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34 Belsize Lane, NW3
Structural Report

2230268
Issued for Information
Revision P02
22/03/24

Engineering a Better Society

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Document Control

	remarks:	Issued for information as part of planning application				
Revision: P01	prepared by:	James Hinks	checked by:	Sarah Pellereau	approved by:	Sarah Pellereau
Date: 19.03.24	Signature:		Signature:		Signature:	
Revision: P02	prepared by:	James Hinks	checked by:	Sarah Pellereau	approved by:	Sarah Pellereau
Date: 22.03.24	Signature:		Signature:		Signature:	

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Contents

Appendices

1. Introduction

Elliott Wood Partnership Limited is a firm of consulting structural engineers operating from offices in central and southwest London and Nottingham. The firm undertakes a broad range of work in both size and type, from minor alterations to major new buildings and refurbishments with project values in excess of £500m. Our understanding of the development of London, its geology and unique features together with direct experience on many similar sites puts us in a strong position to advise clients on structural implications of proposed works.

Elliott Wood has extensive experience of projects of this type and a comprehensive understanding of the underlying ground conditions in the area and challenges of basement construction gained from the numerous basement projects we have completed in and around London.
This report has been prepared to describe the structural scheme design and assumed sequence of construction. It includes a desk study on the site identifying key constraints, a commentary on the existing building and an assessment of the proposals.

The report has been prepared in collaboration with EBBA Architects, the lead consultants on the project.

2. Description of existing building and conditions

2.1 Site Location

The site is located in northwest London at 34 Belsize Lane, NW3 5AE and is a single storey residential property located on a corner plot. The site is bounded by Belsize Lane to the east and south, the adjacent houses in Belsize Lane/Lyndhurst Gardens to the west and St Christopher's School to the north.

The property is Grade II listed and is situated within the Fitzjohns Netherhall Conservation Area.

Figure 1: Aerial view of site

Figure 2: Site photo

2.2 Site Geology

Geological records of the site and our understanding of ground conditions in the area indicate that the ground conditions are likely to consist of made ground over London Clay.

Site investigations were carried out in September 2023 by Geotechnical & Environmental Associates Limited (GEA) which involved 1 No. shallow window sample, 8 No. trial pits, and 4 No. opening up works to ceiling, and 3 No. opening up works to walls.

The site investigations supported our understanding of the site and the ground conditions consist of 1.7m of made ground over London Clay.

2.3 Existing Structure

The house was built in the mid-1970s with small, early 1980s extension and is bounded by older brick garden walls. On plan the single storey building is formed of a central living space with three wings extending off it. The form of the building creates three courtyard gardens on site.

The existing structure is generally the same throughout and comprises timber joisted flat roof supported on an external steel ring beam to the whole of the perimeter of the building. The steel beam sits on the outer leaf of a brick and block load bearing cavity wall. The load bearing masonry walls are supported on mass concrete strip foundations. The ground floor slab is assumed to be a ground bearing RC slab.

Elliott Wood carried out a site walkaround in June 2023 to understand the existing site layout and look at the condition of the building condition. In summary, the existing building appears to generally be in poor condition with need for modernisation. The ceiling/roof throughout are appear in poor condition with clear signs of damp throughout. The perimeter brickwork also appears to be in poor condition with the mortar eroded away, almost entirely in some locations. A significant number of the perimeter walls also show signs of water ingress throughout the building and there is cracking to the perimeter wall adjacent to the school there is a significant crack along the length of the wall at approximately mid height. Please see site visit report in appendix for further information.

It is assumed that all structural elements on site are original and were designed for a 60-year design life, which would see the building approaching the end of its design life. The existing structure is constructed of traditional building materials, which if well maintained can last long past its original design life. The existing structure should look to be repaired where required and maintained going forward to extend the life of the existing structure.

2.4 Underground Infrastructure

We are aware that the Belsize Tunnel (Network Rail) runs under the south end of the site. Based on information we have from working on nearby sites, as well as information obtained from nearby planning applications, including a Network Rail archive drawing, it appears that the crown of the tunnel is approximately 19m below ground level on the site.

Given the depth of the tunnel and the relatively minor proposed works, where any new foundations proposed being shallow spread foundations at the other end of the site, we advise that the impact on the tunnel below the site will be negligible. Please see mark-ups in the appendix.

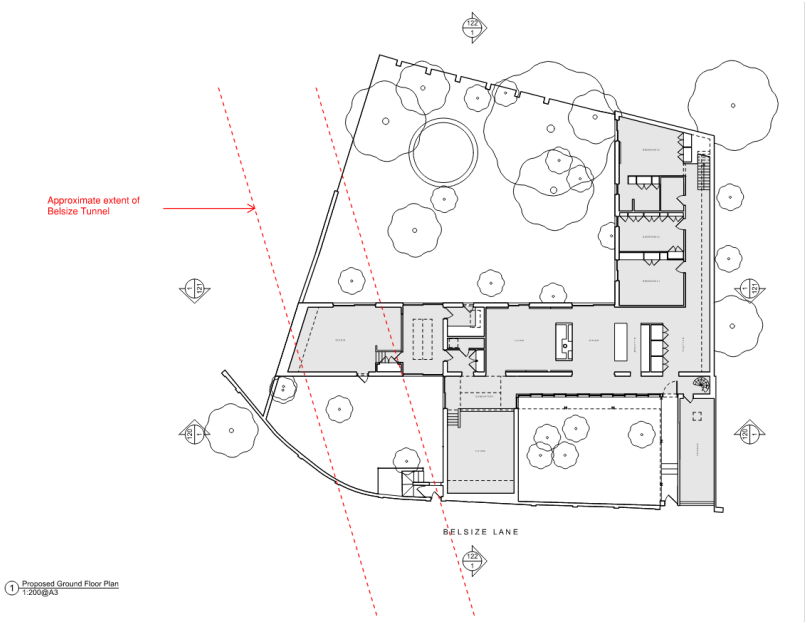


Figure 3: Approximate extent of Belsize Tunnel

3. Proposed Structure

3.1 Summary of the Proposals

The proposed works at 34 Belsize Lane comprise of an extension to and refurbishment of the existing property to upgrade the building to modern standards. The existing building structure is to be retained where possible and the structural proposals are summarised below.

- Replace and lower existing ground bearing RC slab.
- First floor extension to the northwest of the existing building.
- New canopy structure to the east side of the property.
- Existing timber roof strengthening.
- Existing timber roof support detail revision.
- General repairs to brickwork walls.

3.2 Ground floor slab replacement

We understand that in order to modernise the thermal performance of the building a new ground floor slab is proposed to be replaced. The existing floors only have nominal polystyrene insulation and show signs of damp with poor conditions DPMs. There is underfloor heating which has failed after installation and will require replacement.

It is proposed that a new slab will be constructed at a lower level to the existing to allow for required increased floor build-ups while maintaining the existing finished floor levels.

The existing slab will be carefully removed, whilst retaining the existing concrete foundations to perimeter and internal load bearing walls. The ground can then be excavated and a new reinforced concrete ground floor slab installed at the required level. This allows for load bearing walls to be retained in place while the slab is replaced.

Any internal non-load bearing partitions that are built directly off the existing slab will need to be taken down and rebuilt.

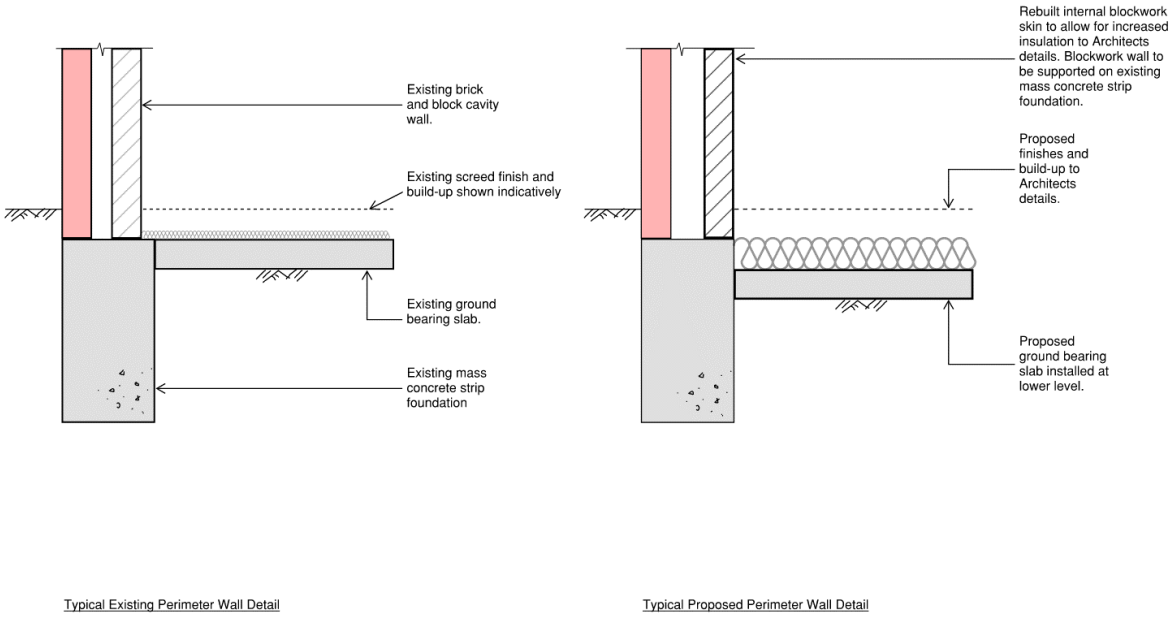


Figure 4: Ground floor slab lowering

3.3 First Floor Extension

To the northwest end of the site a single storey extension is proposed.

The proposed structure for the extension will comprise of lightweight timber construction for the new roof and first floor walls. The new extension will be supported on steel beams and steel columns supported on new mass concrete pad foundation.

For further details on structural scheme design mark-ups, see drawings in the appendix.

3.4 New Link Structure

To the east of the property adjacent to the entrance it is proposed to add a small link extension. This is proposed to be formed using timber roof joists, supported on steel beam sized to match the existing exposed ring beam, supported on new steel posts. New mass concrete pad foundations will be required under posts.

3.5 Existing Timber Roof Strengthening

The existing roof is likely designed for a lightweight roof finish and access load only. In the proposals the roof space will be utilised with the addition of a green roof. The existing timber roof joists have been checked and strengthening will be required to support the additional load from the planting.

To strengthen the roof, it is proposed to retain the existing roof in place and either install new joists in between existing or double up the existing joists by bolting new section to the existing.

3.6 Existing Timber Roof Support Detail

In the existing case the existing timber roof joists are supported on the steel perimeter ring beam, which sits on the outer brickwork leaf of the load bearing wall.

As part of the refurbishment, the Architect is proposing to improve the thermal performance of the building. The existing detail is proposed to be revised to reduce cold bridging and allow for insulation to be installed.

To achieve this the existing inner blockwork leaf of the cavity wall is proposed to be taken down and rebuilt, tied to the external brickwork. The roof joists will then be re-supported on the blockwork wall. The ring beam is proposed to be restrained by strapping back to the existing roof joists with a steel strap at 1.2m centres.

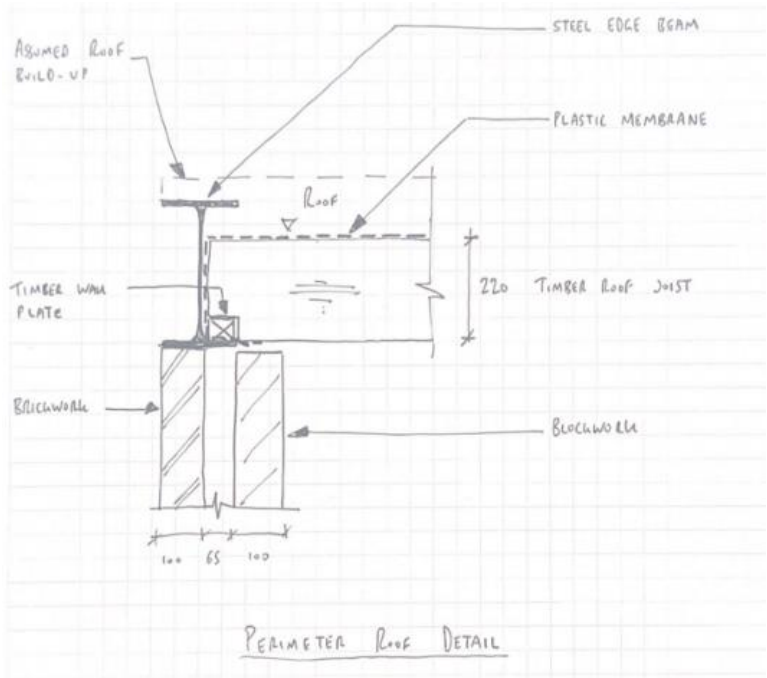


Figure 5: Existing roof detail

3.7 Masonry Repairs

The party wall with the school shows signs of movement in the existing case with a horizontal crack approximately mid height up the wall. In the proposals this wall will likely need to be rebuilt partially. The extent of the remedial works will need to be confirmed following further investigation works on site.

It is assumed that a concrete retaining wall is present along this boundary to retain the soil from the adjacent site. The movement and cracking in the existing case may be due to the existing cavity filling up over they years and a horizontal pressure being exerted on the inner blockwork wall. It may also be caused by ground movement of the school playground producing a lateral force on the existing wall. The cause should be confirmed with further investigation works.

If a new retaining structure is required, we propose to construct a new reinforced concrete retaining wall in bound of the assumed existing retaining structure. The sequence of construction for any new retaining structure should be considered. It may be required that this is constructed in a hit and miss sequence.

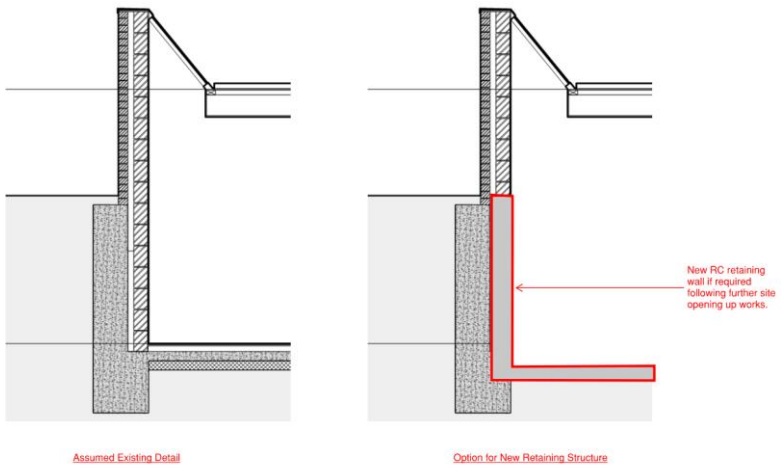


Figure 6: Party wall retaining detail

4. Assumed Sequence of Construction

4.1 Written Sequence of Construction

A written summary of the assumed sequence of construction is included below.

Please note, this sequence assumes temporary propping. The responsibility for all temporary works and the stability of the existing structure rests with the temporary works engineer, who must determine these factors.

Stage 1: Site set-up.

- *The services within the site should be identified and isolated as necessary.*
- *The principles for the removal of spoil shall be agreed. Refer to the CTMP for detailed information on the site set-up and waste removal.*
- *Complete soft strip of internal finishes and internal non-load bearing walls. Please refer to Architects information for further details on what is to be removed, re-used, retained, protected etc.*

Stage 2: Replace ground floor slab and cast new foundations.

- *Carefully remove the existing ground bearing concrete slab.*
- *Locally excavate and cast proposed mass concrete pad foundations.*
- *Excavate ground to required formation level and cast new ground bearing concrete slab.*

Stage 3: Provide temporary propping to existing structure.

- *Prior to carrying out works to the existing roof and perimeter cavity walls provide required temporary works to maintain lateral stability of the external brickwork and steel ring beam and vertically prop existing timber roof joists.*

Stage 4: Re-support timber roof joists on external blockwork skin of cavity wall.

- *Allow for removal of existing inner blockwork leaf to perimeter cavity walls.*
- *Install new blockwork wall with wall ties to existing brickwork outer leaf. Blockwork wall moved to suit increased insulation layer to Architects details.*
- *Re-support existing roof joists on new timber wall plate to top of blockwork wall.*
- *Where required, allow for strengthening existing roof to support proposed green roof and planting loads.*
- *Restrain steel ring beam back to timber roof.*
- *Install roof finishes and insulation to suit.*

Stage 5: First Floor Extension.

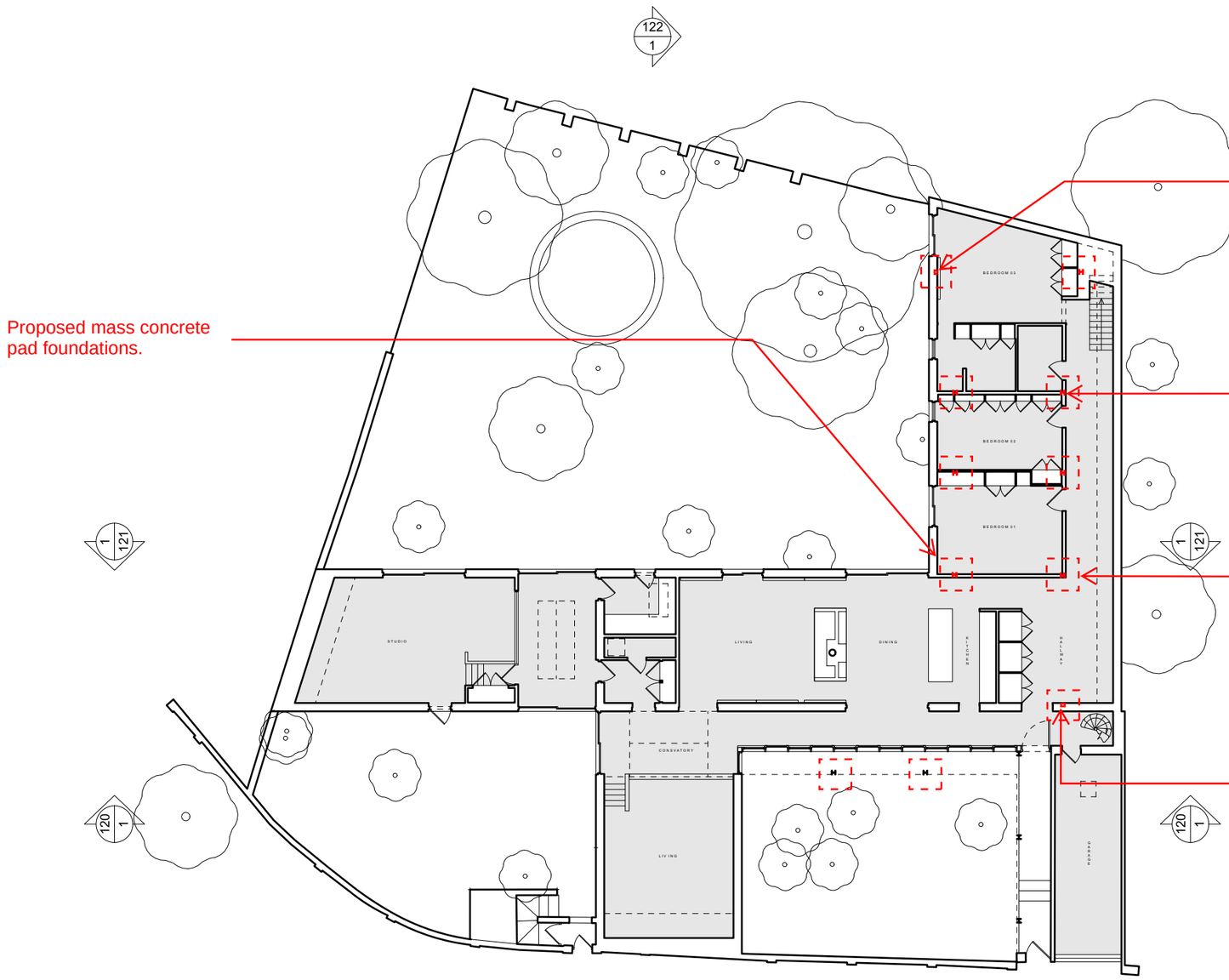
- *Install steel frame built off installed new foundations.*
- *Install timber first floor structure.*
- *Construct first floor extension lightweight timber structure supported on new steelwork installed.*

5. Conclusion

The engineering rationale and construction issues associated with the proposed alterations at 34 Belsize Lane have been summarised in this report.

A structural design has been prepared along with assumed construction sequence to demonstrate that the proposals can be built with careful consideration and without significant impact on the existing structure. The proposed works are capable of sustaining the building's special character and interests but offer the benefit of securing its long term future.

Appendix



1 Proposed Ground Floor Plan
1:200@A3

Proposed Ground Floor

EWP Mark-Up
Project Name: 34 Belsize Lane
Project Number: 2230268
Title: Proposed Structure: Ground Floor Plan
Date: 22/03/24 Mark-Up By: JHi

This is not a formal drawing issue and as such may contain un-coordinated or incomplete information.

Rev.	Date	Description

Notes

- ALL CO-ORDINATES, LEVELS, DIMENSIONS AND DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT IMMEDIATELY
- ALL STRUCTURAL ELEMENTS ARE TO BE DESIGNED BY THE STRUCTURAL ENGINEER
- ALL DRAWINGS TO BE READ IN CONJUNCTION WITH ARCHITECTURAL SPECIFICATION
- DO NOT SCALE FROM THESE DRAWINGS, USE FIGURED DIMENSIONS ONLY

1 5 10m

N

PROJECT: Belsize Lane
CLIENT: Charlie & Christina
DATE: 26/02/2024
SCALE: 1:200 @ A3
DRAWING: Proposed Ground Floor Plan
REFERENCE: 245-S3-101
STATUS: FOR INFORMATION

PROJECT No: 245

EBBA

ISSUE: REV A

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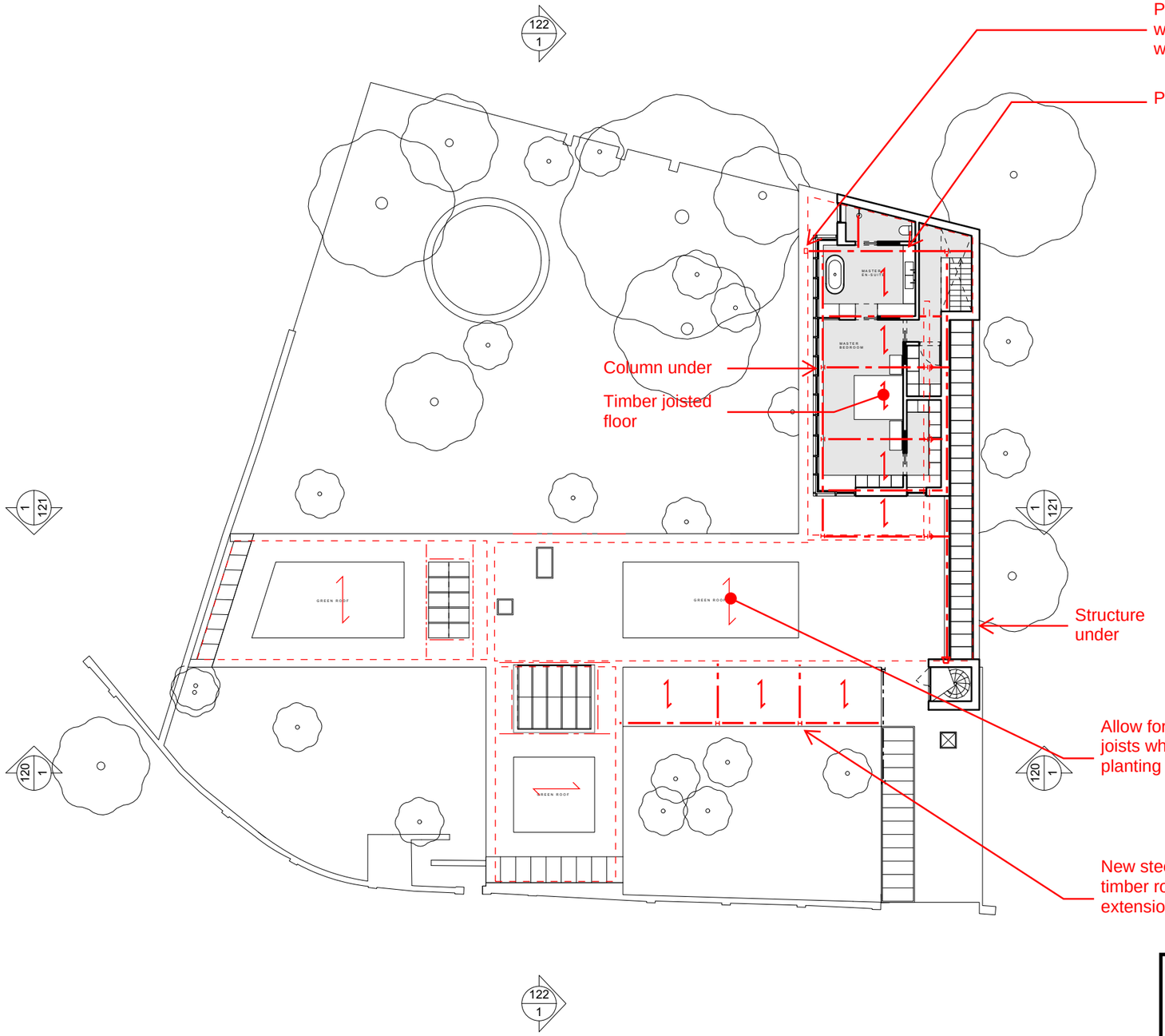

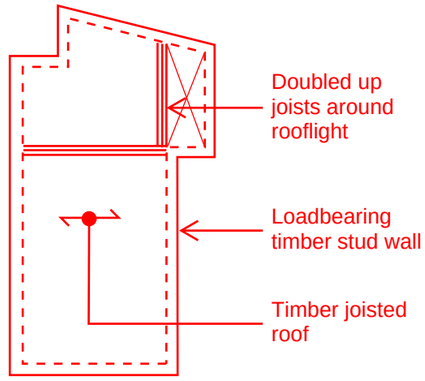

Roof Plan

1 Proposed First Floor Plan
1:200@A3

Proposed First Floor

EWP Mark-Up

Project Name: 34 Belsize Lane
Project Number: 2230268
Title: Proposed structure: First Floor Plan
Date: 08/03/24 Mark-Up By: JHi

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Rev.	Date	Description

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1 5 10m

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PROJECT: Belsize Lane
CLIENT: Charlie & Christina

DATE: 26/02/2024
SCALE: 1:200 @ A3

DRAWING: Proposed First Floor Plan
REFERENCE: 245-S3-102

STATUS: FOR INFORMATION

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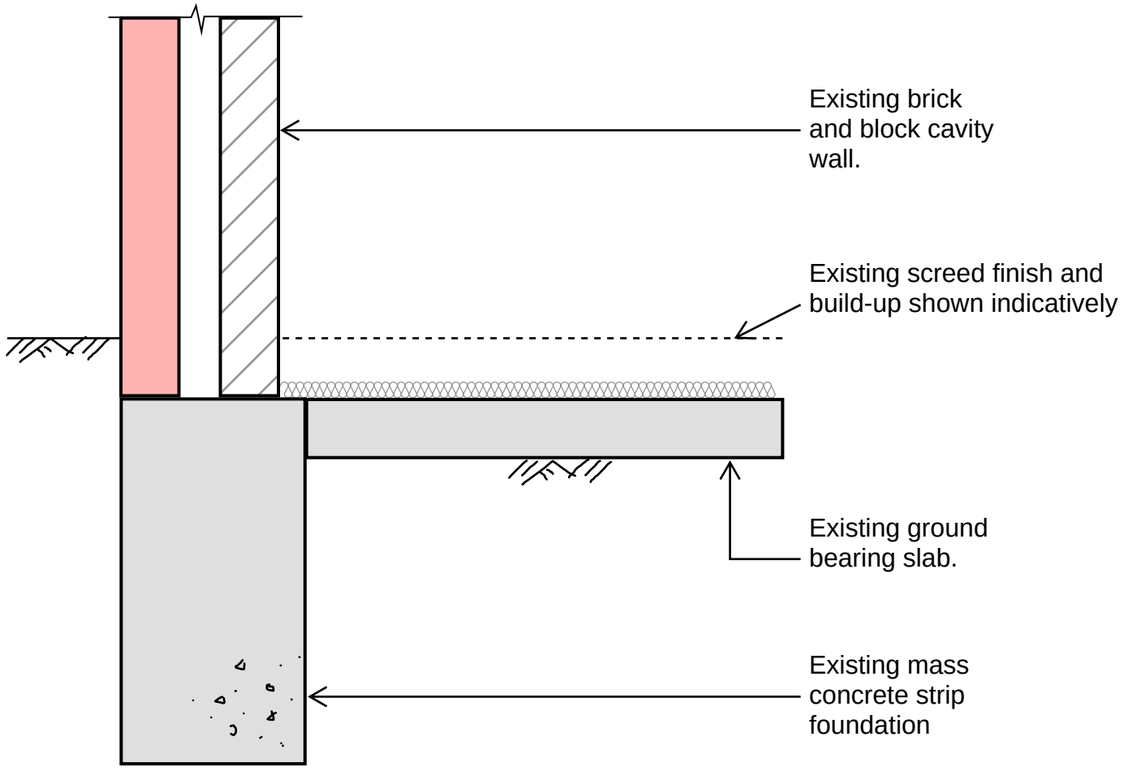
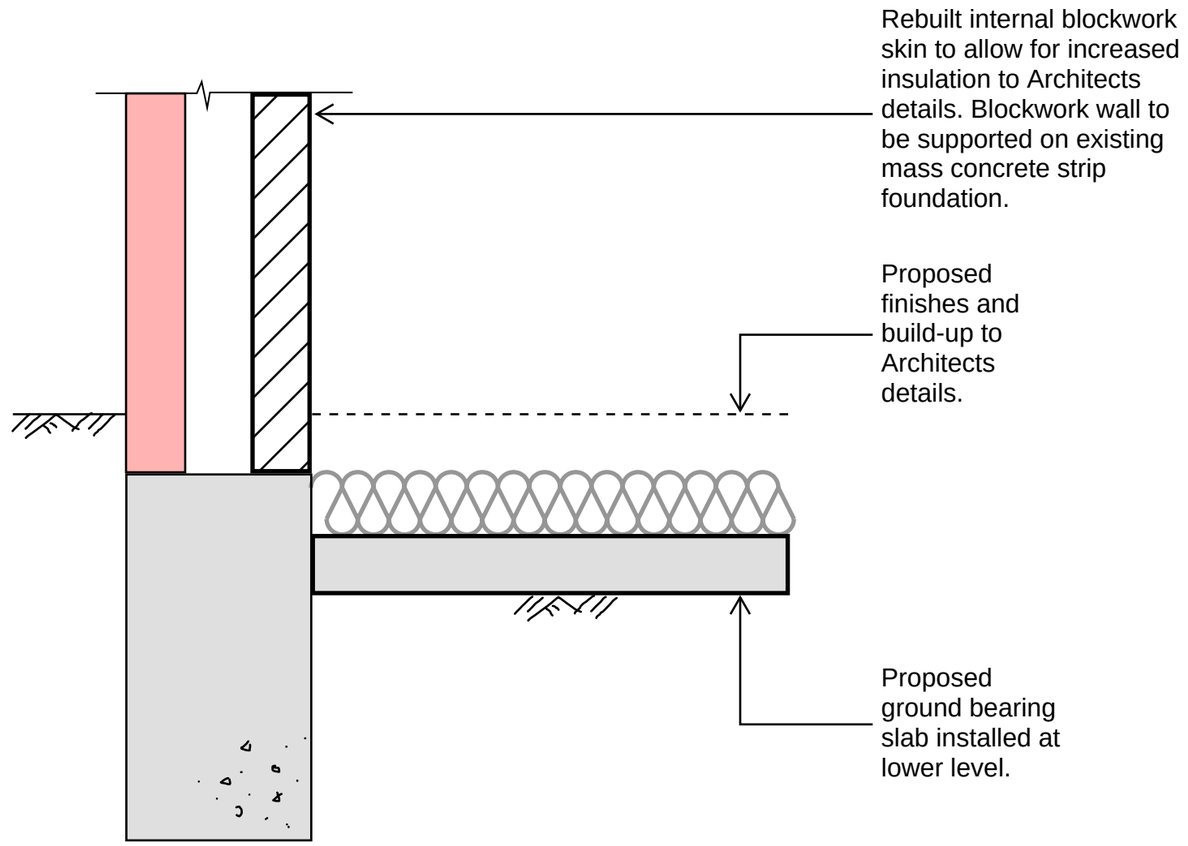


Typical Existing Perimeter Wall Detail



Typical Proposed Perimeter Wall Detail

EWP Mark-Up

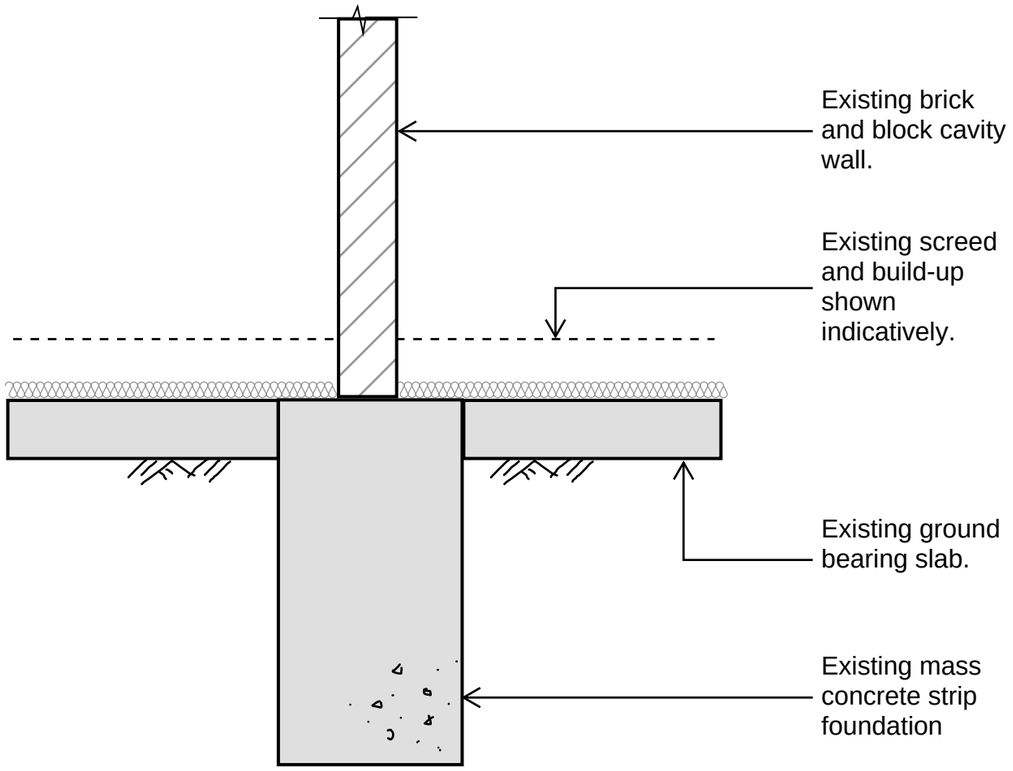
Project Name: 34 Belsize Lane

Project Number: 2230268

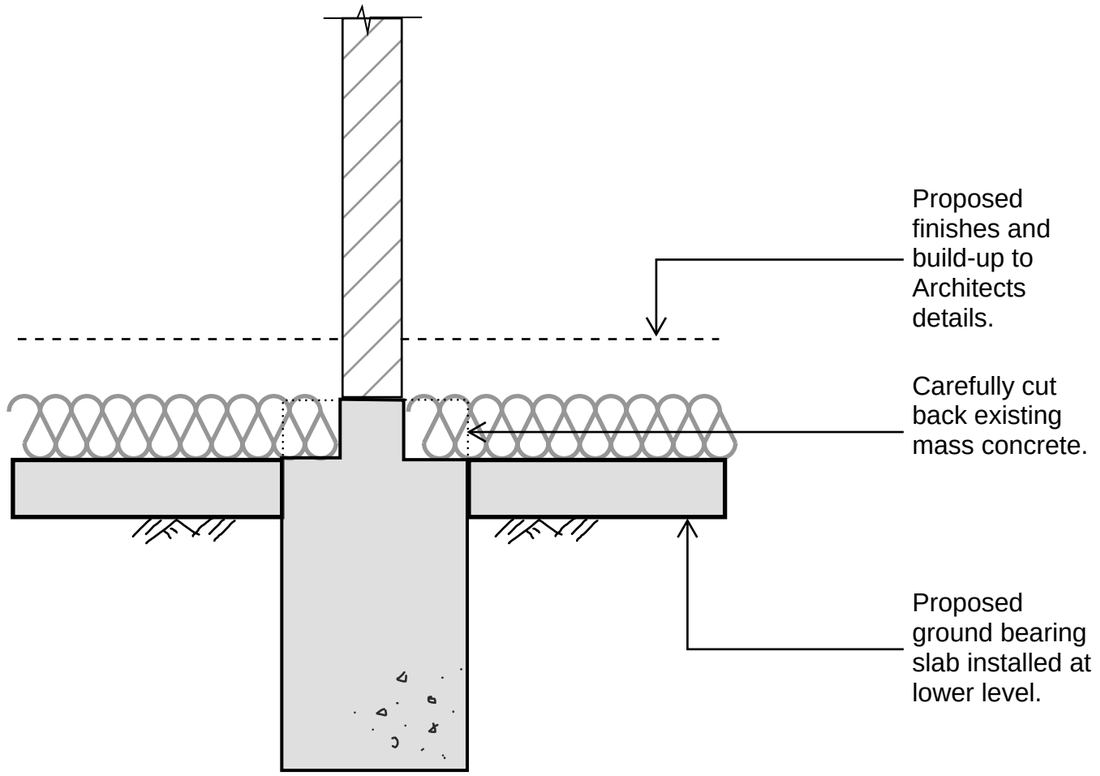
Mark-Up Title: Proposed slab perimeter detail

Date: 19/03/24 Mark-Up By: JHi

This is not a formal drawing issue and as such may contain un-coordinated or incomplete information.



Typical Assumed Existing Internal Wall Detail



Typical Proposed Perimeter Wall Detail

EWP Mark-Up

Project Name: 34 Belsize Lane

Project Number: 2230268

Mark-Up Title: Proposed slab internal detail

Date: 19/03/24 Mark-Up By: JHi

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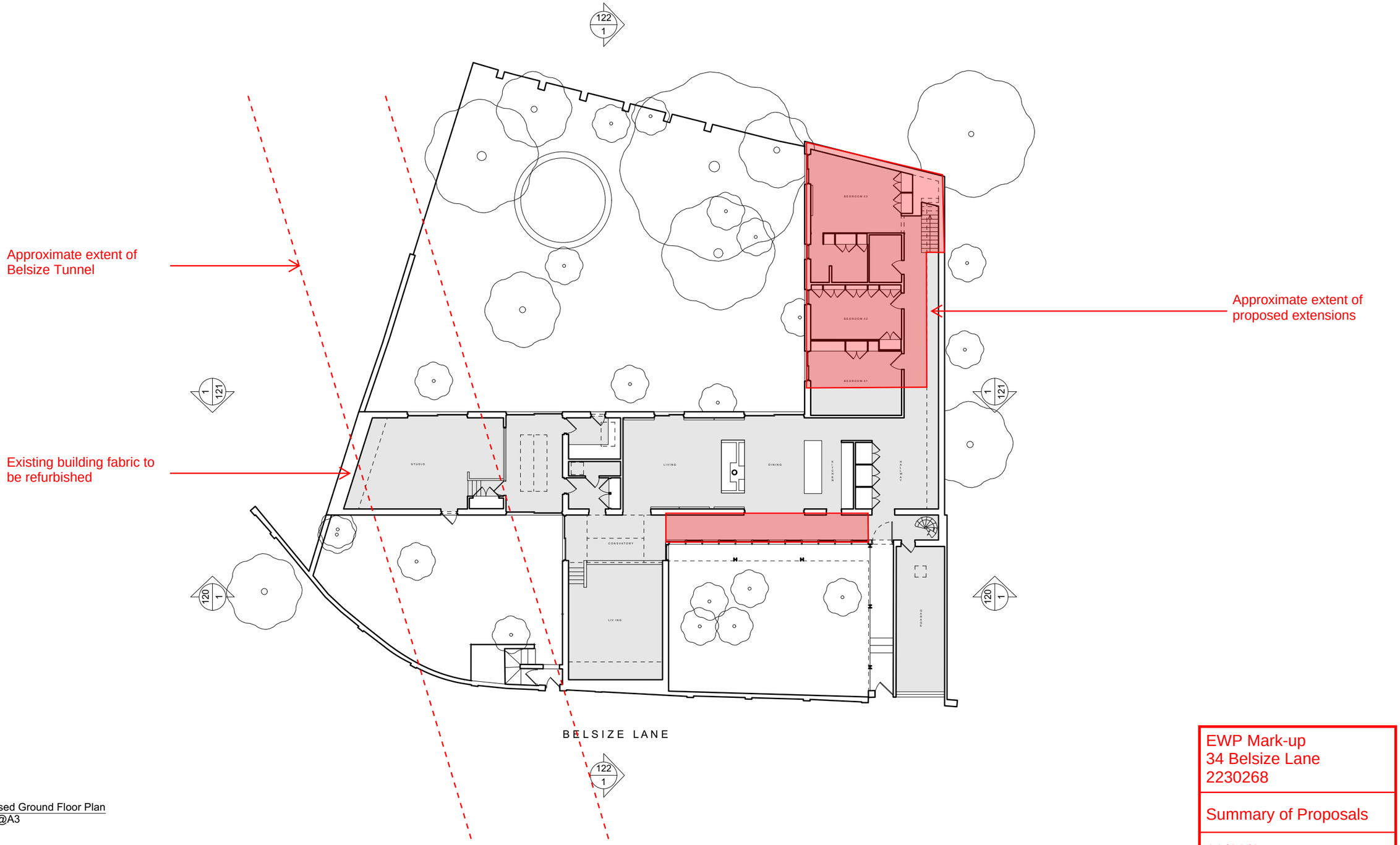

1 Proposed Ground Floor Plan
1:200@A3

EWP Mark-up
34 Belsize Lane
2230268

Summary of Proposals

08/03/24

Rev.	Date	Description

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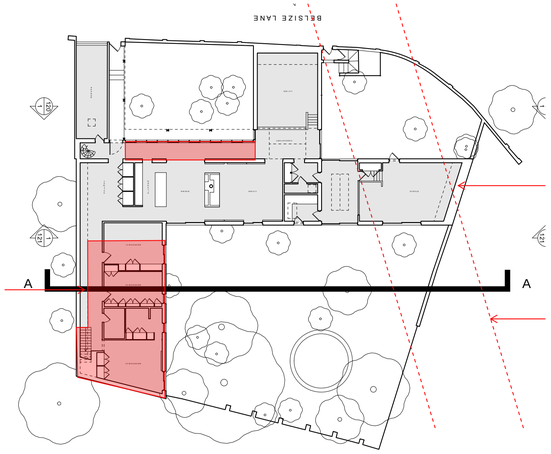
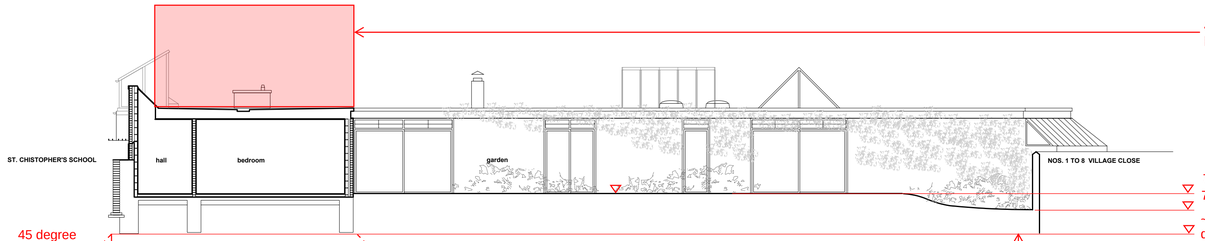


KEY PLAN



Approximate extent of proposed extension.

71.5m AOD. External Ground Level
70.9m AOD. Internal Level

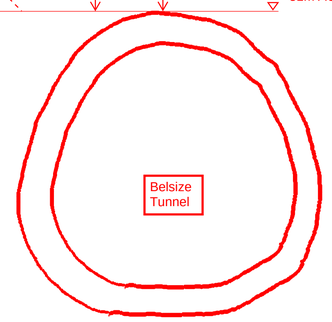
~70.1m AOD. Assumed foundation depth

45 degree load spread.

~19m

10m Exclusion Zone

51m AOD. Tunnel Crown



Overburden on Tunnel:

19m x 23kN/m3 (London Clay) = 437kN/m2

Proposed Load of New Extension:

Single storey extension, allow 15kN/m2 (conservative). This is the load at foundation level.

Additonal Load at Tunnel Crown:

With 45 degree load spread at 19m depth, 15kN/m2 / (19m x 2) = 0.4kN/m2

This equates to approximately **0.1% increase. Therefore, Negligible.**

EWP Mark-up
34 Belsize Lane
2230268

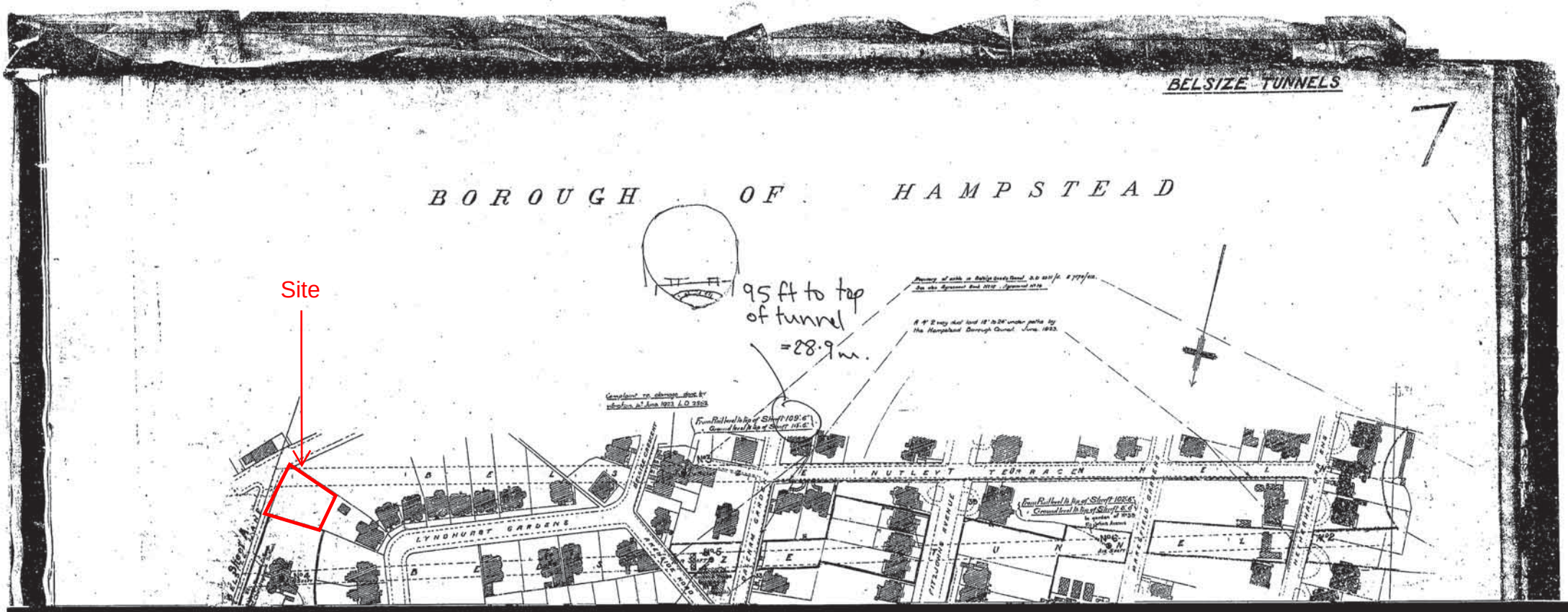
Section showing Belsize Tunnel depth

18/01/24

BELSIZE TUNNELS

7

BOROUGH OF HAMPSTEAD



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Engineering a Better Society

Date
20/11/23

Subject
34 Belsize Lane – Initial Site Visit Report

34 Belsize Lane – Initial Site Visit Report

Elliott Wood visited site on 14/06/23 along with Milecastle Projects and dMFK Architects for a general site walkaround of the site to start to understand the existing site layout, structure, and look at the building condition.

Existing structure

34 Belsize Lane is a single storey residential structure located on the corner of Belsize Lane and Ornan Road. The site is enclosed from the road by a historic brick wall. Inside the brick walls are the property and a number of courtyard gardens.

Based on the site walkaround the existing structure comprises load-bearing masonry cavity perimeter walls, assumed to be supported on concrete strip foundations with a ground bearing concrete ground floor slab. The brickwork appears to be bonded with lime mortar.

There is a steel I section to the whole perimeter of the building at roof level which sits on top of the brickwork piers/walls and spans over door openings and windows. The flat roof is assumed to comprise of timber joists which are supported on the steel perimeter sections.

Condition of existing building

Based on the site walkaround and visual inspection, the existing building appears to generally be in poor condition with need for modernisation. Condition summarised below, please see photos at end of report.

The ceiling/roof throughout are generally in poor condition. There are clear signs of damp throughout. It is assumed that the roof is constructed using timber joists. If this is the case the condition of the timbers exposed to moisture are likely to show signs of decaying.

The perimeter brickwork also appears to be in poor condition with the mortar eroded away, almost entirely in some locations. A significant number of the perimeter walls also show signs of water ingress throughout the building.

Along the perimeter wall adjacent to the school there is a significant crack along the length of the wall at approximately mid height. We believe this is likely due to retained soil behind the wall in between the property and the school. This should be explored and confirmed via targeted site investigations and the wall should be replaced. It is worth noting there is also signs of significant water ingress along this elevation.

Potential for alterations

It is assumed that the existing roof will need to be replaced as there are clear signs of water ingress within the existing building and it is unlikely to meet modern insulation standards. This will likely require a new roof structure to be installed throughout.

The steel perimeter roof beams appeared to be in reasonable condition with some localised corrosion. We would recommend that the steel sections are removed and re-finished to maintain corrosion protection. If they are not already, they should be galvanised due to their external condition. The existing steel sections, once retreated, can then be reinstated, and used as part of refurbishment proposals. In the existing condition the external exposed steels are not thermally isolated from outside to in. The proposals will need to be detailed to achieve this thermal separation. This will be a complex detail to realise and cannot be achieved with the steels, walls, and roof remaining in place.

It is proposed that new windows/doors will be required throughout. With these removed, plus the roof and steel perimeter roof beam removed, the existing masonry cavity walls would be left destabilised as standalone elements. The walls appear to comprise of only half skin thick brickwork externally and assumed half skin of blockwork internally. It is not known if the skins are tied together, or if they originally were, whether any those ties even remain. All of this will lead to the existing walls being unstable. Significant temporary works would be required to keep them stable if they were to be retained. We recommend that the external skin of brickwork is deconstructed, with bricks stored for rebuilding the proposed where feasible, and a new internal blockwork leaf constructed with larger cavity. The existing cavity appears very small which is unlikely to allow for insulation to modern standards. In addition to the stability of the existing walls, several areas appear to be in poor condition with clear signs of cracking and damp.

The existing assumed ground bearing slab will likely need to be lowered in the proposed case to allow for the installation of insulation and damp-proof membranes etc to meet modern standards. Therefore, the existing slab will need to be broken out and a new slab installed at a lower level. The assumed existing strip foundations will hopefully be able to be retained in the proposed case. This will depend on the existing depth and the proposed depth of the new ground floor slab, and this will need to be confirmed by a series of trial pits on site.

Site Investigations – Report Update (20/11/23)

A series of site investigation works were carried out by Geotechnical and Environmental Associates Ltd (GEA) during August and September 2023 which included a window sample, trial pits and opening up works to confirm construction of walls and flat roof. The findings of these investigations have been summarised below.

Existing foundations

Generally existing perimeter walls to the house sit on concrete strip/trench foundations with depths varying from 500-850mm below FFL. Foundations generally bear onto a silty sandy clay layer. There is an existing assumed ground bearing concrete slab with an assumed 100mm screed on top. A DPM layer was found present between concrete slab and screed. There was a nominal amount of polystyrene found in the trial pits which is assumed to be insulation below the slab.

Existing walls

Three existing wall conditions were opened up as part of the investigation works. These included the party wall to the north, a typical external wall, and a wall to the studio to the south.

Generally, the existing walls are cavity wall construction formed with external brick leaf and internal blockwork leaf. Please see below summary of each wall opening up.

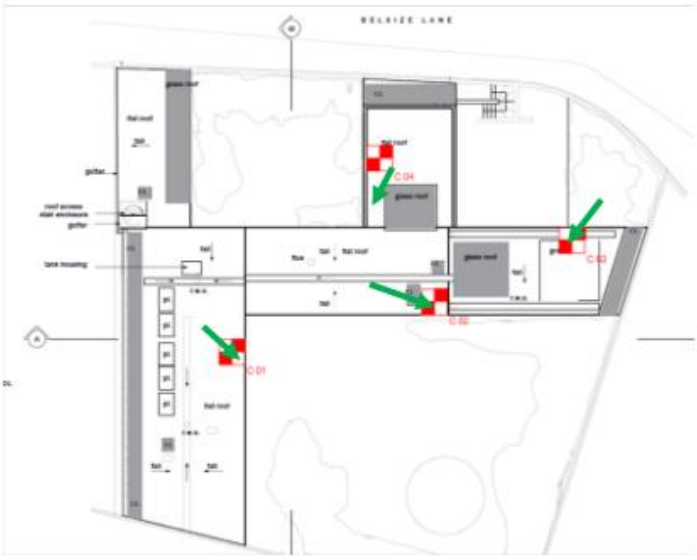
Wall 01 – 65mm cavity, no insulation. Two wall ties revealed, one of which was not connected to inner block wall. It is assumed that there will be very limited ties existing. Bituminous damp proofing present on external face of inner leaf up to 775mm above FFL.

Wall 02 – 65mm cavity with insulation present (blown-in type). No wall ties identified.

Wall 03 – 60mm cavity with glass wool insulation. Butterfly wall ties were present along with cavity tray and DPC to 550mm above FFL.

Existing roof structure

Four existing roof conditions were exposed as part of the investigation works. See summary of locations below.



C01, C02 – Timber joists are 220mm x 60mm at 400mm c/c supported on a timber wall plate to the top of the brickwork outer leaf of the cavity wall. ‘Super foil quilt’ insulation present above timber joists. Joists generally appear to be in good condition along their length with some water staining at ends.

C03 – Timber joists 200mm x 50mm @300mm c/c supported on a timber wall plate fixed to the inner face of the brickwork outer leaf of the cavity wall. Glass wool insulation between joists. No evidence of water damage.

C04 - Timber joists are 220mm x 60mm at 400mm c/c supported on a timber wall plate to the top of the brickwork outer leaf of the cavity wall. Glass wool insulation between joists. Visible water stains present to both joists and insulation.

For further information please refer to Desk Study and Ground Investigation report by GEA dated October 2023.

Site photos

Photo showing perimeter steel arrangement over door openings

Photo showing poor condition of roof

Photo showing poor condition of roof and walls

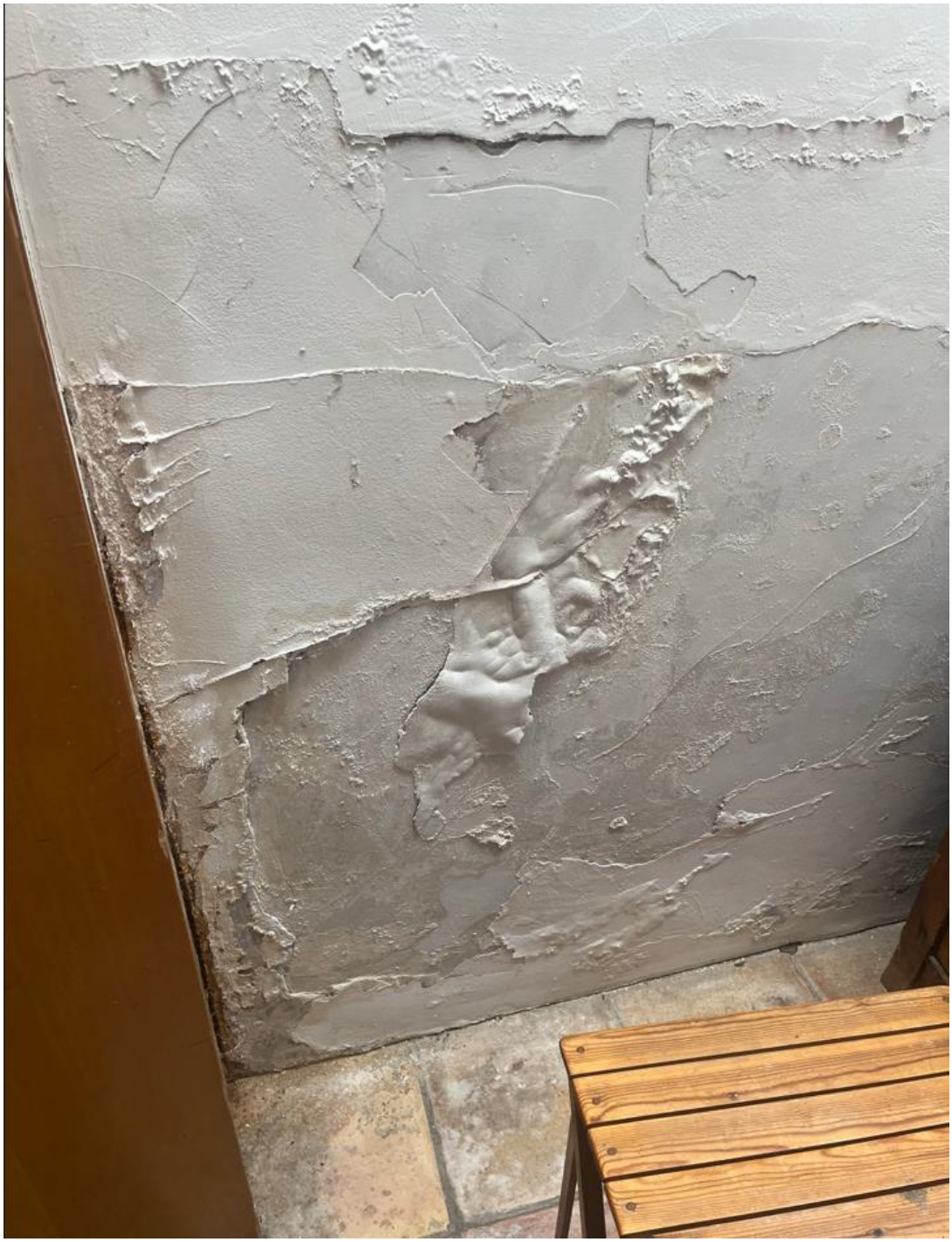


Photo showing poor condition of perimeter wall

Photo showing cracking to perimeter wall

Photo showing cracking to perimeter wall

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