–6' • 6' 0"	–	1300	–	–	27·3	121	81	–
SEEPAGE											
10'	16' 6"	FIRM BROWN	• 10' 0" ▮ 11'–12'6"	–	1250	5·06	0·024	31·7	117	88·	–
		MOTTLED CLAY	• 15' 0" ▮ 17'–19' • 20' 0"	–	2000	–	–	28·9	120	80·	–
20'			• 22' 6"								
	8' 0"	FIRM BROWN FISSURED CLAY	▮ 24'–25'6" • 27' 0"	–	2500	5·23	0·009	29·1	120	89·	–
G.W.L.			▮ 28'6"–30' 30' 0"	–	2150	–	–	29·4	119	92	–
30'											
40'											
50'											

LONDON COUNTY COUNCIL (CHIEF ENGINEER'S DEPARTMENT)

• DISTURBED SAMPLE
▮ UNDISTURBED SAMPLE

Borehole log for TQ28NE43. Copyright: British Geological Survey

This shows made ground to 1m depth, underlain by 5.8m thick layer of firm brown mottled clay with shear strength ranging from 60kN/m2 (1250 lb./sq. ft.) to 96kN/m2 (2000 lb./sq. ft.) from 5.35m below existing ground level. The lower strata is firm brown fissured clay with shear strength of 120kN/m2 (2500 lb./sq. ft.) dropping to 103kN/m2 (2150 lb./sq. ft.) at 9m below ground level.

For clay the allowable ground bearing resistance can be taken as 2 * Cu. This includes 2.5 safety factor. Therefore based on 60kN/m2 shear strength (Cu) the ABP for the existing and new foundations is taken as 120kN/2. This will have to be confirmed during Soil Investigation by a Geotechnical Specialist.

3.2. Existing Foundations

Taking the allowable ground bearing pressure as 120kN/m2 it is expected that the existing warehouses and neighbouring buildings are founded on shallow stepped brick on concrete foundations.

Load on the perimeter wall of the main warehouse is expected to be in the region of 60-80kN/m run. Therefore 700mm wide foundations are expected.

Load on a typical 215mm thick party wall in a two storey terraced house will be in the region of 80-100kN/m run. Therefore 850mm wide foundations are expected.

The existing foundations are expected to be shallow unless the site is underlain by a significant depth of made ground in which case the foundations could be of considerable depth. Intrusive trial pits, within the warehouses footprint, are required to confirm depth and size of existing foundations.

3.3. TREES

There are no trees on site, however there are trees on neighbouring properties. A few of these are around 8-10m high. Given the close proximity of these trees and that the existing stratum is cohesive soil (i.e. London Clay), careful detailing is required to minimising effects of ground movement on new buildings. Deep foundations, suspended ground floor and heave precaution material is expected for the new buildings.

Trees' type, height and distance from existing building will have to be surveyed by a specialist to allow safe and economical foundation design.

Deep foundations may require the perimeter wall to be underpinned.

4. STRUCTURAL ASSESSMENT

4.1. Assumptions

For the purpose of this report, the assessment will focus on demolition of existing warehouses, effect on neighbouring buildings and proposed construction for the new buildings. Taking into consideration the available building information and findings from the visual inspection, our assessment is based on the following assumptions:

- The warehouses are built from load bearing masonry walls and have steel roof trusses and ground bearing concrete floor slab;
- Perimeter walls are solid masonry and are 440mm thick in the main warehouse and 330mm thick in the small warehouse;
- Roof trusses are supported by masonry piers. These are 440x900mm long for the main warehouse and 330x900mm long for the small warehouse;
- Internal walls are non-loadbearing;
- The buildings are around 80 years old;
- The roofs were replaced in around 1970-1980;
- The perimeter walls are no higher than 7m;
- The perimeter walls have small and shallow foundations inadequate of supporting new loads. New buildings are to be supported by new structural elements, independent of the existing ones;
- The condition of the existing brickwork to be retained is good.

4.2. Proposed Demolition and Redevelopment

The proposed works include part demolition and part retention of the existing warehouse structures to create 1,138 sq m of commercial floorspace over 3 levels, 8no. 3 bedroom and 1 no. 2 bedroom dwellings, together with associated landscaping. The elements to be demolished are: roof structure (including roof trusses), internal walls and ground floor slabs. However, most of the existing perimeter walls are to remain. These will be used as a feature and will not typically be used to support any new vertical loads.

The existing neighbouring buildings either have an independent wall behind the warehouse's perimeter wall, or use the same wall for supporting floors. Unless verified, the perimeter walls must remain in place.

Demolition of the existing structure, while retaining the existing perimeter walls, will not have any adverse structural implications on the neighbouring buildings so long as a safe demolition sequence and temporary propping is followed. A competent demolition contractor will have to be appointed and a demolition method statement will need to be produced. This should address all potential issues and will have to be issued to project's structural engineer for comments prior to any works on site.

The proposed new construction consists of three storey terraced houses and a three storey commercial block built inside the perimeter walls of the existing warehouses. It is proposed that the new walls will be built within the existing ones. This will require underpinning and/or cantilevering foundations, depending on existing foundation depths and sizes. An expected structural arrangement for the cantilevering ground floor slab is shown on the typical cross section mark-up in the appendix.

4.3. Proposed Structural Arrangements

The assumed allowable ground bearing resistance of 120kN/m2 is a relatively low figure for a three storey masonry building with precast floors. Therefore to neglect the need for piled foundations it is proposed to minimise the weight of the new structure. A typical solution would be loadbearing masonry with timber floor joists. However, because the clear span in the new terrace houses is 6m, with internal walls not lining up, it is proposed to support timber floor on steel beams spanning between the party walls. The masonry will spread the load into a uniform line load at foundation level – desired for trench fill foundations.

The structural assumption is that the perimeter walls have small and shallow foundations. This means that these are inadequate for supporting loads from the proposed structure, even though the masonry walls can be easily justified for the loads. New buildings are to be supported by new columns on new foundations.

To minimise risk of damage due to heave, the ground floor slab should be constructed from suspended in-situ concrete cast on compressible void former that will allow ground movement.

For the commercial unit an open layout and more robust floor construction is required. Therefore steel frame with metal decking floors is proposed. This solution is heavier than timber floors but lighter than in-situ concrete. Most of the floor loads will be transferred through internal columns and large reinforced pad foundations are expected. However excavation for these will be away from the existing perimeter wall resulting in negligible impact. For the perimeter columns it is proposed to use ground beams spanning between pads and cantilevering to pick up the columns.

Although at present there is not any information on the existing foundations it is assumed that a new ground floor slab will cantilever above the existing to pick up new masonry walls and steel columns. Refer to the typical cross section mark-up in the appendix.

It is important to note that in case of adverse type and size of existing foundations it may be necessary to use mini piles for the new foundations. It will be possible to navigate a small piling rig inside the warehouses, with the line of piling being at least a meter away from any existing walls. This will result in longer and so larger cantilevering ground beams.

4.4. Walls to Remain

Ignoring sheltering effect from neighbouring buildings, and taking the plan size of the main warehouse as 48m x 18m and 7m high at eaves, the wind dynamic pressure (qs) on the walls is 0.6kN/m2. This gives an average net pressure of 0.5kN/m2 on walls and 0.4kN/m2 on roof. This will then be increased by applying net pressure coefficient Cp of 1.7 to 3.4 for free-standing walls.

Based on these values it will be difficult to justify the existing walls as free-standing under wind load alone unless significant sheltering factors are incorporated. However, one of the proposals is to install new roof purlins spanning between perimeter walls. These will be designed as cranked beams with moment connection at the centre and will restrain top of the perimeter walls. A horizontal beam will also be required, at the eaves

and ridge with some diagonal bracing between the cranked beams. These beams will impose horizontal thrust on the perimeter walls. Depending on size and weight of these beams it may be necessary to introduce tension rods to restrain the free-standing walls. This would be at high level and would connect existing walls with main structure of proposed terrace houses. For details refer to the typical cross section mark-up in the appendixes.

5. FURTHER INVESTIGATIONS

This initial assessment is based on a number of assumptions and unknowns. The assumptions have been made to facilitate the feasibility study and are based on the engineering observations and reasonable judgement. To progress the design further detailed investigations will be required:

- Intrusive soil investigation with interpretive report to confirm ground conditions and give recommendations on suitable foundation type. This will particularly have to focus on the close proximity of existing trees;
- Trees survey;
- Drainage survey of the existing drains highlighting clearly the existing outflow manholes, their depths, location and size of pipes;
- Existing services survey;
- Internal trial pits to confirm type, depth and size of the existing foundations;
- Brickwork condition survey.

6. CONCLUSION

Based on the visual inspection it can be assumed that the existing construction is load bearing masonry with ground bearing concrete slab.

The roofs of the two warehouses are to be demolished and walls are to remain as a feature. The new development is to be constructed within these existing perimeter walls.

Demolishing the existing roof structure will not have adverse structural implications on the neighbouring buildings as long as a safe demolition sequence and temporary propping is followed.

For the terraced houses it is proposed to use timber floors spanning between steel beams. The foundations are trench fill concrete (typically).

For the commercial unit an open layout and more robust floor construction is required. It is proposed to use steel frame with metal decking floors and lightweight roof. The foundations are concrete pads (typically).

Intrusive trial pits are required to confirm depth and size of existing foundations. For this feasibility assessment these were assumed to be relatively small and shallow and so cannot be justified for loads from the new development. Therefore it is proposed to construct new columns directly adjacent to the existing walls. These will support the new floors and will sit on new ground beams cantilevering from pad foundations.

The ground floor slab construction will depend on soil investigation results and tree survey. It is expected that a suspended in-situ concrete slab will be required to mitigate effects of ground movement.

The scheme as drawn is structurally feasible subject to the receipt of the further investigations and the assumptions noted within this report.

7. APPENDIX

STRUCTURAL MARK-UPS

SITE PLAN BASED ON PREVIOUS LAYOUT. TO SHOW PERIMETER WALLS TO REMAIN ONLY

LC 21314 BRM DJ

PERIMITER WALLS TO REMAIN

NEIGHBOURING TWO STOREY TERRACE HOUSES

NEIGHBOURING BUILDING

WALLS TO REMAIN

1 **Site Plan**
1 : 100

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2. Do not scale from this drawing, figured dimensions are to be worked in all cases with any discrepancies reported to the Architect prior to commencement of any work.

3. Setting-out is based on outline survey only. All dimensions to be checked on site prior to construction/ ordering.

4. All dimensions are to edge/ centre of structural element of wall or to grid-line, unless noted. If unclear consult Cooley Architects.

REV	BY	DESCRIPTION	CKD	DATE

Cooley | Architects

123 Aldersgate Street London EC1A 4JQ

020 3176 4481 www.cooleyarchitects.com

CLIENT

Owner

PROJECT

Project Name

TITLE

Unnamed

DRAWN BY	DATE	CHECKED BY
Author	05/11/15	Checker
SCALE 1 : 100		PURPOSE OF ISSUE

DRAWING NUMBER REV

Site

COMERCIAL UNIT
GROUND FLOOR

LC21314 T&B
D.J.

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Total Unit Area - 711sqm

Total External Courtyard Area - 49sqm

- WALL TO REMAIN (EXISTING)
- PROPOSED NEW LOADBEARING WALLS
- 150 x 150 SHS COLUMNS
- RC PAD FOUNDATIONS (SUBJECT TO SI RESULTS)

FOR STRUCTURAL PROPOSAL REFER TO TYPICAL TERRACED HOUSE MARK-UP

1 **Commercial - Level 0**
1 : 100

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123 Aldersgate Street London E
020 3176 4481 cooleyarchitects.com

CLIENT
The Estate Charity of E

PROJECT
36-52 & 20 Fortes Green
NW5

DRAWING TITLE
Ground Floor Commercial building

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	05/01/15	RC
SCALE	SIZE	STATUS
1 : 100		Planning
DRAWING NUMBER		REVISION
687-LY - 0001		

DRAFT

COMMERCIAL UNIT
FIRST FLOOR

LC 21314 B&B
D.J

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○ – 150 x 150 SHS COLUMNS

— – 350 UB/UC BEAMS

⌐ – 150 METAL DECKING

1 **Commercial - Level 1**
1 : 100

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02 031 76 4461 cooleyarchitects.com

CLIENT
The Estate Charity of [illegible]

PROJECT
36-52 & 20 Fortess Gro[illegible]
NW5

DRAWING TITLE
First Floor - Commercial building

DRAWN BY	DATE	CHECKED BY
[illegible]	05/11/15	RC
1 : 100	SIZE	STATUS
		Planning

DRAWING NUMBER: 687-LY - 0101 REVISION

DRAFT

COMMERCIAL UNIT
SECOND FLOOR
LC 21314 B&B D.J.

O - 150 x 150 SHS COLUMN
O* - COLUMN BELOW
O - COLUMN STARTING AT THIS LEVEL
— - 350 UB/UC BEAMS
↔ - 150 METAL DECKING

1 **Commercial - Level 2**
1 : 100

REV	BY	DESCRIPTION	CKD	DATE

Cooley Architects

123 Aldersgate Street London [illegible]1A 4JQ
020 3176 4481 [illegible]cooleyarc[illegible].com

CLIENT
The Estate Charity of [illegible]

PROJECT
36-52 & 20 Fort[illegible]s Cr[illegible]
NW5

DRAWING TITLE
Second Floo[illegible]cial building

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[illegible]	05/11/15	RC
SCALE	SIZE	STATUS
1 : 1[illegible]		Planning

DRAWING NUMBER 687-LY - 0201 REVISION

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TYPICAL TERRACED HOUSE PLAN

LC 21314 B&B D.J

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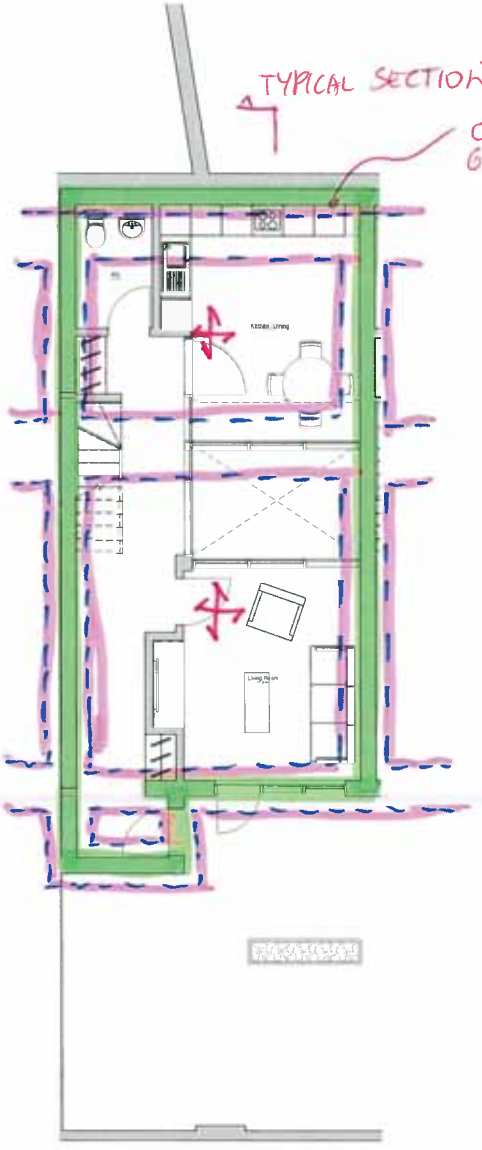
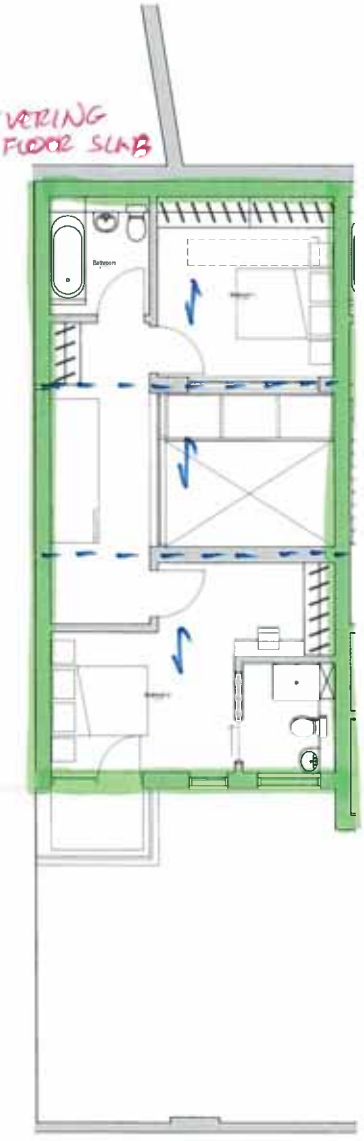
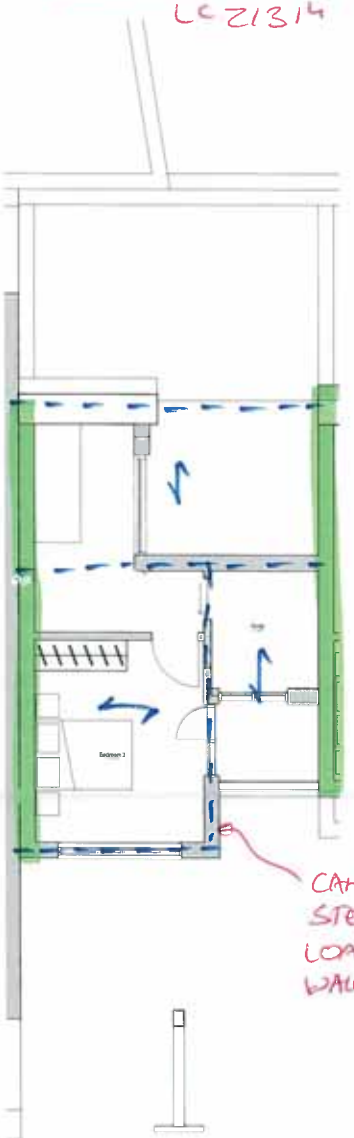


1 **House Type A - G**
1 : 50



2 **House Type A - 1**
1 : 50



3 **House Type A - 2**
1 : 50

RC SUSPENDED GROUND FLOOR SLAB

RC GROUND BEAMS / TRENCH FILL FOUNDATIONS

200dp FLOOR TIMBER JOISTS

203 UB/UC STEEL BEAMS

LOADBEARING MASONRY

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DRAWING TITLE
HOUSE TYPE

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1 : 50		Planning

DRAWING NUMBER
687-LY - 0X02

REVISION

TYPICAL SECTION FOR A TERRACED HOUSE.

LC 2134 BLYTH AND BLYTH D.J.

ROOF FEATURE BEAMS. NO ROOF DECKING AT THIS LEVEL.

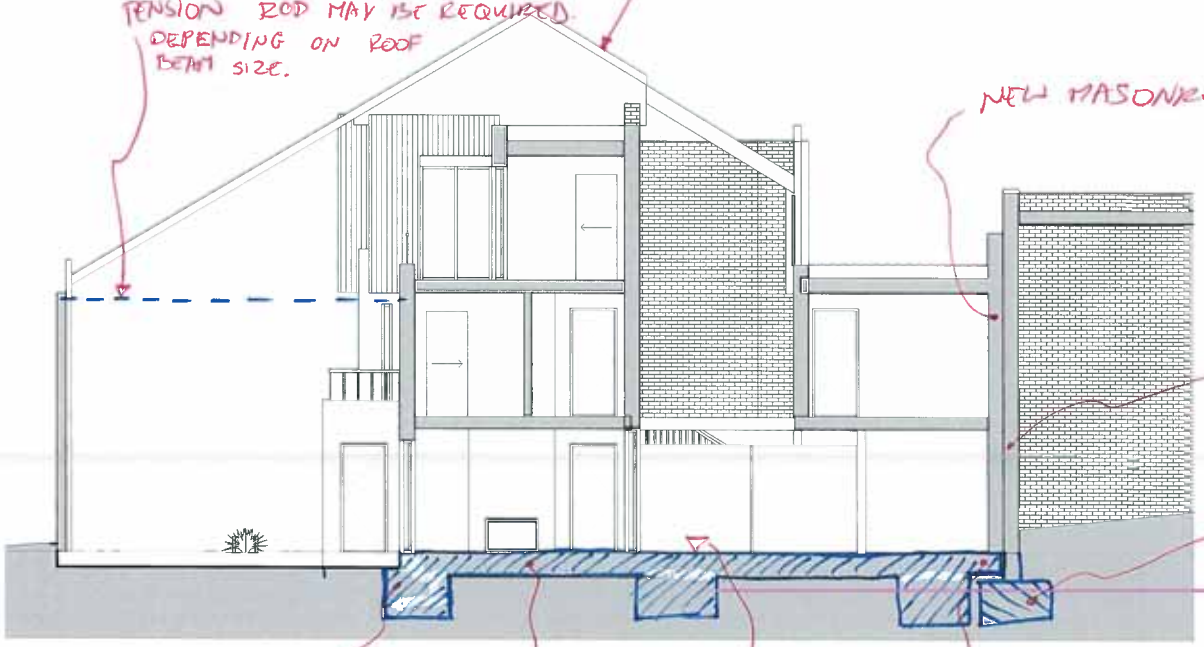
TENSION ROD MAY BE REQUIRED DEPENDING ON ROOF BEAM SIZE.

NEW MASONRY WALL

1 **Residential**

EXISTING PERIMETER WALL TO REMAIN.

EXISTING FOUNDATIONS TO REMAIN. ASSUMED TO BE BELOW EXISTING GROUND FLOOR SLAB.



2 **Section D**
1 : 50

CANTILEVERING GROUND FLOOR SLAB SUPPORTING MASONRY WALL.

TRENCH FILL REINFORCED CONCRETE FOUNDATIONS.

PROPOSED LEVEL SIMILAR TO EXISTING SLABS LEVEL.

SUSPENDED IN-SITU CONCRETE GROUND FLOOR SLAB.

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PROJECT
36-52 & 20 Fortess Road
NW5

DRAWING TITLE
Section DD, 00, 01, residential

DRAWN BY: NB | DATE: 05/11/15 | CHECKED BY: RC
SCALE: 1 : 50 | SIZE | STATUS: Planning
DRAWING NUMBER: 687-LY - 0X04 | REVISION

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